Announcements

Do Writing Assignment 3 Calculations

WA3 due April 7th (3.3)

WA3 peer review due April ~~14~~ 14th

Testing: $H_0: \mu = \mu_0$

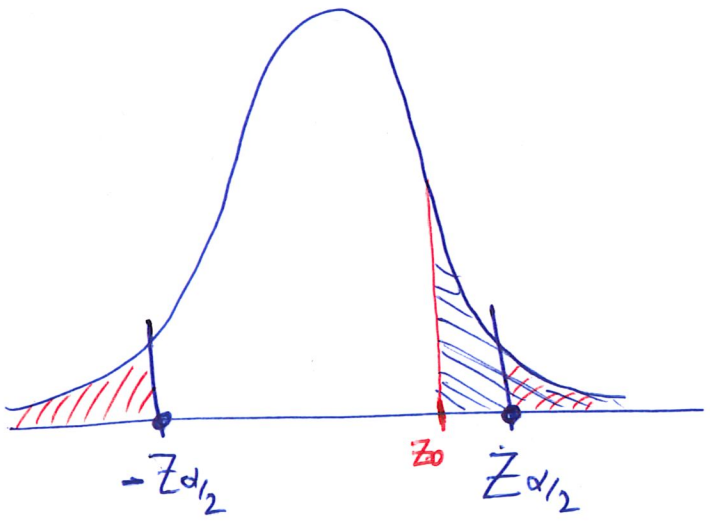
$H_1: \mu \neq \mu_0$

σ is Known

Then we calculate a test statistic:

$$Z_0 = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$$

Note: if H_0 is true then $Z_0 \sim N(0,1)$



Rules:

Reject H_0 if $|Z_0| > Z_{\alpha/2}$

Fail to reject H_0 if:

$-Z_{\alpha/2} \leq Z_0 \leq Z_{\alpha/2}$

Example 8.5 (page 319)

