① $H_0: \beta_j \leq 0$
$H_1: \beta_j > 0$ →

$t = \frac{\hat{\beta}_j - \beta_{j_{H_0}}}{se(\hat{\beta}_j)} = \frac{\hat{\beta}_j - 0}{se(\hat{\beta}_j)}$ ✓

$|t| > |C_\alpha| \Rightarrow$ Rej $H_0 \Leftarrow$ Pvalue $< \alpha$

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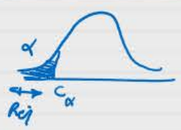
② $H_0: \beta_j \geq 0$
$H_1: \beta_j < 0$

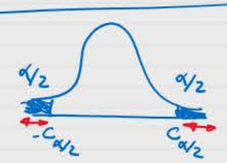


$t = \frac{\hat{\beta}_j - 0}{se(\hat{\beta}_j)}$ ✓

$|t| > |C_\alpha| \rightarrow$ Rej $H_0 \Leftarrow$ Pvalue $< \alpha$

---

③ $H_0: \beta_j = 0$
$H_1: \beta_j \neq 0$



$t = \frac{\hat{\beta}_j - 0}{se(\hat{\beta}_j)}$ use R or manually

$|t| > |C_{\alpha/2}| \rightarrow$ Rej $H_0 \Leftarrow$ Pvalue $< \alpha$

④ $H_0: \beta_j = a_j$
$H_1: \beta_j \neq a_j$

$|t| > |C_{\alpha/2}| \rightarrow$ Rej $H_0 \Leftarrow$ ✓ Pvalue $< \alpha$

$t = \frac{\hat{\beta}_j - a_j}{se(\hat{\beta}_j)}$

} CI

---

⑤ linear Combinati of β_j

$H_0: \beta_1 - \beta_2 = 0$ → use θ Method

$H_1: \begin{cases} \beta_1 - \beta_2 \neq 0 \\ \text{or } < 0 \\ \text{or } > 0 \end{cases}$

$\theta = \beta_1 - \beta_2$ or $\beta_2 = \beta_1 + \theta$

Rewrite the model with θ

& find the t_θ

$H_0: \theta = 0$
$H_1: \theta \neq 0$

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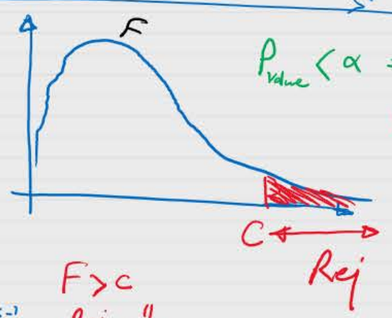
⑥ Joint significance

$H_0: \beta_1 = \beta_2 = \beta_j = 0$
$H_1:$ H_0 is not true



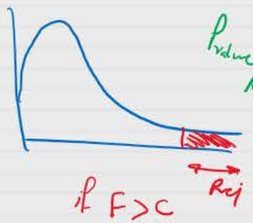
$P_{value} < \alpha \Rightarrow$ Rej H_0

$F = \frac{(SSR_R - SSR_{UR})/q}{SSR_{UR}/n-k-1} \sim F_{q, n-k-1}$ $F > C$ Rej

---

⑦ Overall Significance

$H_0: \beta_1 = \dots = \beta_K = 0$
$H_1:$ H_0 is not true



$P_{value} < \alpha$ Rej

$F = \frac{(SSR_R - SSR_{UR})/q}{SSR_{UR}/n-k-1} = \frac{R^2/K}{(1-R^2)/n-k-1}$ if $F > C$ Rej