Single Hypothesis – Single Parameter

Null : $H_0 : \beta_j = a_j$ $\quad a_j = 0 \rightarrow$ special case

Alternative : $H_1 : \beta_j \neq a_j$ $\rightarrow$ two tailed test

> would be
< one-tailed test

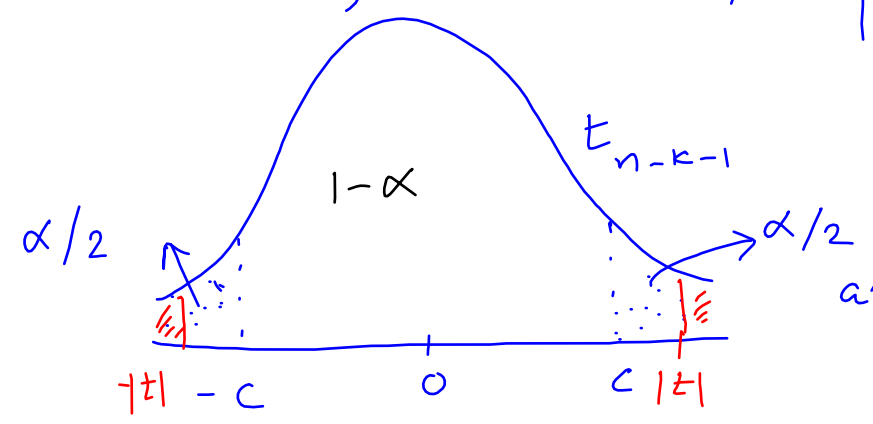
Test statistic :

t "

t ratio $\quad t_{test} = \dfrac{\hat{\beta}_j - a_j}{se(\hat{\beta}_j)}$

If H_0 is true, unlikely $|t_{test}| > c$

↳ critical value



area $\square$ $= \alpha$

Rejection rule: reject H_0 if $|t_{test}| > c$ else fail to reject H_0

α = significance level (or size)

= $P(\text{rej. } H_0 \mid H_0 \text{ true})$

Equivalent rejection rule:

reject H_0 if a_j is beyond $c \cdot se(\hat{\beta}_j)$ from $\hat{\beta}_j$.

$$\frac{\hat{\beta} - a}{se} > c \qquad \frac{\hat{\beta} - a}{se} < -c$$

$$\hat{\beta} - a > c \cdot se \qquad \hat{\beta} - a < -c \cdot se$$

$$\hat{\beta} - c \cdot se > a \qquad \hat{\beta} + c \cdot se < a$$

Fail to reject H_0 if a_j is within

$$\left[\hat{\beta}_j - c \cdot se(\hat{\beta}_j) \, , \, \hat{\beta}_j + c \cdot se(\hat{\beta}_j) \right]$$

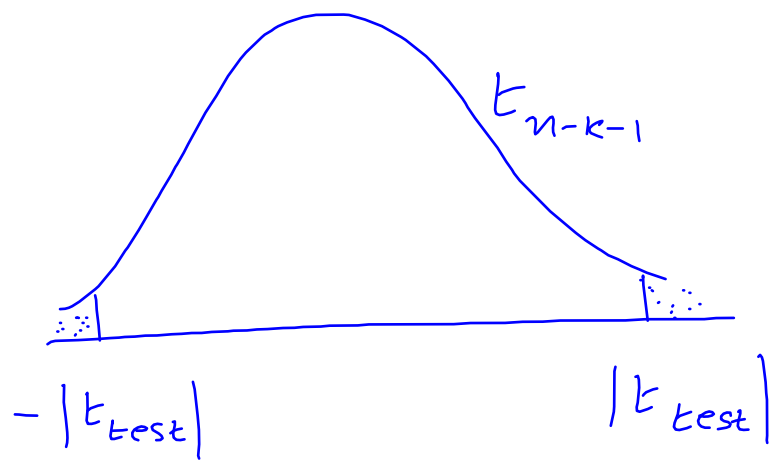
$(1-\alpha)$ confidence interval for β_j: $\hat{\beta}_j \pm c \cdot se(\hat{\beta}_j)$

↳ confidence level $P(\text{not rej. } H_0 \mid H_0 \text{ true})$

Another equivalent rejection rule:

