

## 8.5: Confidence Intervals - Inflation Rates (Worksheet)

Work in groups on these problems. You should try to answer the questions without referring to your notes. If you get stuck, try asking another group for help.

### Student Learning Outcomes

- The student will be able to find  $t$  critical values using the Student's  $t$  Table.
- The student will be able to construct confidence intervals for a population mean and population proportion.
- The student will understand the factors that influence the width of a confidence interval.

### The Data

Recall the data used in the Descriptive Statistics Activity, which was data from a [2014 African Financial Survey](#) on a random sample of  $n = 18$  African countries. In this activity, we will focus on the **Inflation Rate** variable, which gives the inflation rate of the country in 2014, reported as a %. The data are provided in the following table.

African Financial Survey Data

Country	Inflation Rate	Country	Inflation Rate
Algeria	4.24	Mali	2.07
Cameroon	2.45	Mauritius	3.61
Cote d'Ivoire	2.86	Namibia	5.78
Equatorial Guinea	5.83	Rwanda	4.44
Ethiopia	7.89	Seychelles	4.17
Gabon	2.67	South Africa	5.68
Ghana	9.89	Swaziland	5.95
Lesotho	4.94	Togo	2.27
Madagascar	7.2	Zimbabwe	3.97

### I. Finding $t$ Critical Values

Before we calculate any confidence intervals, let's practice using the  $t$  table by calculating the following.

- Find  $t_{df, 0.10}$  assuming a sample size of  $n = 3$ .
- Find  $t_{df, 0.025}$  assuming a sample size of  $n = 9$ .
- Find  $t_{df, 0.01}$  assuming a sample size of  $n = 12$ .

### II. Confidence Intervals for a Population Mean

We will calculate confidence intervals for the population mean inflation rate for African countries using the sample data provided.

Recall that the mean and standard deviation of the sample of inflation rates are equal to the following:

$$\bar{x} = 4.77$$

$$s = 2.11$$

- First, using the following  $z$ -interval formula for a confidence interval of  $\mu$ , construct a 95% confidence interval for the mean inflation rate of African countries. Note that  $\sigma$  is not known, so use the sample standard deviation instead.

$$\bar{x} \pm z_{\alpha/2} \times \frac{\sigma}{\sqrt{n}}$$

- Now, using the following  $t$ -interval formula for a confidence interval of  $\mu$ , construct a 95% confidence interval for the mean inflation rate of African countries.

$$\bar{x} \pm t_{df, \alpha/2} \times \frac{s}{\sqrt{n}}$$

3. Compare the intervals you found in questions 1 and 2. Which one is wider? Briefly explain why.
4. Repeat questions 1 and 2, but this time use a confidence level of 90%.
5. Compare the 90% confidence intervals you computed in question 4 to the 95% confidence intervals you found in questions 1 and 2. Which intervals are wider? Briefly explain why.
6. Given that the sample size is less than 30, the population standard deviation is not known, and the histogram of the sample data is as below in Figure 8.5.1, do you think a  $z$ - or  $t$ -interval is more appropriate?

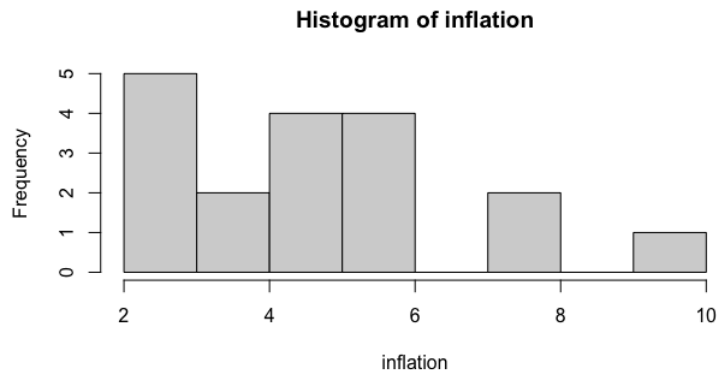


Figure 8.5.1

### III. Confidence Interval for a Population Proportion

Many countries target an inflation rate of 2%; however, there is debate amongst economists whether the target needs to be that low for a healthy economy. Some economists are now arguing for countries to target a rate of 3%. Using this new target of 3% and the sample data, you will construct a confidence interval for the population proportion of African countries that have an inflation rate below 3%.

1. First, using the sample data, find a point estimate for the population proportion of African countries that have an inflation rate below 3%.
2. Now, use the following formula to construct a 95% confidence interval for the population proportion of African countries that have an inflation rate below 3%.

$$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

3. What is the margin of error in the confidence interval you found in the previous question? Give 2 ways to **decrease** the margin of error.

### IV. Interpret the Interval Estimates

1. Pick the confidence interval from the Section II questions that you think is the most appropriate estimate for the population mean inflation rate of African countries and write a sentence providing an interpretation of the interval.
2. Write a sentence providing an interpretation of the confidence interval you found for the population proportion of African countries with inflation rate below 3% in question 2 of Section III.

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