Warm Up

- A large city's Department of Motor Vehicles claimed that 80% of candidates pass driving tests, but a newspaper reporter's survey of 90 randomly selected local teens who had taken the test found only 61 who passed. Does this finding suggest that the passing rate for teenagers is lower than the DMV reported?

- State the parameter of interest and the hypotheses

Part V – From the Data at Hand to the World at Large

Ch. 20 – Testing Hypotheses About Proportions (Day 2)

7 Steps to Hypothesis Testing

1) State hypotheses (includes defining the parameter of interest)
2) Name a test
3) Check conditions
4) Calculate the test statistic
5) Find the p-value
6) Reject or fail to reject H_0 (if p is small, reject H_0)
7) Draw a conclusion <u>in context</u> ("There is/is not enough evidence to conclude that…")

Example #1

- Does “home field advantage” really matter in baseball? In the 2003 major league baseball season, there were 2429 regular season games. It turns out that the home team won 1335 of the 2429 games (54.96%). Does this evidence show that home field advantage really exists?

Step 1: Hypotheses

- If there was no home field advantage, then the home team could be expected to win about half the time
- Don't forget to define the parameter

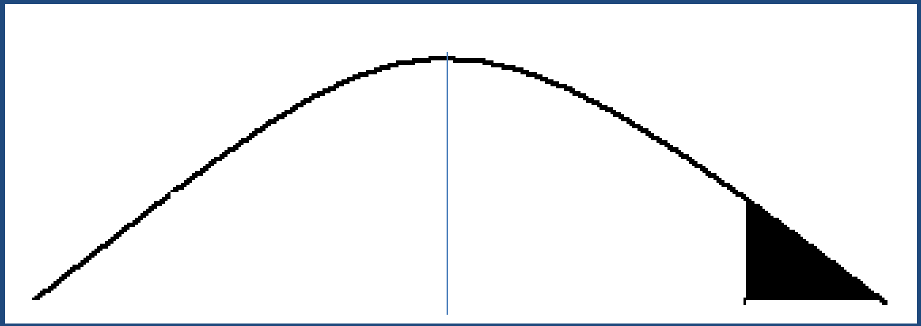
p = the proportion of games won by the home team

H_0: $p = .50$

H_a: $p > .50$

Step 2: Name the Test

- We will perform tests for many different situations – single samples, two samples, means, proportions…
- For this situation, we are performing a *right-tailed* 1-proportion z-test



Step 3: Conditions

- We are still using the Normal model to represent a sample proportion, so the conditions for this test are :
  - Random Sample
  - Sample size < 10% of population size
  - $np \geq 10$ and $n(1 - p) \geq 10$
- Note: For this problem, the sample is <u>not</u> random – it consists of all of the games from the 2003 season. However, we will have to assume these are representative of all major league games.

Step 4: Test Statistic

- For this test, the test statistic is a z-score
- Remember, you can use your formula sheet:

$$\text{standardized test statistic} = \frac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$$

- For proportions:

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

- For this problem:

$$z = -$$

Step 5: P-value

- When we look up z = 4.89 on our z-chart, we can't find it. All we know is that $\underline{p \approx 0}$
- This p-value represents the probability that we could have encountered our sample results by natural variation (chance) if H_0 was true
- So there is practically no chance that if the home team wins 50% of the time overall, we would find a sample of 2429 games in which 54.96% were won by the home team

Step 6: Make a Decision

- If your P-value is small, reject H_0
- Your two options are:
  - Reject H_0
  - Fail to reject H_0
- You should refer only to H_0 at this step
- Don't say "accept H_0"
- Make sure you link your decision to your p-value:

"Since p is very small, reject H_0."

- For today, we will consider our cutoff for "small" to be 5%   (more on this tomorrow)

Step 7: Draw a Conclusion

- The last step requires an explanation in everyday language of what you concluded in Step 6
- Describe H_a in context here – not H_0
- If you reject H_0: "There is enough evidence to conclude that…[H_a in words]"
- If you don't: "There is not enough evidence to conclude that……[H_a in words]"
- For this problem: There is enough evidence to conclude that the home team wins more than 50% of major league baseball games.

Let's try another one…

- According to a recent poll, 32% of Americans believe that the U.S. was correct in invading Iraq. A Press Enterprise reporter thinks that this proportion is higher among Riverside residents. He takes a sample of 50 Riverside residents and finds that 38% of them still support the decision to go to war. Does this provide enough evidence to show that the reporter is correct?

p = the proportion of Riverside residents who still support the decision to go to war in Iraq

H_0: p = .32

H_a: p > .32

Right-tailed one-proportion z-test $p = .38$

Condition	Check
Random sample	Assume this to be true
n < 10% N	50 is less than 10% of all Riverside residents
np ≥ 10 and n(1 – p) ≥ 10	50(.32)≥10 16≥10 50(.68)≥10 34≥10

$z =$

$p =$

Since p is large, fail to reject H_0.

There is not enough evidence to conclude that the proportion of Riverside residents who still support the decision to go to war in Iraq is higher than the national rate of 32%.

Homework!

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