

TWO-PROPORTION Z-INTERVAL

$$n \geq 30$$

$$n\hat{p} \geq 5 \quad \text{and} \quad n\hat{q} \geq 5$$

$$n\hat{p} \geq 10 \quad \text{and} \quad n\hat{q} \geq 10$$

$$n\hat{p} \geq 15 \quad \text{"} \quad n\hat{q} \geq 15$$

n

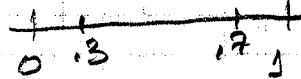
x

$$\hat{p} = \frac{x}{n}$$

$$\hat{p} \pm 3\sigma_{\hat{p}} \quad \text{falls between}$$

0 and 1

$$(0.3, 0.7)$$



two proportions

n_1

x_1

$$\hat{p}_1 = \frac{x_1}{n_1}$$

n_2

x_2

$$\hat{p}_2 = \frac{x_2}{n_2}$$

$$n_1 \hat{p}_1 \geq 5 \quad n_1 \hat{q}_1 \geq 5 \quad \text{and} \quad n_2 \hat{p}_2 \geq 15 \quad n_2 \hat{q}_2 \geq 15$$

10

10

10

10

15

15

15

15

$$\hat{p}_1 \pm 3\sigma_{\hat{p}_1}$$

$$\hat{p}_2 \pm 3\sigma_{\hat{p}_2}$$

one proportion

$$\hat{p} \pm Z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

two proportions

$$\hat{p}_1 - \hat{p}_2 \pm Z_{\alpha/2} \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}}$$

EXAMPLE

Construct a 95% confidence interval for $p_1 - p_2$

$$n_1 = 300$$

$$n_2 = 400$$

$$x_1 = 200$$

$$x_2 = 290$$

$$\hat{p}_1 = \frac{200}{300} \approx .67$$

$$\hat{p}_2 = \frac{290}{400} = .725$$

$$\hat{q}_1 = 1 - \hat{p}_1 = 1 - .67 = .33$$

$$\hat{q}_2 = 1 - .725 = .275$$

$$n_1 \hat{p}_1 = 300 \times .67 = 201 \geq 15$$

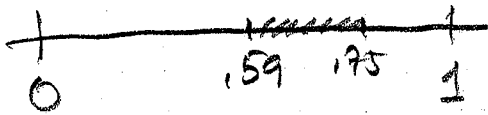
$$n_2 \hat{p}_2 = 400 \times .725 = 290 \geq 15$$

$$n_1 \hat{q}_1 = 300 \times .33 = 99 \geq 15$$

$$n_2 \hat{q}_2 = 400 \times .275 = 110 \geq 15$$

$$\hat{p}_1 \pm 3 \sigma_{\hat{p}_1} = \hat{p}_1 \pm 3 \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1}}$$

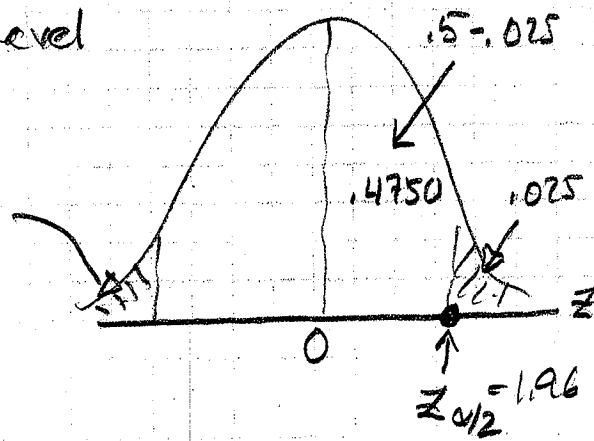
$$= .67 \pm 3 \sqrt{\frac{.67 \times .33}{300}} = (.59, .75)$$



95% Confidence Level

$$\alpha = 1 - .95 = .05$$

$$\alpha/2 = \frac{.05}{2} = .025$$



95% C.I

$$.67 - .725 \pm 1.96 \sqrt{\frac{.67 \times .33}{300} + \frac{.725 \times .275}{400}}$$

$$-.055 \pm .069 = (-.124, .014)$$