7C Test for Prop

Contents

Textbook: Devore 8e

A One-Sample Z-test for proportion

[ToC]

A.1 Test for a Population Proportion

If we wish to test $H_0 : p = p_0$ against alternatives

$$
\begin{aligned}
H_A :\ & p > p_0 && \text{(Upper-tailed alternative)} \\
H_A :\ & p < p_0 && \text{(Lower-tailed alternative)} \\
H_A :\ & p \neq p_0 && \text{(Two-tailed alternative)}
\end{aligned}
$$

We let $\hat{p} = X/n$ and perform one-sample z-test with significance level α of your choice. That is, the test statistic is

$$z = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0)/n}}$$

H_A	P-value
upper-tailed	$1 - \Phi(z)$
lower-tailed	$\Phi(z)$
Two-tailed	$2(1 - \Phi(\|z\|))$

A.2 Ex: Drought and Fertilizer Use

The percentage of farmers using fertilizers in an African country was known to be 35%. The drought and other events of the last few years are believed to have had a potential impact on the proportion of farmers using fertilizers. An international aid program wants to test if it changed. With n=550, sample proportion was $= 242/550$.

A.3 Ex: Tire Share

Suppose that the Goodyear Tire company has historically held 42% of the market for automobile tires in US. Recent changes in company operation prompted the firm to test the validity of the assumption that it still controlls 42% of the market. With n=100, sample showed 35/100 had Goodyear tires.

A.4 Example 8.1-1: One sample proportion

A study was conducted on the impact characteristics of football helmets used in competitive high school programs. In the study, a measurement called the Gadd Severity Index (GSI) was obtained on each helmet using a standardized impact test. A helmet was deemed to have failed if the GSI was greater than 1200. Of the 81 helmets tested, 19 failed the GSI 1200 criterion.

1. What is the point estimate of the proportion of helmets that fail, and standard error of the estimate?
2. Based on the sample, what is the 95% confidence interval for the true proportion of helmets that would fail the test?
3. Test the null hypothesis that true proportion of helmets that would fail the test is 30% against the lower-tailed alternative.
4. If the test was to be conducted again, how many suspension-type helmets should be tested so that the margin of error does not exceed 0.05 with 95% confidence?