$H_0: \mu = 75$

$H_a: \mu < 75$

Population is normal with $\sigma = 9$

$$Z_0 = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$$

$n = 25$

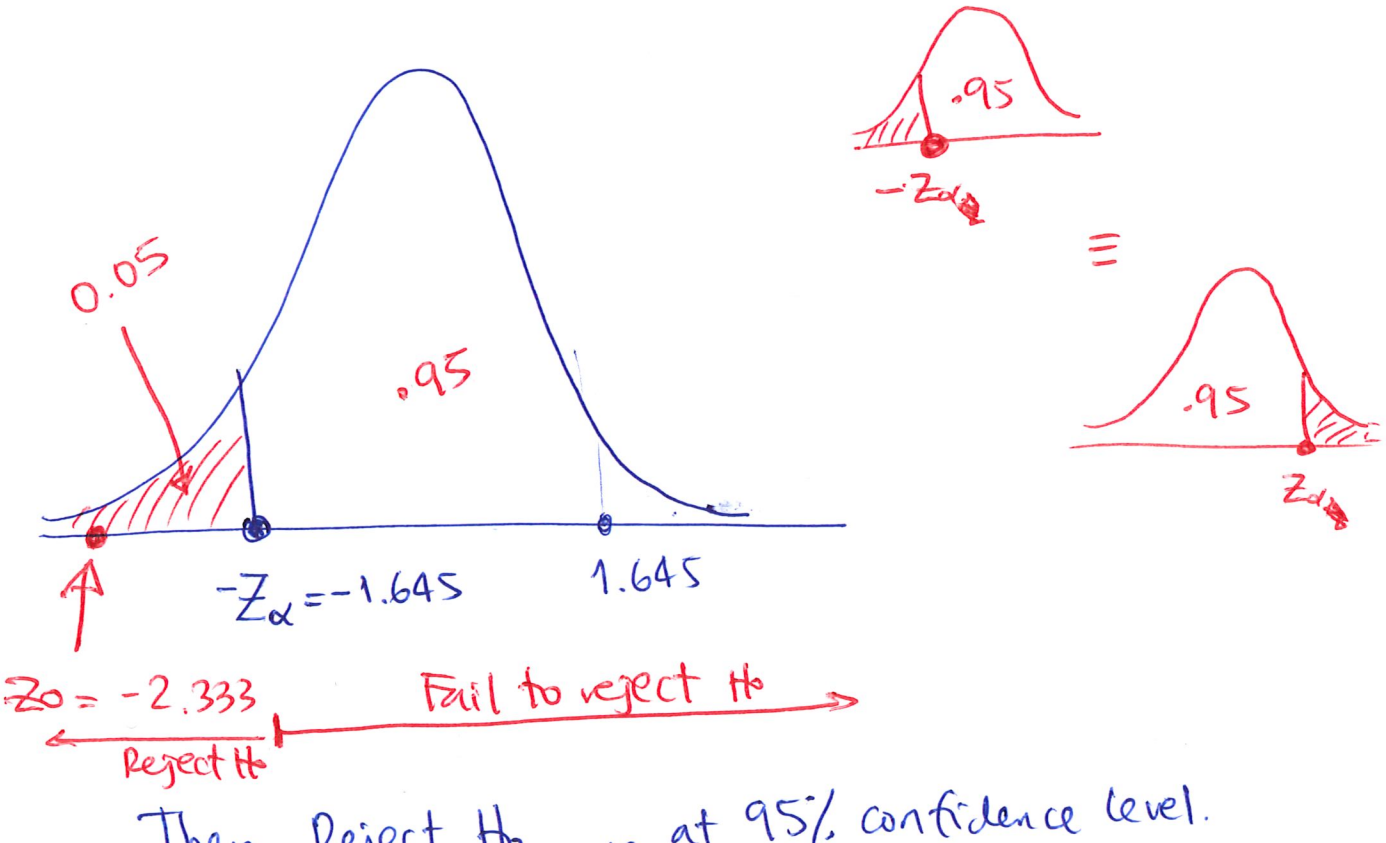
$\bar{x} = 70.8$

$\sigma = 9$

$\mu_0 = 75$

$$Z_0 = \frac{70.8 - 75}{9/\sqrt{25}} = -2.333$$

$\alpha = 5\%$

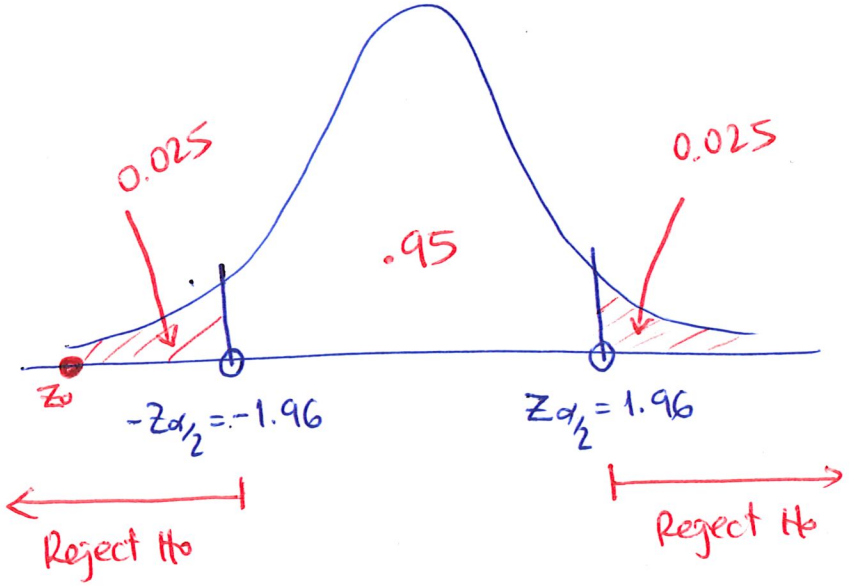


Then Reject H_0 .. at 95% confidence level.

