§8.6 Large-Sample test for Population proportion

Same as before with z-scores as in the section on confidence intervals.

From a sample:

x = number of successes

n = number of observations sampled

$\hat{p} = \frac{x}{n}$, $\hat{q} = 1 - \hat{p}$, p_o = population proportion (also p)*

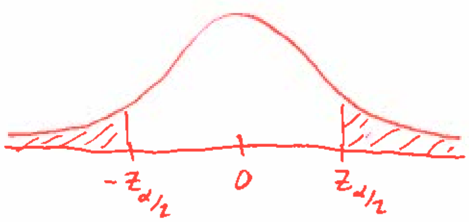
α = significance level

$$z_c = \frac{\hat{p} - p_o}{\sigma_{\hat{p}}} = \frac{\hat{p} - p_o}{\sqrt{p_o q_o / n}}$$

* not to be confused with p = observed significance level in hypothesis tests

Confidence Intervals

$$\hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

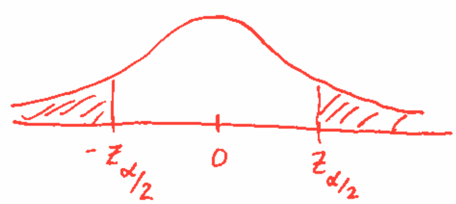


area = α

Hypothesis testing (2-tailed)

$H_o: p = p_o$

$H_a: p \neq p_o$



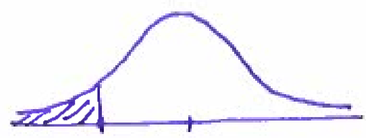
rejection region

If z_c is in the rejection region, we reject H_o. Otherwise, we fail to reject H_o

The other (1-tailed) cases are similar.

Example In the year 2000, the proportion of Michigan adults smokers was reported to be 25.5%. The Michigan Department of Public Health conducted a survey in 2002 to assess if the percent of adult smokers had declined. Out of 2400 adults surveyed 595 reported that they smoked. Test the hypothesis that the percent of smokers declined with significance level of .05.

$Z_{.05} = 1.645 \Rightarrow$



$H_0: p = .255$

$H_a: p < .255$

$x = 595,\ n = 2400 \Rightarrow \hat{p} = \frac{595}{2400} = .248,\ \hat{q} = .752$

Stat -> tests -> 1-PropZtest:

prop < 0.255

$Z_c = -0.796$

$p = 0.213$ ← observed significance level

$\hat{p} = .248$

$n = 2400$

Since Z_c is not in the rejection region (and the observed significance level is greater than α), we fail to reject H_0. There is not enough evidence to suggest that the proportion of adult smokers has decreased by the year 2002.