Hypothesis Tests for a Population Proportion

Definition

When observed results are unlikely under the assumption that the null hypothesis is true, we say the result is **statistically significant** and we reject the null hypothesis

Classical Approach (TI-83/84)

1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H_o always has the equals part on it)
3. See if claim matches H_o or H_1
4. Draw the picture and split α into tail(s)
   - H_1: p ≠ value Two Tail
   - H_1: p < value Left Tail
   - H_1: p > value Right Tail
5. Find critical values (INVNORM)
6. Find test statistic (1-PROPZTEST)
7. If test statistic falls in tail, Reject H_o. If test statistic falls in main body, Accept H_o. Determine the claim based on step 3

Classical Approach (By Hand)

1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H_o always has the equals part on it)
3. See if claim matches H_o or H_1
4. Draw the picture and split α into tails
   - H_1: p ≠ value Two Tail
   - H_1: p < value Left Tail
   - H_1: p > value Right Tail

Classical Approach (By Hand) (cont.)

5. Find critical values: Use Standard Normal Distribution table
6. Find test statistic: $z_o = \frac{\hat{p}-p_o}{\sqrt{\frac{p_o(1-p_o)}{n}}}$ where $\hat{p} = \frac{x}{n}$ and p_o is the number from the claim (in decimal form)
7. If test statistic falls in tail, Reject H_o. If test statistic falls in main body, Accept H_o. Determine the claim based on step 3

P-Value Approach (TI-83/84)

1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H_o always has the equals part on it)
3. See if claim matches H_o or H_1
4. Find p-value (1-PROPZTEST)
5. If p-value is less than α, Reject H_o. If p-value is greater than α, Accept H_o. Determine the claim based on step 3

P-Value Approach (By Hand)

1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H_o always has the equals part on it)
3. See if claim matches H_o or H_1
4. Find test statistic: $z_o = \frac{\hat{p} - p_o}{\sqrt{\frac{p_o(1-p_o)}{n}}}$ where $\hat{p} = \frac{x}{n}$ and p_o is the number from the claim (in decimal form)

P-Value Approach (By Hand) (cont.)

5. Lookup the z-score from step 4 in the Standard Normal Distribution table and find the p-value (Remember the p value is the area JUST in the tail(s))
6. If p-value is less than α, Reject H_o. If p-value is greater than α, Accept H_o. Determine the claim based on step 3

1. Claim

According to ABC News in June 2012, 36% of people believe in UFO's in the United States. If a sample of 200 people find that 74 of them believe in UFO's, test the claim that the percentage that believe in UFO's is greater now at α = 0.05

2. Claim

According to the Chicago Tribune in 1990, 74% of teenagers believed in Angels. If a sample of 500 teenagers shows that 410 believe in Angels, test the claim that the percentage is the same at α = 0.10

3. Claim

According to the Chicago Tribune in 1990, 50% of teenagers believed in ESP. If a sample of 400 teenagers shows that 190 believe in ESP, test the claim that the percentage is different nowadays at α = 0.01

4. Claim

According to the Chicago Tribune in 1990, 29% of teenagers believed in witchcraft. If a sample of 500 teenagers shows that 80 believe in witchcraft, test the claim that the percentage is lower nowadays at α = 0.05

Two-Tailed Hypothesis Testing Using a Confidence Interval

When testing H_o: $p = p_o$ versus H_1: $p \neq p_o$, if a confidence interval (based on $1 - \alpha$) contains p_o, we do not reject the null hypothesis. However, if the confidence interval does not contain p_o, we conclude that $p \neq p_o$ at the level of significance