

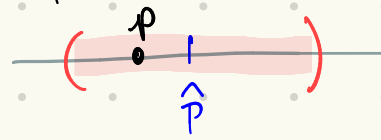
Chapter 9 Review (Only 9.1 & 9.2)

CONFIDENCE INTERVALS

inferential statistics

Population Proportion

Goal estimate population proportion p w/ an interval
↳ using a sample proportion \hat{p}



CI $\hat{p} - E < p < \hat{p} + E$ or $(\hat{p} - E, \hat{p} + E)$

Key Terms

- point estimate : $\hat{p} = x/n$
- critical value : $z_{\alpha/2}$
- margin of Error : E

How to construct CI

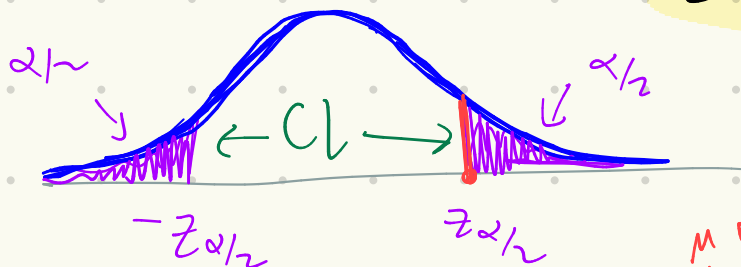
① start w/ point estimate \hat{p} (also $\hat{q} = 1 - \hat{p}$)

↳ check requirement $n \cdot \hat{p} \cdot \hat{q} \geq 10$ & SRS & Indep

② Find critical value : $z_{\alpha/2}$

③ Find Error

$$E = z_{\alpha/2} \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}}$$



④ Find CI

compute $\hat{p} \pm E$ & write CI:

$$(\hat{p} - E, \hat{p} + E)$$

→ CL

• $\alpha = 1 - CL$

• $\alpha/2$

$$z_{\alpha/2} = \text{invNorm}\left(\frac{\alpha}{2}, 0, 1, \text{RIGHT}\right)$$

USE NORMAL DIST/
z-dist

Estimating Sample Size

sample \hat{p} known

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

\hat{p} unknown

$$n = \frac{(z_{\alpha/2})^2}{4 E^2}$$

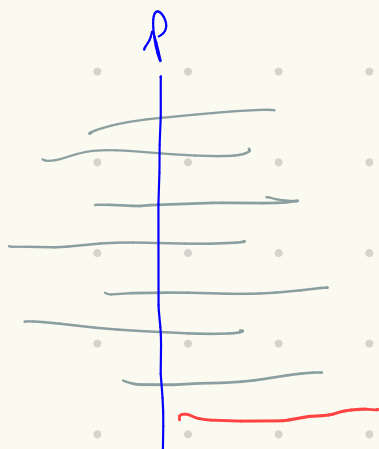
alternative

$$= \frac{(z_{\alpha/2})^2 \cdot 0.25}{E^2}$$

Template "Interpretation" ($M \rightarrow E$)

#1 "We are _____ confident that the true population proportion of _____ is between _____ & _____."

#2 "If we took 100 samples and constructed 100 corresponding confidence intervals, then CL out of 100 of them will contain the true population proportion."



$\hat{p}_1 \quad \hat{p}_2 \quad \hat{p}_3 \quad \hat{p}_4 \quad \hat{p}_5 \quad \hat{p}_6 \quad \dots \quad \hat{p}_{100}$
 $\downarrow \quad \downarrow \quad \quad \quad \quad \quad \quad \downarrow$
 CI CI CI CI CI CI CI

$$CL = 90\% = 0.9$$

so

90 CI contain pop. prop.

9.2 CI for Population MEAN

"MRT IS MEAN"

USE t-distribution

CI for Mean

$$\bar{x} - E < \mu < \bar{x} + E$$

or

$$(\bar{x} - E, \bar{x} + E)$$

How to construct

① Find point estimate: \bar{x} (and also sample standard deviation s)

check requirements: ① SRS ② indep ③ original distribution

normal
OR
 $n > 30$

② Find critical value: $t_{\alpha/2}$

③ Error

$$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$$

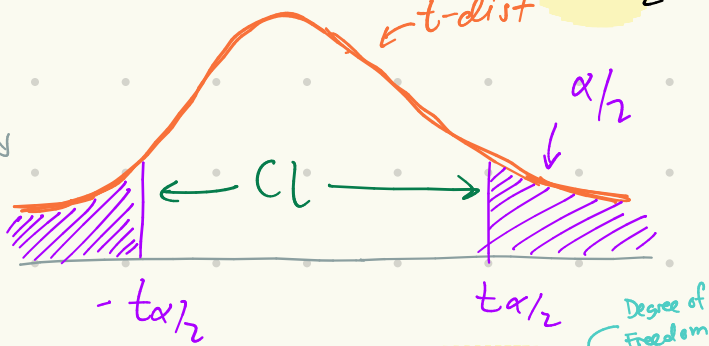
s = sample standard deviation

④ Find CI

compute $\bar{x} \pm E$ & write

$$CI: (\bar{x} - E, \bar{x} + E)$$

note "fatter tails"



$$\begin{cases} \bullet CL \\ \bullet \alpha = 1 - CL \\ \bullet \alpha/2 \end{cases} \Rightarrow t_{\alpha/2} = |invT(\alpha/2, df)|$$

(or = $invT(1 - \alpha/2, df)$)

Estimating Sample Size

$$n = \left(\frac{z_{\alpha/2} * s}{E} \right)^2$$

wait? why not using t-dist?
b/c we don't know n (we're trying to find this) so we use $z_{\alpha/2}$ as est.