**College Student Debt – Part I**

In recent years, the issue of college student debt has been of interest to the American public. According to the organization *The Project On Student Debt*, about “two-thirds of college seniors who graduated in 2010 had student loan debt, with an average of $25,250 for those with debt, up five percent from the previous year.” [[1]](#footnote-1)

**Discuss the Following Questions**

Suppose a high school student is interested in applying for colleges around the country and wants to get an estimate for how much student loans he will be taking out.

1. What is the research question of interest for the student?
2. What is the statistic that is of interest in the research question?
3. How might you go about collecting data to answer this research question?

**CREATING A BOOTSTRAP CONFIDENCE INTERVAL USING STATKEY**

* Go to <http://lock5stat.com/statkey>.
* Click on the link *CI for Single Mean, Median, St. Dev*.

Instead of using preloaded data set in StatKey, you will be bringing in the data from a CSV file.

A random sample of 103 colleges and universities was taken from The Institute for College Access & Success, College InSight data (<http://www.college-insight.org>). The colleges and universities are made up of both public four-year and private four-year institutions that have a bachelor degree program at the institution. The average student debt was reported by the institution for the 2009-2010 academic year.

* Open the file *CollegeStudentDebt103.csv*.
* Copy the column labeled *Debt* (including the *Debt* header).
* In StatKey, click on the button that says *Edit Data*.
* Highlight all of the data in the window and press Delete.
* Paste the *Debt* variable into the Edit Data window and click Ok.

1. Describe some of the numerical summaries for the *CollegeStudentDebt103* data set.

To get a single bootstrap sample, click the *Generate 1 Sample* button.

1. Describe how the bootstrap sample was obtained.
2. What is the value of the bootstrap statistic for the single bootstrap sample?

* Generate at least 10,000 bootstrap samples (recall that the number of bootstrap samples is displayed at the top of the bootstrap distribution).

1. Sketch a plot of the bootstrap distribution below.
2. Where is the plot centered? Why does this make sense?
3. What is the standard deviation of the bootstrap statistics? What does this variable tell you?
4. Use the standard error approach to construct a 95% confidence interval.
5. In order to answer the research question, provide an interpretation of the interval you created.
6. Do you know with 100% confidence that the population mean debt is contained in this interval estimate? If not, explain what “95% confidence” means.

Now you will explore how sample size affects the width of the interval.

* Copy the first 51 rows in the column labeled *Debt* (including the *Debt* header).
* In StatKey, click on the button that says *Edit Data*.
* Highlight all of the data in the window and press Delete.
* Paste the 50 *Debt* cases into the Edit Data window and click Ok.
* Generate at least 10,000 bootstrap samples.

1. Sketch a plot of the bootstrap distribution below.
2. What is the standard deviation of the bootstrap statistics?
3. How does this standard error compare to the standard error you found in question 9?
4. Use the standard error approach to construct a 95% confidence interval.
5. How does this confidence interval compare to the confidence interval you found in question 10?
6. Write a general rule that relates the sample size to the width of an interval.

**EXTENSIONS**

1. Provide a critique about how the data were collected. Hypothesize what might be missing from the average debt reported from each institution.
2. If you were to have average debt data from **all** institutions in the United States, would there be a need to compute an interval estimate?
3. Does the interval change if you simulated 1,000 bootstrap samples compared to 10,000 bootstrap samples?

1. http://projectonstudentdebt.org/files/pub/classof2010.pdf [↑](#footnote-ref-1)