CI / Hypothesis test handout

Math 382

t-Test for the mean

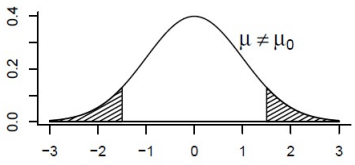
Step 1. Null Hypothesis $H_0 : \mu = \mu_0$

Step 2. Alternative Hypothesis $H_1 : \mu \neq \mu_0$ two-sided

Step 3. Critical value: $t_{\alpha/2}$ with $\texttt{df} = n - 1$

Step 4. Test Statistic $t = \dfrac{\sqrt{n}(\overline{X} - \mu_0)}{s}$

Step 5. Decision Rule: Reject H_0 if $|t| > t_{\alpha/2}$



Step 6. (optional) p-value $= 2 \times P(T > |t|)$

Reject H_0 when p-value $< \alpha$

Step 7. Conclusion in the words of the problem.

CI for the mean

$$\overline{X} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$$

t-Test for two independent samples

(assume equal variances)

$H_0 : \mu_1 - \mu_2 = d_0$

$$t = \frac{\overline{X}_1 - \overline{X}_2 - d_0}{s_p \sqrt{1/n_1 + 1/n_2}}$$

$$s_p = \sqrt{\frac{s_1^2(n_1 - 1) + s_2^2(n_2 - 1)}{n_1 + n_2 - 2}}, \ \texttt{df} = n_1 + n_2 - 2$$

CI for $\mu_1 - \mu_2$

$$\overline{X}_1 - \overline{X}_2 \pm t_{\alpha/2} s_p \sqrt{1/n_1 + 1/n_2}$$

z-Test for proportion

Step 1. Null Hypothesis $H_0 : p = p_0$

Step 2. Alternative Hypothesis $H_1 : p \neq p_0$ two-sided

Step 3. Critical value: $z_{\alpha/2}$

Step 4. Test Statistic $z = \dfrac{\sqrt{n}(\hat{p} - p_0)}{\sqrt{p_0 q_0}}$

Step 5. Decision Rule: Reject H_0 if $|z| > z_{\alpha/2}$

Step 6. (optional) p-value $2 \times P(Z > |z|)$

Reject H_0 when p-value $< \alpha$

Step 7. Conclusion in the words of the problem.

Note: Z-test is valid when $np_0q_0 > 5$

CI for the proportion:

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