

H0 - #8

$$M_0 = 5.5$$

$$\bar{X} = 5.4$$

$$5.4 - 5.5$$

$$\frac{0.3}{0.33}$$

$$\sqrt{55}$$

#9 P-value

$$* \text{ Assume } \sim Z = 3.81$$

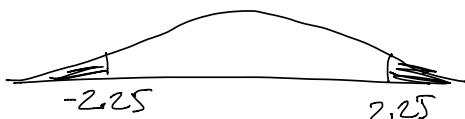
$$\frac{5.38 - 5.5}{0.3}$$

$$\sqrt{55}$$

$$= -2.25$$

#10

if alternate not =, 2 sided



find # in table for -2.25

$$* 2 = \text{answer}$$

$$M = 10$$

$$M < 10$$

$$\bar{X} = 8$$

$$P \text{ value} \approx .04 \rightarrow \sim 4\%$$

* false positives

Bonferroni correction

$$\text{Ad. } P = \text{orig } P * \# \text{ of tests}$$

if ad. p is still small,
still significant :)

$$\text{or say } D = 0.022$$

$$0.022 * 5 =$$

$$0.11$$

not extreme,
so don't reject

* do test
again

* w/ Bonferroni

$$\text{aka } .003 * 5 = .015$$

still extreme

so still reject :)

Multiple Testing

Even if the null hypothesis is true, there is a 5% chance that the result of a test will have a p-value of less than 0.05.

If we carry out 200 tests, we expect about 5%, or 10, to be significant, even if the null is true every time.

- Example: Test 5 new fertilizer formulations for mean yields higher than current standard formulation.

- Formulation A: $P = 0.49$
- Formulation B: $P = 0.24$
- Formulation C: $P = 0.17$
- Formulation D: $P = 0.003$
- Formulation E: $P = 0.53$

maybe
chance?

large samples ($n \geq 40$)
one samp / pop
test / CI for mean

$$Z = \frac{\bar{X} - \mu}{(s/\sqrt{n})}$$

① assume sampling

dist. is normal

central limit theor.

Small-Sample Intervals

2 problems assumption

- ① only normally distributed random variables
- ② must use pop. standard dev. $\rightarrow \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$

$$T = \frac{(\bar{X} - \mu)}{\frac{s}{\sqrt{n}}} \quad \text{use diff. table}$$

\rightarrow w/ $n-1$ degrees of freedom!

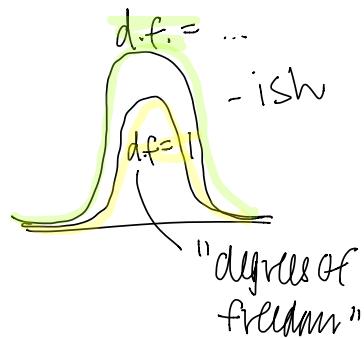
t_{n-1} is bell curve w/ heavier tails
"now"

As $v \rightarrow \infty$

$$T_{35-40} \sim \text{normal}$$

Closer to normal distribution

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



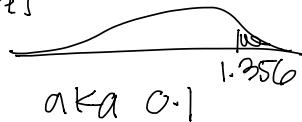
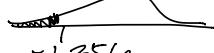
- * T table - probs on top/side (opposite)
- * t scores are in inside
- * each row is different distribution

Ex: $T \sim t_{12} \xrightarrow{(n=13)}$

$$P(T \geq 2.681) = 0.01 \quad (\text{column}) \quad t_{0.01, 12} = 2.681$$

$$P(T < -1.356) = 0.1$$

but table gives



Ex: $t_9 = T \quad (n=10)$

$$P(T \geq 1.833) = .05$$

find 9 in column \rightarrow find # \rightarrow answer is column title

$$\therefore t_{.05, 9} = 1.833$$

$$P(-2.262 < T < 2.262) = ? \quad .025 * 2 = .05$$



Find c such that $P(T > c) = 0.001$



$$t_{0.001, 9} < -4.297 \quad \text{tabular}$$

$$\bar{X} \pm t_{\alpha/2, n-1} \frac{s}{\sqrt{n}}$$

double sided

CI for Smaller Sample

① assume normal distribution

② CI looks exactly same, except not 1.96 for 95%.

