Wednesday, April 14, 2010
8:45 PM

Pg. 142:

2. In the 1980s it was generally believed that congenital abnormalities affected about 5.2% of the nation's children. Some people believe that the increase in the number of chemicals in the environment has led to an increase in the incidence of abnormalities. A recent study examined 384 children and found that 28 of them showed signs of abnormality. Follow the steps of the significance test, and state your conclusions by answering in context to the following questions: At the 5% significance level, does this data give strong evidence that the risk has increased? At the 1% level?

$H_0: p = 0.052$

$H_a: p > 0.052$

$\hat{p} = \frac{x}{n} = \frac{28}{384} \approx 0.073$

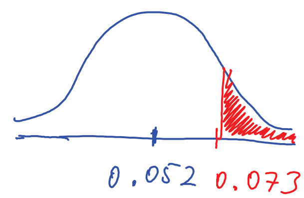
Conditions: random ?
we don't know, hopefully yes.

$n p_0 = 384(0.052) > 10$ ✓

$n(1-p_0) = 384(1-0.052) > 10$ ✓

Test statistic:

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{0.073 - 0.052}{\sqrt{\frac{0.052(1-0.052)}{384}}} = 1.85$$



p-value (from the z-table):

$1 - 0.9678 = 0.0322$

From the calculator: 5: 1-PropZTest:

$z = 1.846$ p-value $= 0.032$

CONCLUSION: At the 5% level we can reject H_0 since p-value < 5%. That is, we can conclude that the risk has increased.
On the other hand, at the 1% level we cannot reject H_0. At the 1% level we can't reject the claim that 5.2% of the children have congenital abnormalities.

3. A research center estimates that 40% of U.S. adults eat breakfast every day. 45% of a random sample of 300 U.S. adults say they eat breakfast every day. At the 10% significance level, is there enough evidence to reject the researcher's claim? At the 5% level?

$H_0: p = 0.40$

$H_a: p \neq 0.40$

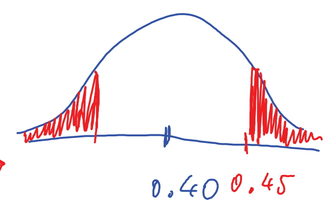
Comment: never ever look at the sample results before you state the claims!

<u>Conditions</u>: random ✓ $\quad np_0 = 300(0.40) > 10$ ✓

$n(1-p_0) = 300(1-0.40) > 10$ ✓

<u>Test statistic</u>:

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{0.45 - 0.40}{\sqrt{\frac{0.40(1-0.40)}{300}}} = 1.77$$



Comment: we have both tails because we have a two-sided test (a "$\neq$" in H_a)

<u>p-value</u> (from the z-table): the probability for the upper tail is $1 - 0.9616 = 0.0384$. But we have two tails so the p-value is $2 \cdot (0.0384) = 0.0768$

From the calculator: 5: 1-PropZTest: using

$X = 300(0.45) = 135$: $z = 1.77$ and $p = 0.077$

<u>Conclusion</u>: We can reject H_0 at the 10% level because p-value < 10%. We can conclude that not 40% of U.S. adults eat breakfast. On the other hand, we cannot reject H_0 at the 5% level. At the 5% level we cannot reject the claim the 40% of U.S. adults eat breakfast.