Now, if : $H_0 : \mu = 75$

$H_a : \mu \neq 75$ (two-sided test) $\alpha = 5\%$

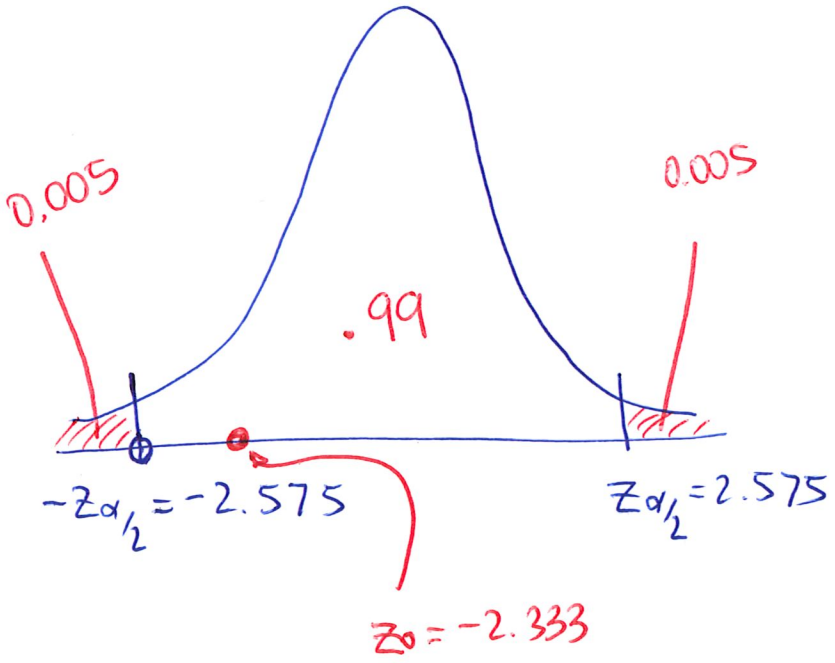
$$Z_0 = \frac{70.8 - 75}{9/\sqrt{25}} = \boxed{-2.333}$$



Reject H_0

There is significant difference between 75 and the real μ

However, if $\alpha = 0.01$



Fail to Reject H_0

There is no significant difference between 75 and the real μ

- So, decision depends on the choice of α
- Hence, we could have a different decision when we change the value of α.
- That is problematic, as the choice of value of α is very subjective.

What are the cost-implications of α-error?

α = P(Rejecting H_0 / H_0 is true)

- Thus, instead of using a subjective α-value, we present hypothesis result in terms of p-value

