§9.2: Z Test for Proportions

Skills

- Conduct a one sample z-test for proportions

Step 1

$H_0: p = p_0$
$H_a: p \ |?| \ p_0$

This calls for a one sample *z*-test for proportions

Step 2

This requires

- The sample was obtained randomly (a random sample or a randomized experiment)
- The sample size is no larger than 10% of the population size
- np and $n(1-p)$ are each at least 10

Step 3

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

We find the probability much like we did last semester...

Step 4

If [null hypothesis is true] then I can expect to find [probability statement] in approximately [p-value] of samples.
Since [p-value] [< / >] [α], this [is / is not] significant; I [reject / fail to reject] the null hypothesis.
[now with context...evidence or no evidence of the alternate]

Example

Previous polls have determined that 39% of people plan on taking more vacation time this year An economist believes that this number is too high. He obtains a sample of 100 people and finds that 35 plan on taking more vacation time this year.

Example

Bob has an old coin, with which his Uncle Bill used to make (and win) bets. Bob has reason to believe that the coin isn't balanced, and thus might land heads up more often than not.
To test his theory, he flips the coin 100 times and obtains 55 heads.

Alternate Approach

Instead of finding a *p*-value, find a region of test statistics (z) that will lead to rejection
This is really an inverse normal calculation...

Tests and Intervals

There is a natural connection between a two sided test and an interval, as long as $\alpha = 1 - C$

- When the hypothesized value of the parameter is *in the interval*, the test will likely *fail to reject*
- When the hypothesized value of the parameter is *not in the interval*, the test will likely *reject*

It's not perfect!

Example

A 95% interval to determine the percentage of unemployed is (0.075,0.105)

An economist wants to test $p = 0.082$ versus $p \neq 0.082$ at the 5% level

What will the likely result of the test be?

...now try some problems!