

Question 1.1. Let's run a hypothesis test using confidence intervals to see if there is a linear relationship between egg weight and bird weight. Define the null and alternative hypotheses that will allow you to conduct this test. (8 points)

Note: Please write your answer **in the cell below** in the following format: - **Null Hypothesis:** - **Alternative Hypothesis:**

Type your answer here, replacing this text.

SOLUTION:

Null Hypothesis: The true slope of the regression line that predicts bird weight from egg weight, computed using the population of all Snowy Plovers, is 0. If the slope of the regression line computed from our sample isn't 0, that is just a result of the particular birds we have in our sample.

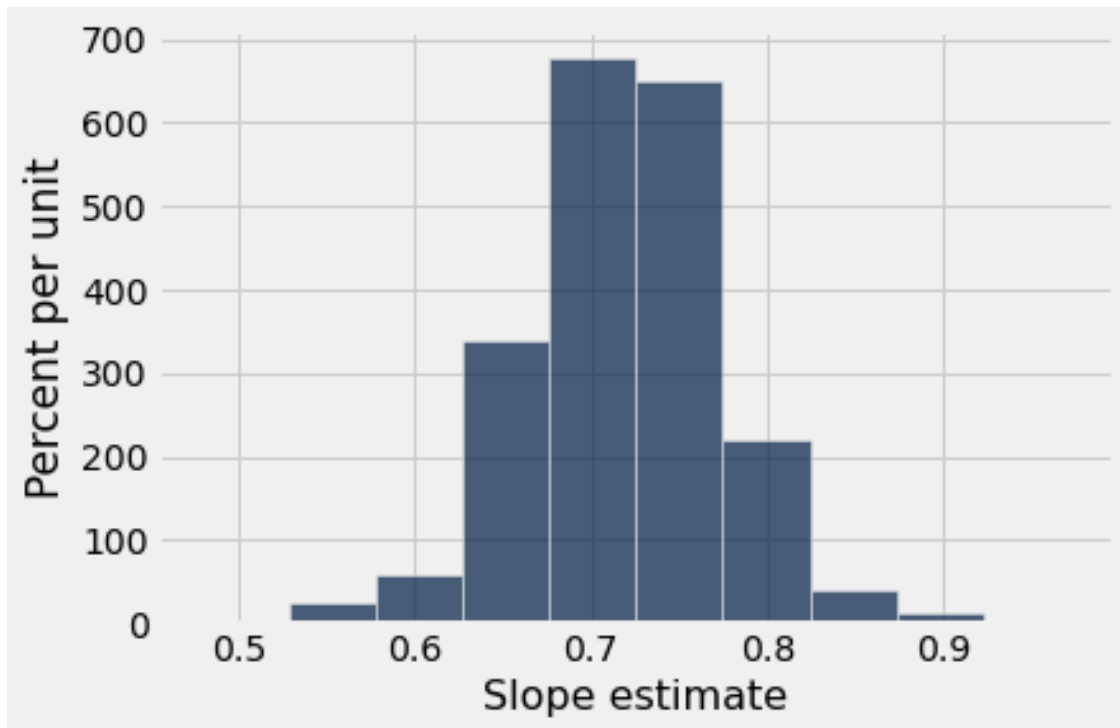
Alternative Hypothesis: The true slope of the regression line is not 0.

Question 1.4. Create an array called `resampled_slopes` that contains the slope of the best fit line for 1000 bootstrap resamples of `birds`. Plot the distribution of these slopes. (8 points)

```
In [14]: resampled_slopes = make_array() # SOLUTION

for i in np.arange(1000):
    birds_bootstrap = birds.sample(with_replacement=True) # SOLUTION
    bootstrap_line = fit_line(birds_bootstrap, "Egg Weight", "Bird Weight") # SOLUTION
    bootstrap_slope = bootstrap_line.item(0) # SOLUTION
    resampled_slopes = np.append(resampled_slopes, bootstrap_slope) # SOLUTION

# DO NOT CHANGE THIS LINE
Table().with_column("Slope estimate", resampled_slopes).hist()
```



```
In [ ]: grader.check("q1_4")
```


Question 1.6. Based on your confidence interval, would you accept or reject the null hypothesis that the true slope is 0? Why? What p-value cutoff are you using? **(8 points)**

Type your answer here, replacing this text.

