Chapter 8

Hypotheses Tests

8.1 Hypotheses and Test Procedures
8.2 Tests About a Population Mean
8.3 Tests Concerning a Population Proportion

Example

If the population is normal with known standard deviation \( \sigma_0 \), develop a test for \( H_0: \mu = \mu_0 \) vs \( H_a: \mu > \mu_0 \).

Suppose a producer claims that each package of his products contains at least 250 gram. We also know that the weight has a normal distribution with \( \sigma_0 = 5 \). Suppose we take a sample of size 100.

Given \( \alpha = 0.05 \), find the rejection rule.

Example

If the population is normal with known standard deviation \( \sigma_0 \), develop a test for \( H_0: \mu = \mu_0 \) vs \( H_a: \mu \neq \mu_0 \).

Suppose that the weight (in gram) of sugar packages has a normal distribution with a known standard deviation of 2.5. The target value for the mean is \( \mu_0 = 980 \). 100 packages are chosen randomly, with a resulting sample mean of 980.52.

Can we reject \( H_0: \mu = \mu_0 \) with \( \alpha = 0.05 \)?

Summary for \( H_0: \mu = \mu_0 \)

Test statistic value:

For a one-tailed test:

- \( H_a: \mu > \mu_0 \) reject when \( z \geq z_{\alpha} \)
- \( H_a: \mu < \mu_0 \) reject when \( z \leq -z_{\alpha} \)
- \( H_a: \mu \neq \mu_0 \) reject when \( z \geq z_{\alpha/2} \) or \( z \leq -z_{\alpha/2} \)

For a two-tailed test:

- \( H_a: \mu > \mu_0 \) reject when \( t \geq t_{\alpha/2, n-1} \)
- \( H_a: \mu < \mu_0 \) reject when \( t \leq -t_{\alpha/2, n-1} \)
- \( H_a: \mu \neq \mu_0 \) reject when \( t \geq t_{\alpha/2, n-1} \) or \( t \leq -t_{\alpha/2, n-1} \)
Example

A random sample (normal rvs) yields the measurements 299, 300, 302, 305, 307, 311.

Test $H_0$: $\mu = 300$ vs $H_1$: $\mu \neq 300$ with $\alpha = 0.05$