

Sample Means

Consider observing two years worth of sales at your company at a monthly interval ($n = 24$). Monthly sales have a mean of \$1000 and a standard deviation of 100.

- What is the distribution of the sample mean? Sketch this distribution.
- What is the probability that a given sample of 24 months has a sample mean of \$990 or less?
- Now, assume you have two more years of data ($n = 48$). What is the probability that a given sample of 24 months has a sample mean of \$990 or less? Why is this probability different?

Confidence Intervals

Consider observing two years worth of sales at your company at a monthly interval ($n = 24$). Monthly sales have a mean of \$1000 and a standard deviation of 100.

- Using the true population mean of \$1000, find the middle 90% of sample means.

Now, you don't know the population mean and instead just have that the sample mean is \$1020.

- Create a confidence interval for this estimate and circle the margin of error.
- Is it true that 90% of sample means falls within your confidence interval? Why not?
- Interpret the confidence interval correctly.

Hypothesis Testing

Consider observing two years worth of sales at your company at a monthly interval ($n = 24$). Monthly sales have a standard deviation of 100. Our sample has a mean of \$1020. Consider the following test:

$$H_0 : \mu = 1000$$

$$H_A : \mu \neq 1000$$

- Sketch the sample distribution under the null and on the sketch, show what the p-value is

- Test the hypothesis with a level of significance $\alpha = 0.10$. Do you reject the null?

- Without redoing work (just think about it), how would the p-value you calculated above compare to the p-value from this test:

$$H_0 : \mu = 1000$$

$$H_A : \mu > 1000$$

Rejection Region

Consider observing two years worth of sales at your company at a monthly interval ($n = 24$). Monthly sales have a standard deviation of 100. Consider the following test:

$$H_0 : \mu = 1000$$

$$H_A : \mu \neq 1000$$

- Calculate the rejection region with a level of significance $\alpha = 0.10$. Use this rejection region to determine whether you would reject the null with a sample mean of 1020.
- Draw this rejection region. Compare this to the middle 90% of sample means with a population mean of 1000 that you calculated on the first page. They should be highly related!!

Size

Consider observing two years worth of sales at your company at a monthly interval ($n = 24$). Monthly sales have a standard deviation of 100. Consider the following test:

$$H_0 : \mu = 1000$$

$$H_A : \mu \neq 1000$$

- Using the rejection region from the previous page, calculate the probability, under the null, that we (incorrectly) reject the null. How is this related to α ?

Power

Consider observing two years worth of sales at your company at a monthly interval ($n = 24$). Monthly sales have a standard deviation of 100. Consider the following test:

$$H_0 : \mu = 1000$$

$$H_A : \mu \neq 1000$$

- Now consider that the true population mean is actually $\mu = 1010$. Calculate the power to be able to (correctly) reject the null.