Statistics
Spring 2023
Lecture 43

Feb 19-8:47 AM

The college randomly selected 240 students and 84 of them were on financial Aid. $n = 240$, $x = 84$

1) what proportion of these students are on financial Aid? $\hat{p} = \frac{x}{n} = \frac{84}{240} = .35$ $\hat{q} = 1 - \hat{p} = .65$

2) find 90% conf. interval for the proportion of all students that are on financial aid.

C-level: .9 1-PropZInt $.299 < p < .401$

$30\% < p < 40\%$

3) find the margin of error.

$E = \frac{.401 - .299}{2} = \frac{.102}{2} = .051 \approx 5\%$

$\hat{p} = \frac{.401 + .299}{2} = \frac{.7}{2} = .35 = 35\%$

May 2-7:16 AM

Minimum Sample Size needed to construct Conf. interval for population proportion:

$$E = z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}} \xrightarrow{\text{with Some Algebra}} \boxed{n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2}$$

If decimal, Always round-up

If $\hat{p}$ and $\hat{q}$ are unknown, then we use .5 for them, and $\boxed{n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2}$

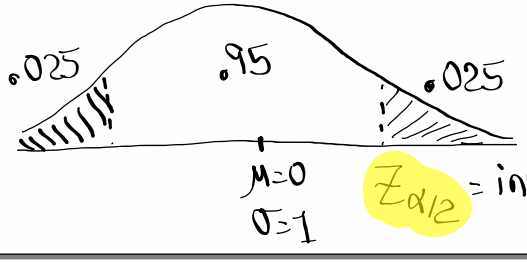
May 2-7:27 AM

Suppose the college wish to be 95% confident and margin of error not to exceed 4%, what is the minimum Sample Size needed?

$$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$

$$= (.35)(.65)\left(\frac{1.960}{.04}\right)^2 = 546.2275$$

$$\boxed{n \approx 547}$$



$z_{\alpha/2}$ = invNorm(.975, 0, 1) = 1.960

May 2-7:32 AM

60% of 352 College Students randomly selected had a part-time job.

$n = 352$

$\hat{p} = .6 \rightarrow \hat{q} = .4$

1) How many of these students had a part-time job?

$x = n\hat{p}$ $\quad x = 352(.6) = 211.2$

if decimal, Round-UP

$x = 212$

2) find Conf. interval for the porportion of all College students that have part-time job.

NO C-level $\Rightarrow$ use .95

1-PropZInt

$.551 < p < .653$

$55\% < p < 65\%$

3) find the margin of error.

$$E = \frac{.653 - .551}{2} = .051 \approx 5\%$$

$$\hat{p} = \frac{.653 + .551}{2} = .602 \approx 60\%$$

May 2-7:38 AM

4) find minimum Sample Size needed if we wish to be 99% confident and margin of error not to exceed 4%.

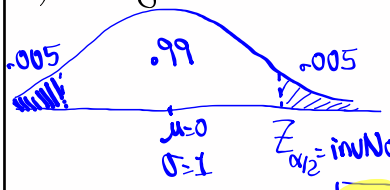
a) use given $\hat{p}$

$$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$

$$= .6 \cdot .4 \left(\frac{2.576}{.04}\right)^2$$

$= 995.3664$

$n \approx 996$



$z_{\alpha/2} = \text{invNorm}(.995, 0, 1)$

$= 2.576$

b) Assume $\hat{p}$ & $\hat{q}$ are unknown.

$$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{2.576}{.04}\right)^2$$

$= 1036.84$

$n \approx 1037$

May 2-7:47 AM

In a Survey of 185 college students, 28% of them were STEM majors. $n = 185$, $\hat{p} = .28$, $\hat{q} = .72$

1) find 98%-Conf. interval for the prop. of all college students that are STEM majors.

C-level: .98 1-PropZInt $.204 < p < .358$

$20\% < p < 36\%$

$x = n\hat{p} = 185(.28) = 51.8$

$x = 52$

2) find the margin of error.

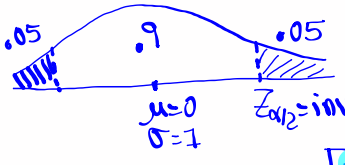
$$E = \frac{.358 - .204}{2} = .077 \approx 8\%$$

May 2-7:55 AM

4) find minimum Sample Size needed if we wish to construct conf. interval for Pop. prop. with 90% C-level and error not to exceed 5%.

$$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$

a) use given $\hat{p}$ & $\hat{q}$.



$z_{\alpha/2} = \text{invNorm}(.95, 0, 1)$

$= 1.645$

$$= .28 \cdot .72\left(\frac{1.645}{.05}\right)^2$$

$n = 218.214$

$n \approx 219$

b) Assume $\hat{p}$ and $\hat{q}$ are unknown.

