Confidence Intervals

1. Recall the class survey. Nineteen female and thirty male students filled out the survey, reporting (among other variables) their GMAT scores and interest levels in the course. We will use this data to compare females and males.

   (a) What are the relevant populations?

   (b) For the 19 female respondents who reported their GMAT scores, the mean was 677 and the standard deviation was 35. For the 30 male respondents, the mean was 683 and the standard deviation was 46. Find a 95% confidence interval for the difference in population means.

   (c) For the 22 female respondents who reported their interest levels in the course (1–10), the mean was 6.9 and the standard deviation was 2.1. For the 32 male respondents, the mean was 7.1 and the standard deviation was 1.8. Find a 95% confidence interval for the difference in population means.

   (d) For the confidence intervals you constructed in parts (b) and (c) to be valid, what assumptions need to be satisfied? How could you check these assumptions?

Hypothesis Tests

2. Consider again the class survey data. We will use the data to evaluate whether or not there is a significant difference between the female and the male population means.

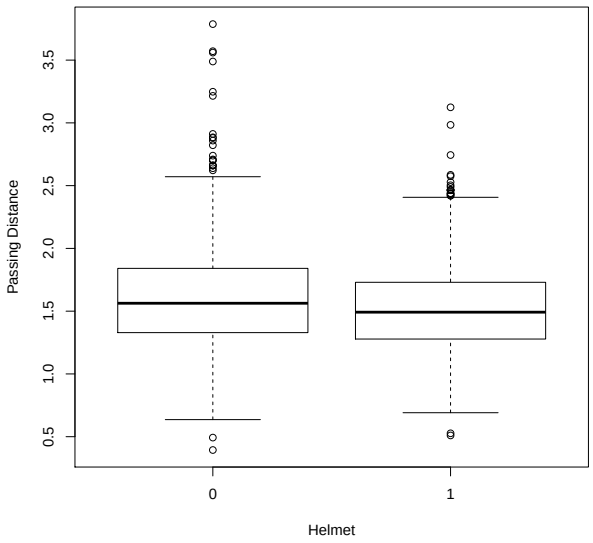
   (a) For the 19 female respondents who reported their GMAT scores, the mean was 677 and the standard deviation was 35. For the 30 male respondents, the mean was 683 and the standard deviation was 46. If the population means were equal what would be the chance of seeing a difference in sample means as large as observed?

   (b) For the 22 female respondents who reported their interest levels in the course (1–10), the mean was 6.9 and the standard deviation was 2.1. For the 32 male respondents, the mean was 7.1 and the standard deviation was 1.8. If the population means were equal what would be the chance of seeing a difference in sample means as large as observed?

   (c) What is the relationship between the confidence intervals in Question 1 and your answers to parts (a) and (b)?

Case Study: Bicycle Passing Distance

3. Here are boxplots of the passing distances (in meters) for a bike rider with and without a helmet. Is there evidence that the passing distance differs when the rider has a helmet?



Here are the sample statistics for the passing distance without a helmet: $n_1 = 1206$, $\bar{x}_1 = 1.61$, $s_1 = 0.405$. Here are the sample Here are the sample statistics for the passing distance with a helmet: $n_2 = 1149$, $\bar{x}_2 = 1.52$, $s_2 = 0.354$.

Formulate the problem as a hypothesis test, using significance level 5%.

(a) What are the populations?

(b) What are the null and alternative hypotheses?

(c) What are the samples?

(d) What is the test statistic?

(e) Approximately what is the p-value and the result of the test?

(f) Find a 95% confidence interval for the difference in passing difference with and without a helmet.