Global Test on Reference Variance 19-1

evaluate consistency of results with assumptions

$\sigma_0^2 = \sigma_i^2$, σ_0^2 vs. $\hat{\sigma}_0^2$

Hypothesis Test $H_0: \sigma^2 = \sigma_0^2$ Null hypothesis

$H_1: \sigma^2 > \sigma_0^2$ Alternate

population value

assumed value

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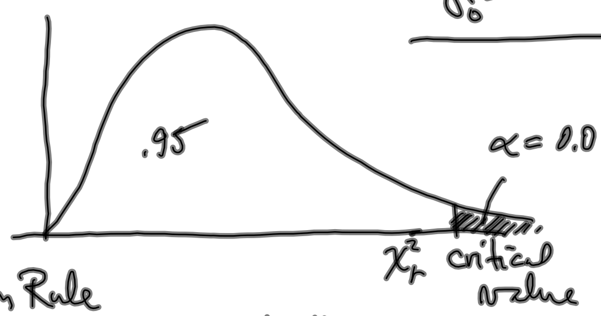
χ^{2*} test statistic $\underline{\frac{v^T W v}{\sigma_0^2} \sim \chi^2_r}$ $\underline{\text{1 sided test}}$ 19-2



Decision Rule

if $\chi^{2*} <$ c.v. accept H_0

otherwise reject H_0, accept alternate

α : level of significance of test

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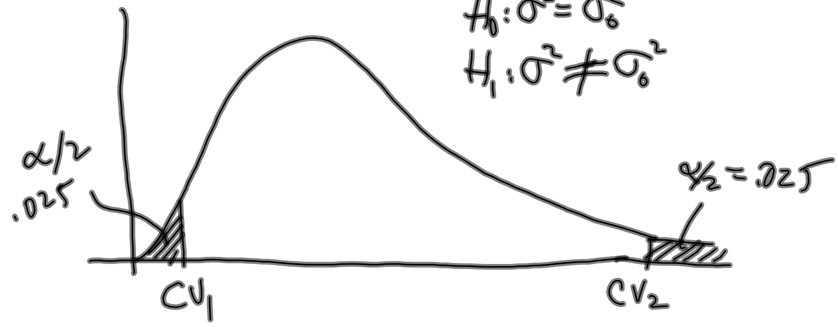
α: probability that you $\underbrace{\text{reject } H_0 \text{ when true}}_{\text{type 1 error}}$ 19-3

2 sided test

$\alpha = .05$

$H_0: \sigma^2 = \sigma_0^2$

$H_1: \sigma^2 \neq \sigma_0^2$



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Decision rule 19-4

if $cv_1 < \chi^{2*} < cv_2$ accept H_0

otherwise reject H_0, accept H_1

2-sided case $\alpha/2 \leftarrow P$

$CV_1 = \text{icdf}('\text{chi2}', .025, r)$

$CV_2 = \text{icdf}('\text{chi2}', \underset{1-.025}{1-\alpha/2}, r)$

1-sided case

$CV = \text{icdf}('\text{chi2}', \underset{.95}{1-\alpha}, r)$

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identities

19-5

1. $v \to \infty$

   $\chi^2_v \to$ normal

2. $v_2 \to \infty$

   $F_{v_1,v_2} \to \frac{\chi^2_{v_1}}{v_1}$

   $F_{v_1,\infty} = \chi^2_{v_1}/v_1$

3. $v \to \infty$

   $t_v \to$ std. normal

4. $t_v^2 = F_{1,v}$

5. $F_{1,\infty} = t^2_\infty = z^2 = \chi^2_1$

$x \sim F_{r,\infty} \Longleftrightarrow r \cdot x \sim \chi^2_r$

$x \sim \chi^2_r / r$

$x \sim \chi^2_r \Longleftrightarrow \frac{x}{r} \sim F_{r,\infty}$

$\boxed{\chi^{*}_r = \frac{v^T W v}{\sigma_0^2} \sim \chi^2_r}$ – chi sq

$\frac{\frac{v^T W v}{\sigma_0^2}}{r} \sim F_{r,\infty}, \quad \frac{\frac{v^T W v}{r}}{\sigma_0^2} \sim F_{r,\infty}$

$\boxed{\frac{\hat{\sigma}_0^2}{\sigma_0^2} \sim F_{r,\infty}}$ – F test

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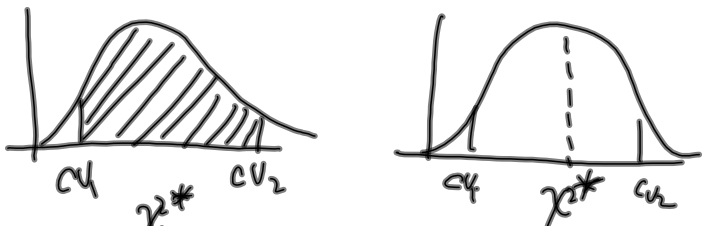
19-6



$p = \text{cdf}(\text{'chi2'}, \chi^{2*}, r)$

if $(\alpha/2 < p < 1-\alpha/2)$ then

accept H_0

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if you do not pass Global Test &
you cannot fix it 19-7

$$\Sigma_{xx} = \hat{\sigma}_0^2 Q_{xx}, \quad \boxed{\hat{\sigma}_0^2 = \frac{v^T W v}{r}}$$

<u>Confidence interval</u> 1 R.V.

<u>Confidence region</u> 2 R.V.

" volume 3 R.V.

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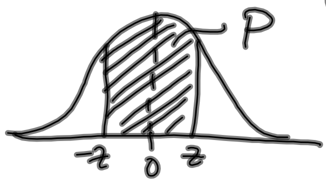
<u>Confidence interval</u> 1D $z \rightarrow F(z)$ (cdf) 19-8

$F^{-1}(F(z)) \rightarrow z$ (icdf)

$\hat{x}$ standardize $\underline{\underline{\frac{\hat{x}-\mu}{\sigma_{\hat{x}}}}}$

$\underline{z} = icdf('norm', 0, 1, \frac{P+1}{2})$



Start with P, get z
1. P, what is F(z) ✓
2. F(z) what is z

$$F(z) = \frac{1}{2} + \frac{P}{2} = \frac{P+1}{2}$$

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19-9

$$\text{Prob}\left(-z < \frac{\hat{x}-\mu_x}{\sigma_x} < +z \right) = P \text{ (chosen)}$$

$$(-z\sigma_x < \hat{x} - \mu_x < +z\sigma_x)$$

$$\text{Prob}(-\hat{x} - z\sigma_x < -\mu_x < -\hat{x} + z\sigma_x) = P$$

$$(\hat{x} + z\sigma_x > \mu_x > \hat{x} - z\sigma_x)$$

$$\text{Prob}(\hat{x} - z\sigma_x < \mu_x < \hat{x} + z\sigma_x) = P$$

centered @ $\hat{x}$ $\quad \hat{x} - z\sigma_x \rightarrow \hat{x} + z\sigma_x$

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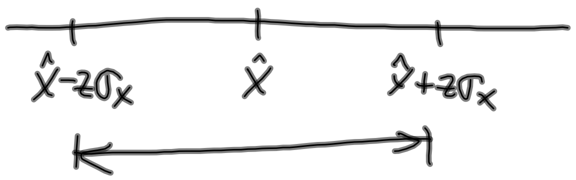
19-10

P conf. interval



1. select P
2. solve for z
3. get $\hat{x}$, σ_x $\quad \Sigma_{xx} = \sigma_0^2 Q_{xx}$
4. construct interval

all assumes PASSED GLOBAL TEST

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