Hypothesis Testing

Stat 573

4-14-15

1

Two competing hypotheses
- statements about a population parameter

$\begin{cases} H_0 & \text{"null hypothesis"} \\ H_1 & \text{"alternative hyp."} \end{cases}$

Examples

$H_0: \mu = 70$	$H_0: p \geq .6$	$H_0: \mu_1 \leq \mu_2$
$H_1: \mu \neq 70$	$H_1: p < .6$	$H_1: \mu_1 > \mu_2$

H_0 gets the benefit of the doubt

Possible conclusions
- Reject H_0 — You found sufficient evidence of H_1
- Fail to reject H_0 — You failed to find sufficient evidence of H_1

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		Conclusion	
		Fail to reject H_0	Reject H_0
Actually True	H_0	✓	Type I
	H_1	Type II	✓

$\alpha = \text{Prob}(\text{Type I})$

$\beta = \text{Prob}(\text{Type II})$

Type I error occurs if H_0 is actually true, but you reject it.

Type II error occurs if H_1 is actually true, but you fail to reject H_0.

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α is set in advance

+ it is called the "level of significance"

$1-\beta$ is called the "power" of the test

$1-\beta$ = Prob(not committing a Type II error)

From the data, you will compute a test statistic

Compare the test stat to a value (or values) read from a table + draw your conclusion.

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Examples

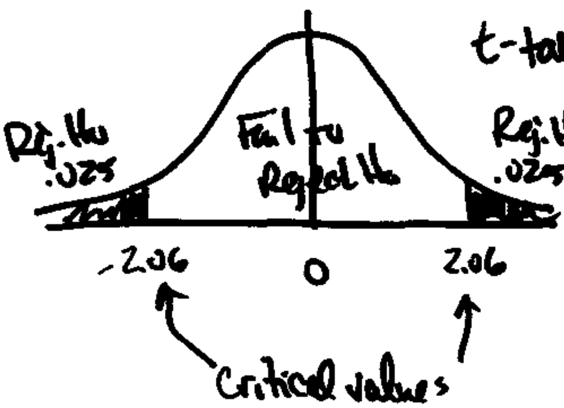
Nike has a current soccer ball that gets an average score of 70 (out of 100)

They plan to survey 25 randomly-selected players + get them to rate the new ball. Use $\alpha = .05$

t-table, 24 df

$H_0: \mu = 70$

$H_1: \mu \neq 70$



Now, collect the data.

Suppose they find $\bar{x} = 72.5$ and $s = 5$

$$\text{Test stat} = \frac{\bar{x} - \mu_0}{\left(s/\sqrt{n}\right)} = \frac{72.5 - 70}{\left(5/\sqrt{25}\right)} = 2.5$$

Reject H_0.