CONF INTERVALS

point estimate ± margin of error | not symmetric

① **CI for μ**

$\bar{X} \pm t \cdot s/\sqrt{n}$

df = n-1

CI for p

$\hat{p} \pm z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$\hat{p} = \frac{X}{n}$

CI for σ^2

$\left(\frac{(n-1)s^2}{\chi^2_R}, \frac{(n-1)s^2}{\chi^2_L}\right)$

take square root to get CI for σ

② effect on margin of error

smaller margin of error means more precise

- more confidence means less precision (larger margin of error)
- more data means more precision (smaller margin of error)

③ Interpret CI

we are ____% confident that <population parameter in context> is between ____ and ____.

population parameter — μ, p, σ, σ^2

HYPOTHESIS TESTING

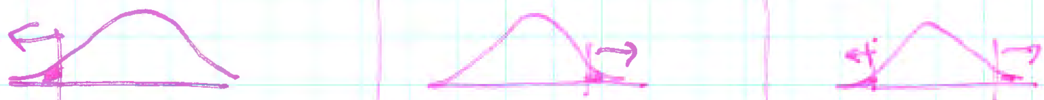
- ALL Hypotheses — only "population parameters (μ, σ, p)

(1) H_0: $=, \leq, \geq$ | H_a: $\neq, >, <$

Claim you want to Reject | Claim you want to support

Know how to Write H_0, H_a in words and parameters.

(2) H_a < | H_a > | H_a $\neq$



left tail "lower" | Right tail "upper" | two tail

(3) Design

significance level $\alpha = P(\text{Reject } H_0 \mid H_0 \text{ is true})$

Type I error = Reject H_0 when H_0 is true

$\beta = P(\text{FTR } H_0 \mid H_a \text{ is true})$

Type II error = FTR H_0 when H_a is true

$1-\beta$ = power = $P(\text{Reject } H_0 \mid H_a \text{ is true})$

Know to explain Type I, Type II error in context (GW 14)

(4) Data

p value = P(getting data this extreme | H_0 is true)

Reject H_0 if pvalue < α

(5) Critical value method · (only chapter 9)

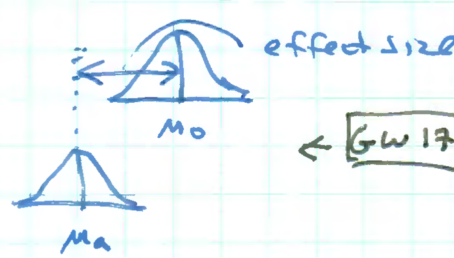
Rejection Region

Reject H_0 if test statistic is in Rejection Region

(3) effect size $= |\mu_0 - \mu_a|$

$= |p_0 - p_a|$

"practical difference"



← GW 17

- If you increase n, α or effect size, you increase power

(6) Conclusions -

Reject Ho → Ha in words

FTR Ho → "There is insufficient evidence to conclude" Ha in words

(7) One sample Model

If you reject Ho in a two-tailed test, it is ok in conclusion to say which direction

One sample t test of mean	One sample z test of proportion	One sample χ^2 test of variance
$H_0: \mu = 10$	$H_0: p \geq .42$	$H_0: \sigma \leq 10$
$H_a: \mu \neq 10$	$H_a: p < .42$	$H_a\ \sigma > 10$
$t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}$ $df = n-1$	$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$	$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$
If $n < 30$, assume Normal	$np \geq 10$ $n(1-p) \geq 10$	Data approx Normal

(8) Two sample Models

Independent Sampling
Comparing two means
$H_0: \mu_1 = \mu_2$ $H_a: \mu_1 \neq \mu_2$

If $\sigma_1^2 = \sigma_2^2$ → Pooled Variance t-test

If $\sigma_1^2 \neq \sigma_2^2$ → Unequal Variance t-test

If n_1 or $n_2 < 30$, Assume data is Approximately Normal

Independent Sampling
Compare two variances
(std devs)

$H_0: \sigma_1 = \sigma_2$ $H_a: \sigma_1 \neq \sigma_2$

F test for variance

you can use this test to choose model.

Dependent Sampling
Look at mean of differences

$H_0: \mu_d = 0$ $H_a: \mu_d \neq 0$

Matched Pairs t-test

If $n < 30$, Assume Approx Normal Dist.