

Section 10.4

unknown $\rightarrow p$ (popul. prop.)

estimator $\rightarrow \hat{p}$ (sample prop.)

$\rightarrow$ previously μ

Confidence interval for p

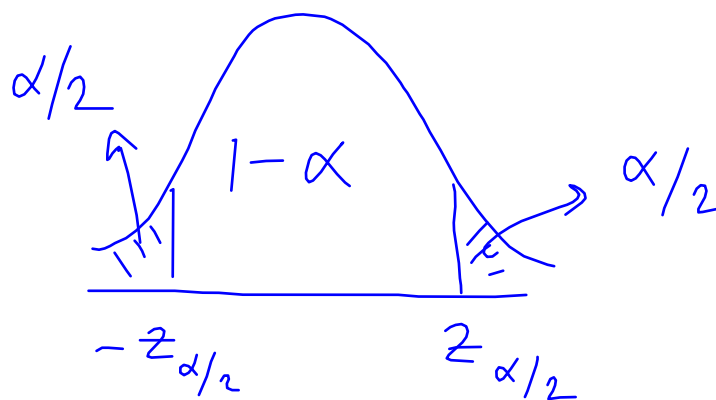


$$\text{level} = 1 - \alpha$$

$$\text{e.g. } 1 - \alpha = 0.95$$

$$\alpha/2 = 0.025$$

$$z_{\alpha/2} = 1.96$$



prev. : CI for μ

$$\bar{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$$\hat{p} \pm z_{\alpha/2} \sigma_{\hat{p}}$$

$$\begin{aligned} np &\geq 10 \\ n(1-p) &\geq 10 \end{aligned}$$

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} \approx \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

max. at 0.5

unemp. σt .

$$n = 10,000$$

$$n\hat{p} = 350$$

$$\# \text{ employed} = 350$$

$$n(1-\hat{p}) = 9,650$$

$$\hat{p} = \frac{350}{10,000} = 0.035$$

$$1-\hat{p} = 0.965$$

CI for p

$$1-\alpha = 0.95 \Rightarrow z = 1.96$$

$$\hat{p} \pm 1.96 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

↙

$$0.035 \pm 1.96 \sqrt{\frac{0.035 \times 0.965}{10,000}}$$

0.004

$$CI : [0.031, 0.039]$$

Determine reqd. n given E

$$E = Z \cdot \sigma_{\hat{p}}$$

$$= Z \cdot \sqrt{\frac{p(1-p)}{n}} \quad \text{or} \quad Z \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$n = \frac{Z^2 \cdot p(1-p)}{E^2} \quad \text{or} \quad \frac{Z^2 \cdot \hat{p}(1-\hat{p})}{E^2}$$

Previous question $n = 10,000$
 $E = 0.004$

Say $E = 0.05$

n ?

$1 - \alpha = 0.95$

$$n = \frac{Z^2 \cdot 0.035 \times 0.965}{(0.05)^2}$$

$$= \frac{1.96^2 \times 0.035 \times 0.965}{(0.05)^2}$$

$$\text{reqd. } n = 52$$

$$E = 0.01 \rightarrow \text{reqd. } n = 1298$$

$$E = 0.001 \rightarrow \text{reqd. } n = 129750$$