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MATH-388 @ 11:30 - 14:15

LAB 17

1. Compute the standard error of the mean for the first sample.

- $\frac{s}{\sqrt{n}} = \frac{.609}{2} = 0.3045$

2. For the first sample, compute the t-statistic corresponding to the sample mean.

- $\frac{2.0745-1.7}{0.3045} = 1.229885057$

3. Paste your histogram of the 1000 t-statistics below. How is the distribution of the t-statistics similar to a standard normal distribution? How is it different?

- Please see second to last page for the graph. It is similar to the normal distribution because it looks like a bell curve but it does not look as precise.

4. What are the degrees of freedom associated with this t-statistic?

- Degrees of freedom $= n - 1 = 4 - 1 = 3 \implies df(3)$

5. Compute the standard error of the mean for the first new sample.

- $\frac{s}{\sqrt{n}} = \frac{.609}{\sqrt{100}} = \frac{0.609}{10} = 0.0609$

6. For the first new sample, compute the t-statistic corresponding to the sample mean.

- $\frac{2.0745-1.7}{0.0609} = 6.149425287$

7. Create a histogram of the 1000 new t-statistics and paste it below. Overlay both the density curve and the normal curve.

- Please see last page for attached histogram

8. What are the degrees of freedom associated with this t-statistic?

- Degrees of freedom $= n - 1 = 100 - 1 = 99 \implies df(99)$

9. For a sample of size 4, what is the probability of obtaining a sample mean at least 2 standard errors away from the population mean (t > 2 or t < -2)? What about for a sample of size 100?

- For sample size of n = 4
  - $P(t > 2) + P(t < -2)$

```r
a <- pt(2, 3, lower.tail = FALSE)
b <- pt(-2, 3)
print(a + b)
[1] 0.139326
```

- For sample size of n = 100
  - $P(t > 2) + P(t < -2)$

```r
a <- pt(2, 99, lower.tail = FALSE)
b <- pt(-2, 99)
print(a + b)
[1] 0.04823969
```

10. Briefly describe how the standard error and t-distribution change as the sample size increases.

- As your sample size increases, the standard error will subsequently lower. The t-distribution will increase when the sample size increases as well.