$0 \leq$ p-value ≤ 1

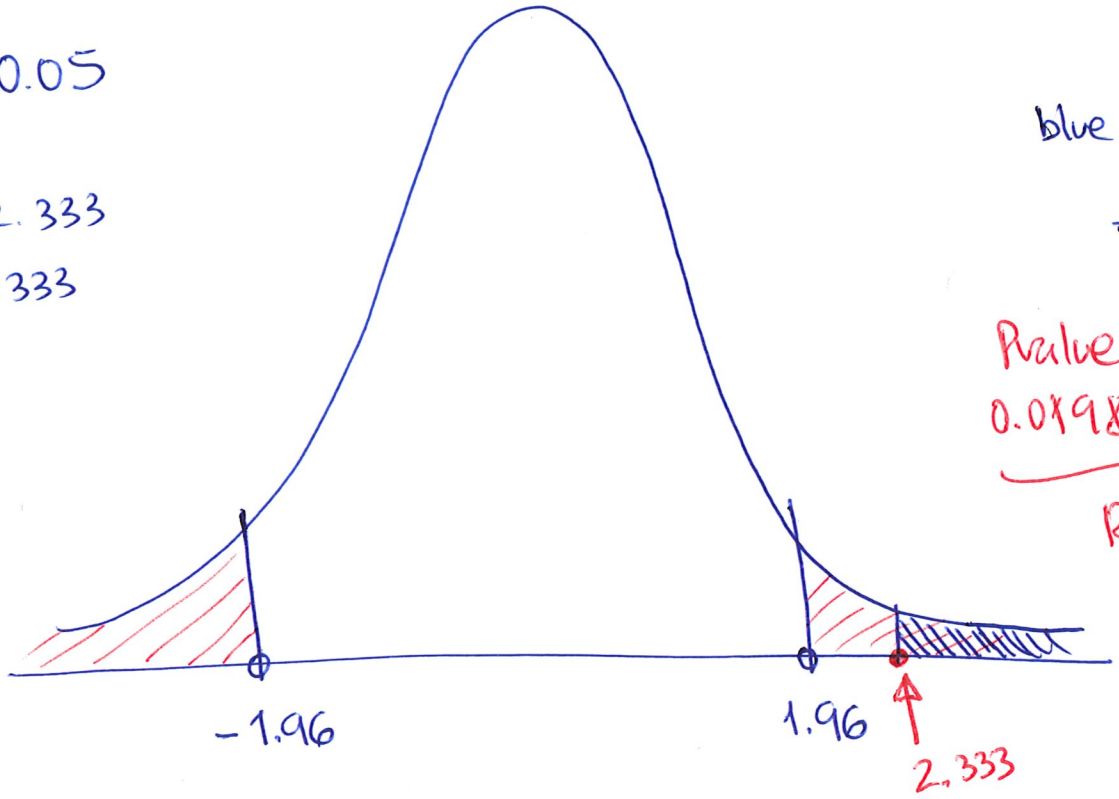
p-value represents an Area

p-value is related to Z_0

$\alpha = 0.05$

$Z_0 = -2.333$

$|Z_0| = 2.333$



blue shaded - area

= Pvalue / 2

$P\text{value} \leq \alpha$

$0.0198 \leq 0.05$

Reject H_0

Then: $P\text{value} = 2[\text{shaded\_Area}] = 2(0.0099) = 0.0198$

If $P\text{value} \leq \alpha \Rightarrow$ REJECT H_0

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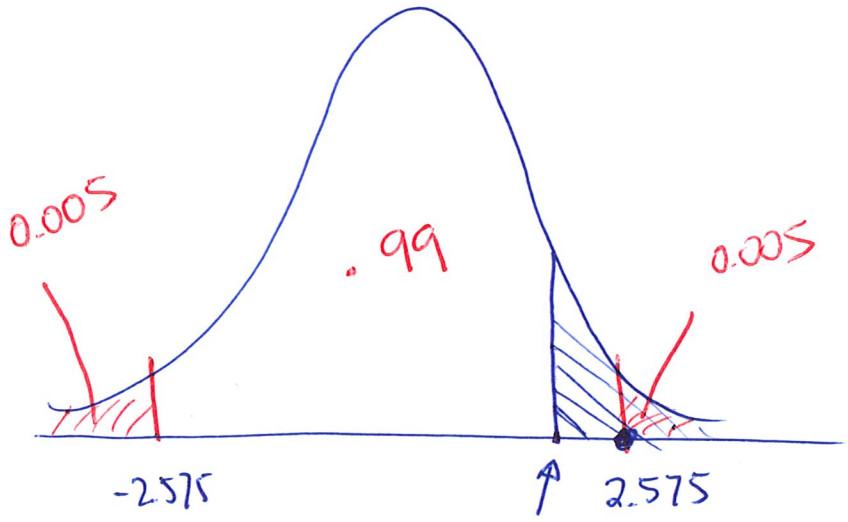
if $\alpha = 0.01$

In this case $P\text{value} > \alpha \Rightarrow$ Fail to reject H_0

$(0.0198 > 0.01)$



Pvalue = minimum α-error needed to reject H_0

Reject H_0 { $\mu \notin$ CI of μ (from Ch7)
$|z_0| > z_{\alpha/2}$ ✓
Pvalue $\leq \alpha$ ✓

Writing Assignment 3 – Calculations

$n = 8$
$\bar{x} = 3.72$
$s = 1.25$
$\alpha = 0.05$
$\mu_0 = 3.50$

$H_0: \mu = 3.50$
$H_a: \mu > 3.50$

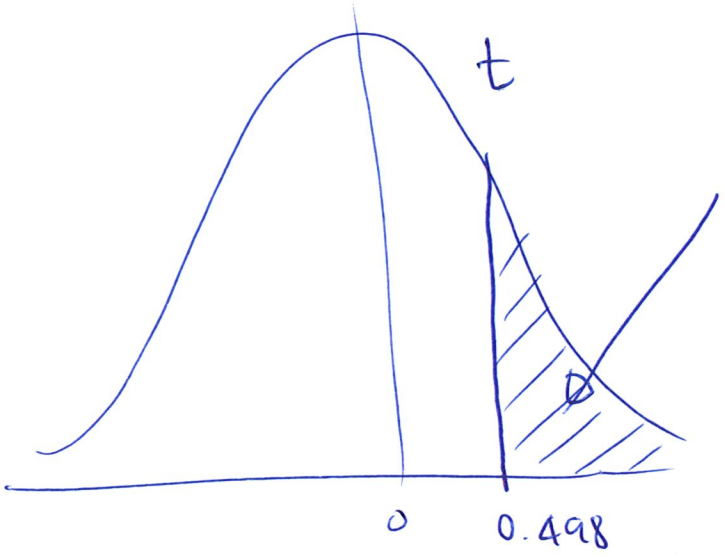
$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \sim t_{n-1}$$

Pvalue = area under the t_{n-1} curve to the right of t

$$t = \frac{3.72 - 3.50}{1.25/\sqrt{8}} \sim t_7$$

$t = 0.498$

$t = 0.50$



Pvalue = 0.316 > 0.05 = α

$\Rightarrow$ Fail to Reject H_0

There is not significant difference between the real μ and 3.50