

# Chapter 10 |

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2023-12-05

## Quick review (1)

- In **hypothesis testing** we want to consider the plausibility of a specific claim (claims are called hypotheses)

$H_0$  : “*H-naught*,” “*H-null*,” or “*null hypothesis*.”

$H_1$  (sometimes written as  $H_a$  ): “*alternative hypothesis*.”

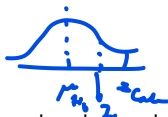
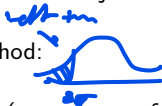
- The null hypothesis ( $H_0$ )
  - Gets the benefit of the doubt
  - The default belief or “status quo”
  - Associated with no change in course
- The alternative hypothesis ( $H_1$ )
  - Carries the burden of proof
  - Change our belief
  - Requires us to take some action or change our action
- Three setup for tests:
  - Alternative:  $\mu \neq \mu_0$  (two tailed test)
  - Alternative:  $\mu > \mu_0$  or  $\mu < \mu_0$  (right/left tail test)

## Quick review (2)

Procedure of testing When  $\sigma$  is known,  $Z_{\bar{X}} = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} \sim N(0, 1)$

- 1 Identify the hypotheses with a hypothesized value for  $\mu, \mu_{H_0}$ .
- 2 Determine the significance level,  $\alpha$
- 3 Calculate the z-test statistic  $Z_{\bar{X}} = \frac{\bar{X} - \mu_{H_0}}{\sigma/\sqrt{n}}$
- 4 Critical value method (or rejection region method)

- critical z-score identifies the rejection region
- determined by  $\alpha$ :  $z_{\alpha}$  (upper-tail),  $-z_{\alpha}$  (lower-tail) or  $\pm z_{\alpha/2}$  (2-tail)
- compare the test statistic with the critical value(s): Reject  $H_0$  if test statistic falls in the rejection region



- 5 p-value method:
- The p-value (sometimes referred to as the observed level of significance) is the probability of observing a sample mean (or test statistic) at least as extreme as the one selected for the hypothesis test, assuming the null hypothesis is true.
  - Compare p-value with  $\alpha$ . Reject  $H_0$  if p-value is less than  $\alpha$ .

$$\alpha = P(Z > z_{\alpha})$$