SOLUTION: We would reject the null, since 0 is not within the approximate 95% confidence interval. If we use an approximate 95% confidence interval, we're using a 0.05 cutoff.

Question 1.7. What do you think the true slope is? You do not need an exact number. How confident are you of this estimate? **(8 points)**

Hint: Can you provide an interval that you think the true slope falls in?

Type your answer here, replacing this text.

SOLUTION: With 95% confidence, we can say that the true slope is somewhere between

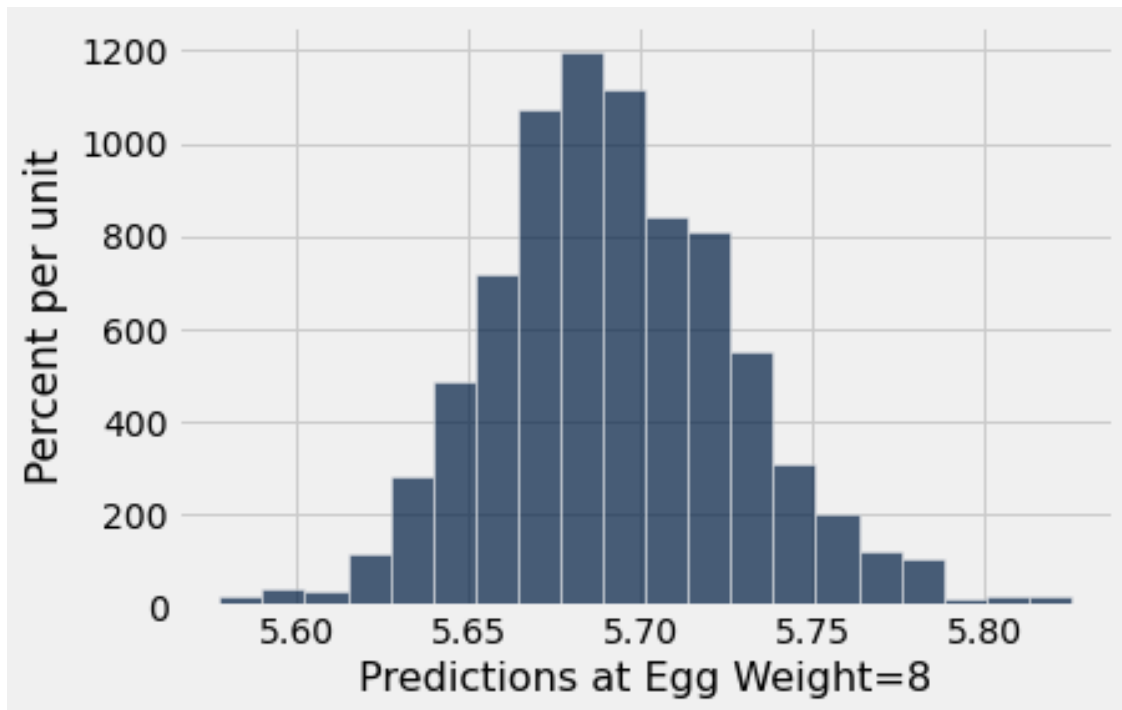
$$[0.600944, 0.821622]$$

The confidence interval generated may be different for the student. The approximate 95% confidence interval that we generate in the experiment not only allows us to make a conclusion about whether the true slope is 0, but also allows us to define a range that the true slope falls in!

Question 2.4. Create an array called `predictions_for_eight` that contains the predicted bird weights based on an egg of weight 8 grams for each regression line in `regression_lines`. (8 points)

```
In [31]: predictions_for_eight = regression_lines.column('Slope') * 8 + regression_lines.column('Intercept')

# This will make a histogram of your predictions:
table_of_predictions = Table().with_column('Predictions at Egg Weight=8', predictions_for_eight)
table_of_predictions.hist('Predictions at Egg Weight=8', bins=20)
```



```
In [ ]: grader.check("q2_4")
```

