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Chapter 8

Hypotheses Tests

- 8.1 Hypotheses and Test Procedures
- 8.2 z-Tests for Hypotheses about a Population Mean**
- 8.3 The One-Sample t-Test
- 8.4 Tests Concerning a Population Proportion

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Example

If the population is normal with known standard deviation 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. Let $\alpha = 0.05$.

- (a) If the sample mean is 251, what is the P-value?
- (b) If the sample mean is 250.5, what is the P-value?
- (c) Find the rejection rule.

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Example

If the population is normal with known standard deviation σ_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 $\alpha = 0.05$?

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Summary for $H_0: \mu = \mu_0$

Test statistic value:

$$z = \frac{\bar{x} - \mu_0}{\sigma_0 / \sqrt{n}}$$

- $H_a: \mu > \mu_0$ reject when $z \geq z_\alpha$ (**upper-tailed test**)
- $H_a: \mu < \mu_0$ reject when $z \leq -z_\alpha$ (**lower-tailed test**)
- $H_a: \mu \neq \mu_0$ reject when $z \geq z_{\alpha/2}$ or $z \leq -z_{\alpha/2}$ (**two-tailed test**)

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z curve (probability distribution of test statistic Z when H_0 is true)

(a) (b) (c)

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