Statistics 300 **Tue./Thu.**
Quiz #15 **7:00-8:50 p.m.** **Name:** Solution

(9 points:12 minutes)

1. **Some people want to compare the proportion of high school boys that smoke cigarettes to the proportion of high school girls that smoke cigarettes. Use the data below to test the claim that the proportion of boys that smoke is 5% bigger than the proportion for girls.** (Use the classical approach to hypothesis testing with a 0.10 significance level.)

smoke	Girls	Boys
Yes	407	470
No	1451	1469

Claim: $p_B = p_G + 0.05$

$(p_B - p_G) = 0.05$

$H_0: (p_B - p_G) = 0.05$ ← difference is Not zero.

$H_1: (p_B - p_G) \neq 0.05$

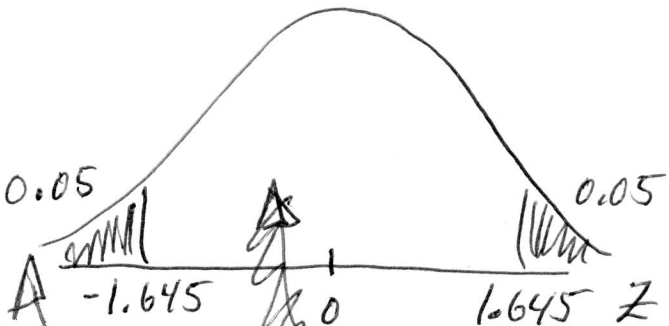
$\alpha = 0.10$ in 2 tails

$n = 1858$ | 1939

$\hat{p}_G = \frac{407}{1858} = 0.2191$ | $\hat{p}_B = \frac{470}{1939} = 0.2424$

$\hat{q}_G = 0.7809$ | $\hat{q}_B = 0.7576$

Test Statistic when value of difference in hypotheses is not zero:



$$\frac{(\hat{p}_B - \hat{p}_G) - (p_B - p_G)}{\sqrt{\frac{\hat{p}_B \hat{q}_B}{n_B} + \frac{\hat{p}_G \hat{q}_G}{n_G}}} = \frac{(0.2424 - 0.2191) - 0.05}{\sqrt{\frac{(.2424)(.7576)}{1939} + \frac{(.2191)(.7809)}{1858}}}$$

$$= \frac{.0233 - 0.05}{0.0137} = \frac{-0.0267}{0.0137} = -1.95$$

Reject H_0:

Statistics 300 **Tue./Thu.**
Quiz #15 **7:00-8:50 p.m.** **Name:** Solution

(9 points:12 minutes)

2. **Some people want to compare the proportion of high school boys that smoke cigarettes to the proportion of high school girls that smoke cigarettes. Use the data below to test the claim that the proportion of boys that smoke is the same as the proportion for girls.** (Use the classical approach to hypothesis testing with a 0.10 significance level.)

smoke	Girls	Boys
Yes	407	470
No	1451	1469

same data as problem #1

claim: $p_B = p_G$

$(p_B - p_G) = 0$

$H_0: (p_B - p_G) = 0$ ← difference is zero.

$H_1: (p_B - p_G) \neq 0$

$\alpha = 0.10$ in 2 tails

$\hat{p}_G = 0.2191$ $\hat{p}_B = 0.2424$

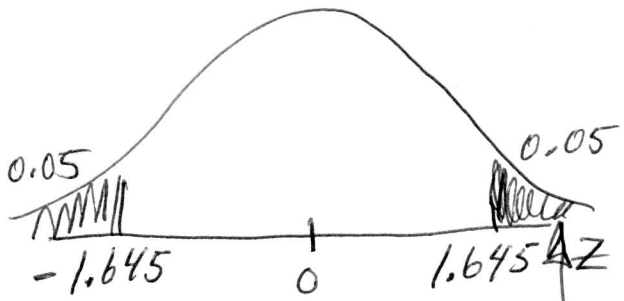
$\hat{q}_G = 0.7809$ $\hat{q}_B = 0.7576$

$n_G = 1858$ $n_B = 1939$

since value of difference in hypotheses is zero, we need $\bar{p}$

$$\bar{p} = \frac{x_B + x_G}{n_B + n_G} = \frac{407 + 470}{1858 + 1939} = 0.231$$

$\bar{q} = 0.769$



Test Statistic

$$\frac{(\hat{p}_B - \hat{p}_G) - (p_B - p_G)}{\sqrt{\frac{\bar{p}\bar{q}}{n_B} + \frac{\bar{p}\bar{q}}{n_G}}} = \frac{(0.2424 - 0.2191) - 0}{\sqrt{\frac{(0.231)(0.769)}{1939} + \frac{(0.231)(0.769)}{1858}}} = \frac{0.0314}{0.010} = 3.14$$

(zero)

reject H_0:

Statistics 300 **Tue./Thu.**
Quiz #15 **7:00-8:50 p.m.** **Name:** Solution

(9 points:12 minutes)

3. **Some people want to compare the proportion of high school boys that are "overweight" to the proportion of high school girls that are "overweight". Use the data below to make an 80% confidence interval for the true difference between p_g (the proportion of all girls that are overweight) and p_b (the proportion of all boys that are overweight).**

Overweight	Girls	Boys
Yes	418	486
No	1451	1469

$n = 1869 \quad 1955$

$\hat{p}_G = \frac{418}{1869} = 0.2236 \qquad \hat{p}_B = \frac{486}{1955} = 0.2486$

$\hat{q}_G = 0.7764 \qquad \hat{q}_B = 0.7514$

$80\%\ CI(p_B - p_G) = (\hat{p}_B - \hat{p}_G) \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_B\hat{q}_B}{n_B} + \frac{\hat{p}_G\hat{q}_G}{n_G}}$

confidence $= 0.80$

$\alpha = 1 - 0.80 = 0.20$

$\alpha/2 = 0.10$

$z_{\alpha/2} = 1.28$

$CI(p_B - p_G) = (0.2486 - 0.2236) \pm 1.28\sqrt{\frac{(0.2486)(0.7514)}{1955} + \frac{(0.2236)(0.7764)}{1869}}$

$= 0.025 \pm 1.28(0.0137)$

$= 0.025 \pm 0.018$

$= [0.007 < (p_B - p_G) < 0.043]$