STATISTICAL METHODS II
ASSIGNMENT 02
SOLUTIONS

PROBLEM 02.1 ⟦3⟧

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However, let us test whether the Big 12 is *statistically* better than the SEC in terms of average points scored per game. Notice that we now have the following two hypotheses:

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Solution:

- We are asked to determine if the difference between the average points per game for the Big 12 is significantly different than that scored by the SEC during the 2009 football season.

- The null hypothesis is that the average number of points per game for the SEC is not greater than that of the Big 12. The alternative is that the average number of points per game for the SEC *is* statistically greater than that of the Big 12.

- I will perform a one-tailed t-test to determine the answer. The t-test assumes that the scores are Normally distributed and that they are independent. I chose this test because it appears as though the assumptions are met and because we only want to compare two groups. The test is one-sided because the alternative hypothesis is strictly "greater than."

- According to the test, the average number of points scored by the Big 12 is *not* statistically greater than that scored by the SEC ($t = 0.409; df = 285.255; p = 0.3414$).

- Because the p-value is not less than our usual value of $\alpha = 0.05$, we cannot reject the null hypothesis and we must conclude that the data support the contention that the two conferences scored the same number of points per game, statistically speaking.

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PROBLEM 02.2 ⟦3⟧

Last week, a professor I know made the statement that Africa is more poor (has a lower GDP per capita) than Asia. This seems to be the common wisdom. However, it is true? Using the dataset `gdpcap`, determine if common wisdom is correct; that is, determine if the Africa region has a significantly lower GDP per capita than does the Eastern region.

Solution:

- We are asked to determine if the gross domestic product (GDP) per capita is significantly lower among the African region states than among the Eastern region states.

- The null hypothesis is that the GDP per capita for states in the African region is not lower than among the Eastern region states. The alternative hypothesis is that the GDP per capita among the African region states *is* significantly lower than among the Eastern region states.

- I will perform a one-tailed t-test to determine the answer. The t-test assumes that the GDP per capitas are Normally distributed and that they are independent. I chose this test because it appears as though the assumptions are met and because we only want to compare two groups. The test will be one-sided because the alternative hypothesis is strictly "less than."

- According to the test, the GDP per capita in the African region *is* statistically lower than that in the Eastern region ($t = -2.3362; df = 17.118; p = 0.984$).

- Because the p-value is less than our usual value of $\alpha = 0.05$, we must reject the null hypothesis and we must conclude that the data support the common wisdom that African states are poorer than Eastern states.

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PROBLEM 02.3 〚4〛

At a certain SEC university, there was a great debate between the members of two rival fraternities as to which was smarter. I'm not sure that answer can be determined, as "smarter" has many different meanings. However, since having too low of an average grade point average (GPA) can put the fraternity on double secret probation, let us use this value to compare the two fraternities.

Using the `fraternity` data set, determine if the members of XP and AO had statistically different GPAs in 2007. Provide an appropriately labeled boxplot to illustrate your conclusions.

Solution:

- We are asked to determine there is a difference between the average GPAs in these two fraternities, XP and AO.
- The null hypothesis is that the average GPA is statistically the same between these two fraternities. The alternative hypothesis is that the average GPA is statistically different between these two fraternities.
- I will perform a two-tailed t-test to determine the answer. The t-test assumes that the GPAs are Normally distributed and that they are independent. I chose this test because it appears as though the assumptions are met and because we only want to compare two groups. The test will be two-sided because the alternative hypothesis is "not equal to."
- According to the test, the GPAs are *not* statisticallly different between the two fraternities ($t = 0.9455; df = 14.184; p = 0.3602$).
- Because the p-value is greater than our usual value of $\alpha = 0.05$, we cannot reject the null hypothesis and we must conclude that the data support the conclusion that the fraternities have statistically equal GPAs.

The boxplot of the data supports this conclusion, as well (see next page for the plot).

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GPA Comparison