reject H_0 if area beyond $|t_{test}|$ &

$-|t_{test}|$ $< \alpha$



area $\boxed{\cdot\cdot}$

$= 2\,P(t > |t_{test}|)$

$\downarrow$

p-value

rej. H_0 if p-value $< \alpha$

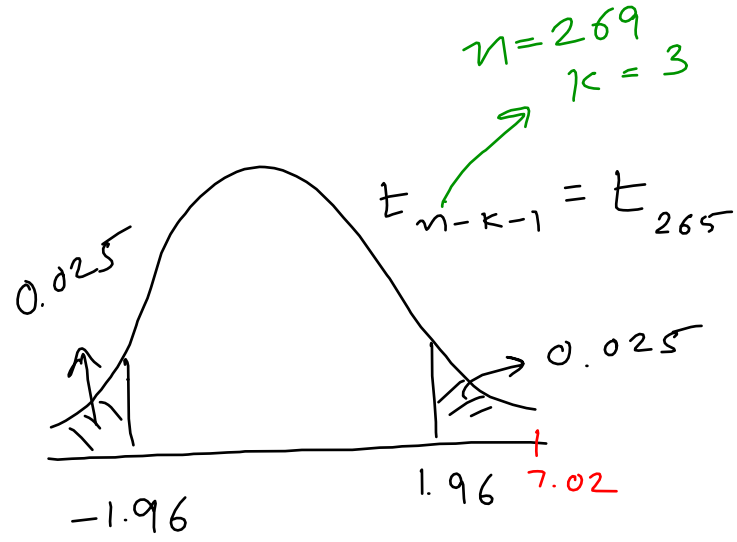
nbasal :

$$wage = \beta_0 + \beta_1\ points + \beta_2\ rebounds + \beta_3\ assists + u$$

$H_0 : \beta_1 = 0$

$H_1 : \beta_1 \neq 0$

$$t_{test} = \frac{\hat{\beta}_1 - 0}{se(\hat{\beta}_1)} = 7.02$$



$\alpha = 0.05$

c for t_{n-k-1}

Table G2 : t

" G1 : N(0,1)

Rej. H_0 ∵ $t_{test} > 1.96$

$H_0 : \beta_1 = 70$

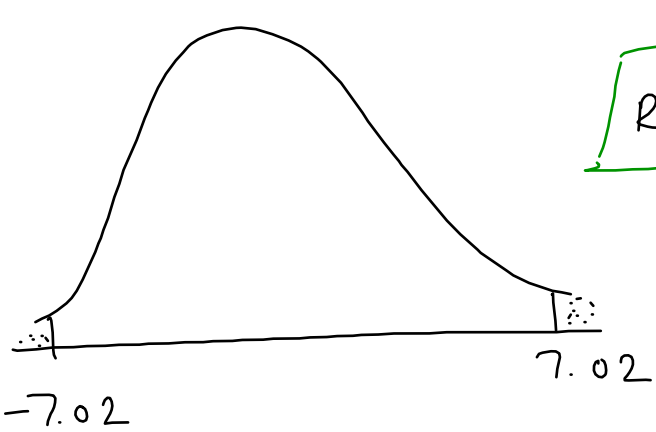
$H_1 : \beta_1 \neq 70$

0.95 CI : $\hat{\beta}_1 \pm c \cdot se(\hat{\beta}_1)$

↙ 81.194 ↓ 1.96 ↘ 11.569

[58.41 , 103.97]

Rej. H_0 ∵ CI excludes 0



Rej. H_0 ∵ p-value < 0.05

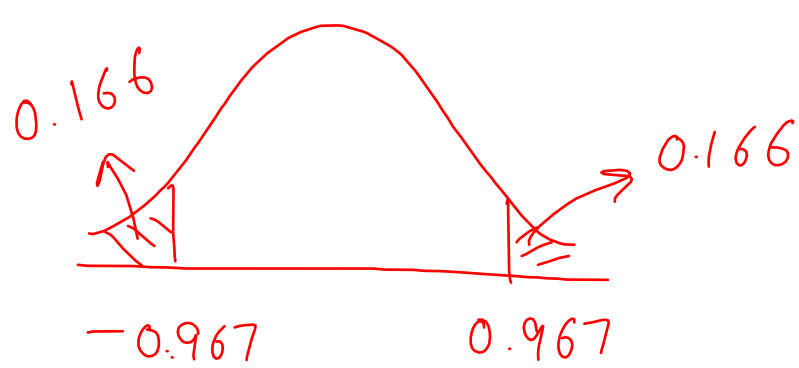
↓

practically 0

$$t_{test} = \frac{\hat{\beta}_1 - 70}{se(\hat{\beta}_1)} = 0.967 \qquad \alpha = 0.05$$

$H_0 : \beta_1 = 70$

$H_1 : \beta_1 \neq 70$



Fail to rej. H_0.

p-value $= 2 \times 0.166$

$= 0.312$

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. reg wage points rebounds assists
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Source	SS	df	MS	Number of obs	=	269
				F(3, 265)	=	80.07
Model	127366839	3	42455612.8	Prob > F	=	0.0000
Residual	140512078	265	530234.258	R-squared	=	0.4755
				Adj R-squared	=	0.4695
Total	267878917	268	999548.197	Root MSE	=	728.17

wage	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
points	81.19369	11.56929	7.02	0.000	58.41426	103.9731
rebounds	92.23602	19.911	4.63	0.000	53.03213	131.4399
assists	24.34695	26.98747	0.90	0.368	-28.79021	77.4841
_cons	130.2154	96.50168	1.35	0.178	-59.79217	320.223