Section 7.3: Large-Sample Hypothesis Testing - Binomial Proportion

Monday, March 12, 2018 8:49 AM

Question #3 on handout:

proories:

H_0: $p = p_0$

H_a: $p \neq p_0$

can we use the normal distribution?

$n\hat{p}_1 = 63$ (or $np_0 = 75$)

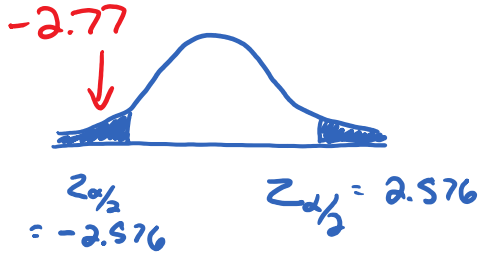
$n\hat{q}_1 = 37$ ($nq_0 = 25$) all > 5 ✓

test statistic:

$$z = \frac{\hat{p} - p_0}{\sqrt{p_0(1-p_0)/n}} = \frac{0.63 - 0.75}{\sqrt{\frac{(0.75)(0.25)}{100}}}$$

$= -2.77$

acceptance/rejection: 99% level



$z_{\alpha/2} = 2.576$

-2.77 lies in the rejection region

Conclusion:

with 99% confidence, we can say that the test results do not support the geneticist's claim.

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question #4: (carpool)

H_0: $p_1 = p_2$ (same) — before → p_1, after → p_2

H_a: $p_1 < p_2$ (carpooling increased) — one-tailed

check:

$n_1 \hat{p}_1 = 62$

$n_1 \hat{q}_1 = 1000 - 62$

$n_2 \hat{p}_2 = 93$

$n_2 \hat{q}_2 = 1250 - 93$

} all > 5 ✓

test statistic:

after − before

$$z = \frac{\hat{p}_2 - \hat{p}_1}{\sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

where $\hat{p} = \frac{n_1 \hat{p}_1 + n_2 \hat{p}_2}{n_1 + n_2}$ (total number of successes)

$= \frac{62 + 93}{1000 + 1250}$

$$= 0.06\overline{8}$$

$$z = \frac{\frac{93}{1250} - \frac{62}{1000}}{\sqrt{0.06\overline{8}\left(1 - 0.06\overline{8}\right)\left(\frac{1}{1000} + \frac{1}{1250}\right)}}$$

$$= 1.154$$