Hypothesis Testing

1

452

4-20

$H_0 : \mu = 27$ null hypothesis

$H_1 : \mu \neq 27$ alternative hypothesis

Possible conclusions:

1 Reject H_0 (27 is not a plausible value)

2 Accept H_0 (27 is a plausible value)

		Decision	
		Acc H_0	Rej. H_0
Actually True	H_0	✓	I
	H_1	II	✓

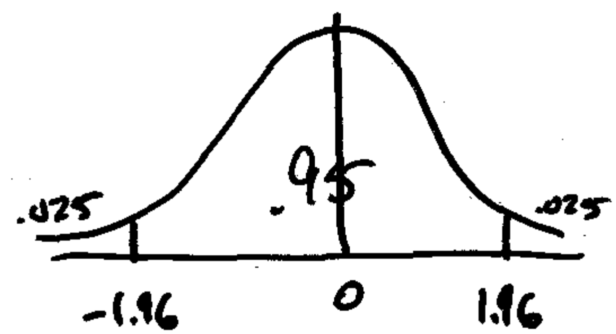
2

α = Prob (Type I error)

β = Prob (Type II error)

α will be chosen in advance

$1-\beta$ = power of the test



Give H_0 the benefit of the doubt.

Suppose that the true population mean is μ_0.

Then $Z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$ will

have (approx) a $N(0,1)$ distribution

Suppose we formulate a decision rule that says:

Accept H_0 if $-1.96 \le Z \le 1.96$

Reject H_0 if $|Z| > 1.96$

Then, if H_0 is true, there will be a 5% chance of committing a Type I error.

Step 1: State H_0 and H_1

Step 2: Select α and find critical value(s) from the table

Step 3: Collect the data & compute the test statistic Z

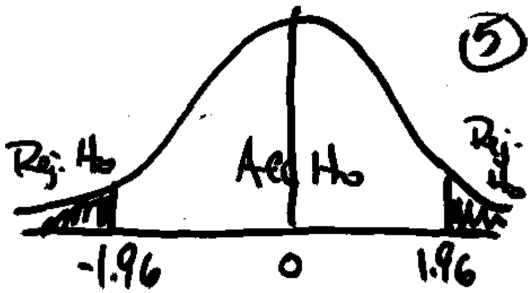
Step 4: Make a decision to either Accept H_0 or Reject H_0.

Example: There is a claim that the population mean is 27, and we would like to see if there is evidence to contradict this claim.

(5)

$H_0: \mu = 27$

$H_1: \mu \neq 27$



Use $\alpha = .05$

Collect data: $n = 20$, $\bar{x} = 25$

(Know in advance that $\sigma = 3$)

Test stat $= Z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$

$$= \frac{25-27}{3/\sqrt{20}} = -2.98$$

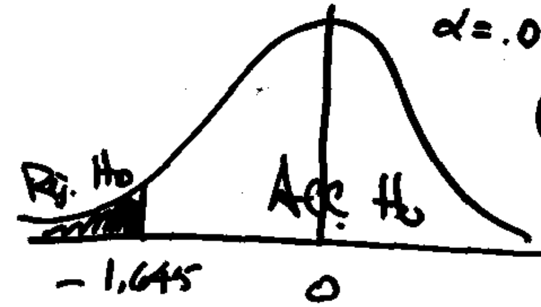
Reject H_0. There is strong evidence that the population mean is not 27.

$\alpha = .05$

(6)

$H_0: \mu \geq 27$

$H_1: \mu < 27$



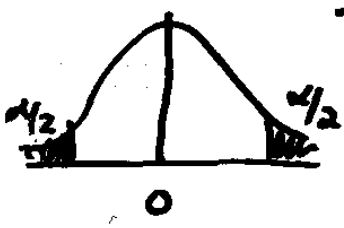
This would be a "lower 1-sided test"

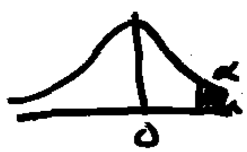
Test stat $= -2.98$

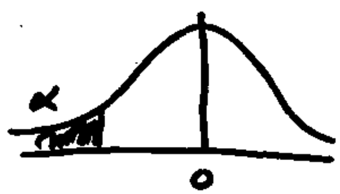
Reject H_0. There is strong evidence that the population mean is less than 27.

Summary:

$H_0: \mu = \mu_0$	$H_0: \mu \le \mu_0$	$H_0: \mu \ge \mu_0$
$H_1: \mu \ne \mu_0$	$H_1: \mu > \mu_0$	$H_1: \mu < \mu_0$
2-sided	upper 1-sided	lower 1-sided







$$\text{Test stat} = \begin{cases} z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} \\[2ex] t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} \quad df = n-1 \end{cases}$$

HW #4 due 4/27

p.357 # 20
25
40