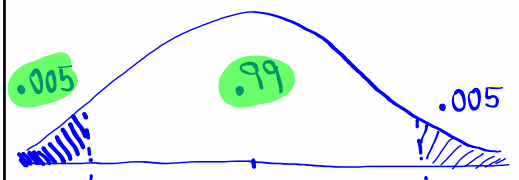
$$n = .25\left(\frac{z_{\alpha/2}}{E}\right)^2 = .25\left(\frac{1.645}{.05}\right)^2$$

$= 270.6025$

$n = 271$

May 2-8:03 AM

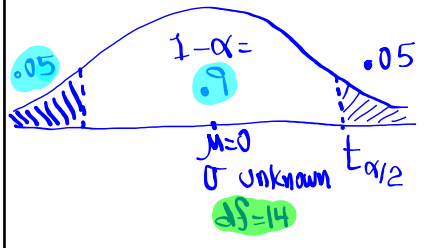
Find $\pm t_{\alpha/2}$ for 99% C-level with df = 12.



Find $t_{\alpha/2}$ for $\alpha = .1$ and df = 14.

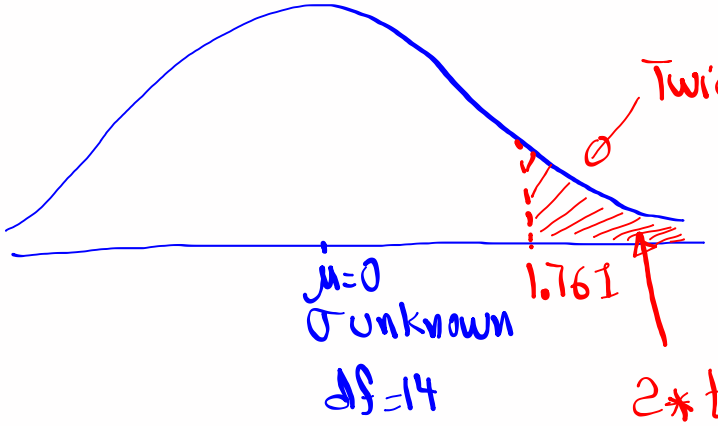
$t_{\alpha/2}$ = invT(.95, 14)

= 1.761



May 2-8:11 AM

Find twice the area to the right of $t = 1.761$ with df = 14.



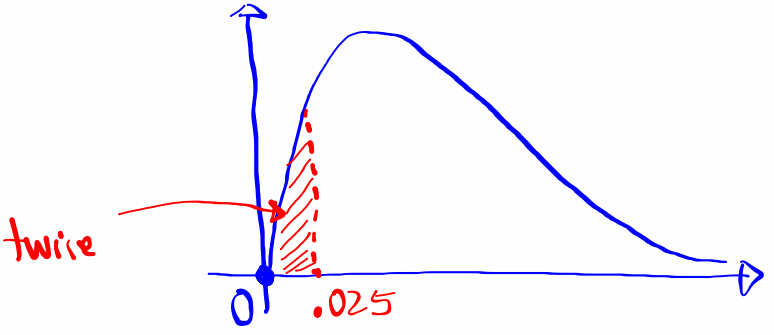
2 * tcdf(1.761, E99, 14)

≈ .100 = .1

May 2-8:17 AM

Find twice the area to the left of $\chi^2 = .025$ with df = 8.

chi-sqr



$2 * \chi^2cdf(0, .025, 8) = 2.014 \times 10^{-9}$

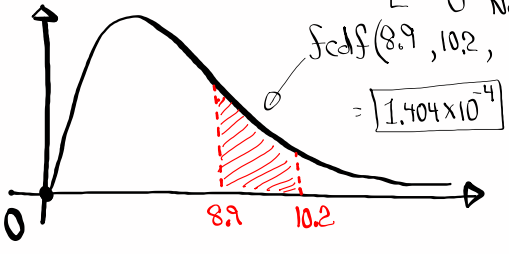
May 2-8:20 AM

Find $P(8.9 < F < 10.2)$ with Ndf = 3 & Ddf = 30.

L U Ndf Ddf

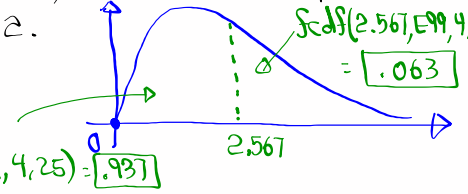
fcdf(8.9, 10.2, 3, 30)

$= 1.404 \times 10^{-4}$



Find the area on each side of F = 2.567 with Ndf = 4, & Ddf = 25. Multiply the smaller area by 2.

fcdf(2.567, E99, 4, 25) = .063



fcdf(0, 2.567, 4, 25) = .937

2 * Smaller area =

2 * .063 = .126

May 2-8:24 AM