1. Considere las siguientes afirmaciones y determine su valor de verdad.

a) Suponga que se ajustó el modelo $y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i}$ y se tiene que $gl(SSE) = 98$. El modelo fue ajustado con 102 observaciones.

$n = 102$

$k = 3$

$p = 4$

$g.l(SSE) = 98$

$n - 4 = 102 - 4 = 98$

b) Una suma de cuadrados extra, mide la reducción marginal en la SSE.

$$SS_{extra} = SSE(MR) - SSE(MF)$$
$$= SSR(MF) - SSR(MR)$$

c) En la hipótesis lineal general ($H_0 : \mathbf{L}\beta = 0$ vs $H_1 : \mathbf{L}\beta \neq 0$) los grados de libertad del cuadrado medio debido a la hipótesis son iguales al rango de la matriz $\mathbf{L}$.

$$\boxed{\begin{array}{l} H_0 : \underline{L}\,\underline{\beta} = 0 \\ H_a : \underline{L}\,\underline{\beta} \neq 0 \end{array}}$$

$$MSH = \frac{SSH}{r}$$

$\boxed{\beta_1 = \beta_2}$

$\beta_1 - \beta_2 = 0$

$$L = \begin{array}{c} \begin{array}{ccc} \beta_0 & \beta_1 & \beta_2 \end{array} \\ \begin{bmatrix} 0 & 1 & -1 \end{bmatrix} \end{array} \qquad \beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \end{bmatrix}$$

$\boxed{2\beta_1 = 2\beta_2}$

$2\beta_1 - 2\beta_2 = 0$

$$L = \begin{bmatrix} 0 & 1 & -1 \\ 0 & 2 & -2 \end{bmatrix} \qquad r = 2$$

H_0: $\beta_1 = \beta_2$

$\beta_1 = \beta_3$

$\beta_1 = 2\beta_2$

$5\beta_1 = 3\beta_3$

$$L = \begin{bmatrix} 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & -1 \\ 0 & 1 & -2 & 0 \\ 0 & 3 & 0 & -3 \end{bmatrix} \qquad \boxed{r \neq 4}$$

$r = 3$

se plantea el modelo de reg...

$$Y = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \varepsilon_i \, ;$$

$$\varepsilon_i \overset{iid}{\sim} N(0, \sigma^2)$$

Donde

Y: ...

X_1: ...

X_2: ...

X_3: ...

X_4: ...

Para X_3:

$$\begin{cases} H_0: \beta_3 = 0 \\ H_a: \beta_3 \neq 0 \end{cases} \qquad F = \frac{\frac{SSextra}{1}}{MSE} = \frac{\frac{SSextra}{1}}{\frac{SSE(MF)}{49}}$$

$$\sim F_{1,49}$$

$SSE(MF)$ ó $SSE(MR)$

$SSextra \geq 0 \Rightarrow SSE(MR) - SSE(MF)$

$\Rightarrow SSR(MR)$ ó $SSR(MF)$

$SSR(MF) - SSR(MR)$

$$MF: Y = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \varepsilon_i$$

MR: $\rightarrow$ Modelo bajo H_0

$$Y = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_4 X_{4i} + \varepsilon_i$$

MF

	Sum_of_Squares	DF	Mean_Square	F_Value	P_value
Model	409.934	4	102.4834	3.50058	0.0136397
Error	1434.532	49	29.2762		

MSE(MF) = 29,2762

SSE(MF) = 1934,532

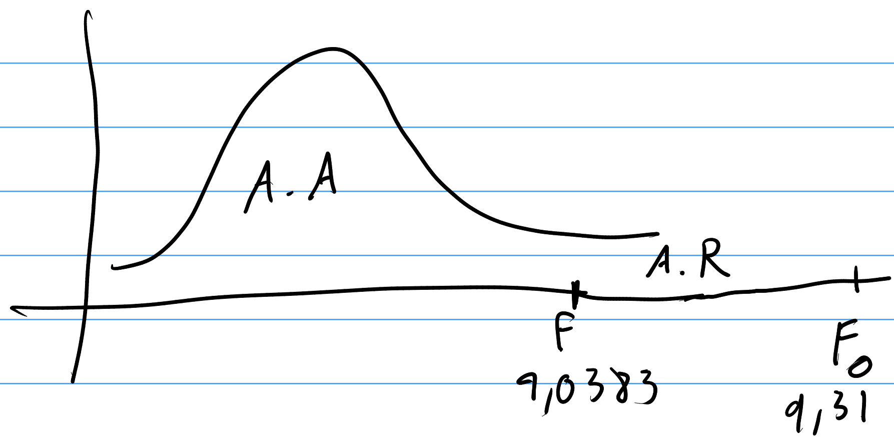
MR

	Sum_of_Squares	DF	Mean_Square	F_Value	P_value
Model	137.281	3	45.7604	1.34023	0.271872
Error	1707.184	50	34.1437		

SSE(MR) = 1707,184

$\alpha = 0{,}05$

$$F_0 = \frac{\frac{1707{,}184 - 1934{,}532}{1}}{29{,}2762}$$



Significancia de la Regresión es que al menos un parámetro se significativo

$$\overset{MF}{Y = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \varepsilon_i}$$

MR

$\boxed{Y = \beta_0 + \varepsilon_i} \to$ No es significativa la reg.

$$\begin{cases} H_0: \beta_1 = \beta_2 = \cdots = \beta_K = 0 \\ H_a: \text{Algún } \beta_j \neq 0, \text{ para } j = 1, 2, \dots, K \end{cases}$$

$$\begin{cases} H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0 \to \begin{matrix} \beta_1 = 0 \\ \beta_2 = 0 \\ \beta_3 = 0 \\ \beta_4 = 0 \end{matrix} \\ H_a: \text{ "} \end{cases}$$

$$\begin{array}{cccccc} & \beta_0 & \beta_1 & \beta_2 & \beta_3 & \beta_4 \end{array}$$

$$\underline{L} = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \qquad \underline{\beta} = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \end{bmatrix}$$

rango de $\underline{L} = 4$

$$\begin{cases} H_0: \underline{L}\,\underline{\beta} = 0 \\ H_a: \underline{L}\,\underline{\beta} \neq 0 \end{cases}$$

$$F = \frac{\frac{SSE(MR) - SSE(MF)}{4}}{MSE(MF)} \sim F_{4,49}$$

MF –

	Sum_of_Squares	DF	Mean_Square	F_Value	P_value
Model	409.934	4	102.4834	3.50058	0.0136397
Error	1434.532	49	29.2762		

$MSE(MF) = 29{,}2762$

$SSE(MF) = 1434{,}532$

	Sum_of_Squares	DF	Mean_Square
Model	1844.47	0	Inf
Error	1844.47	53	34.8012

$SSE(MR) = 1844{,}47$

$$F_0 = \frac{\dfrac{1844{,}47 - 1434{,}532}{4}}{29{,}2762} \sim F_{4,4}$$

$$\begin{cases} H_0 : \beta_1 = \beta_2 = \beta_4 \\ H_1 : \text{A determinar} \end{cases}$$

$r: \cancel{3}$

$\beta_1 = \beta_2 = \beta_4$

$\beta_1 - \beta_4 = \beta_2 - \beta_4 = 0$

$\beta_1 - \beta_4 = 0$

$\beta_2 - \beta_4 = 0$ $\qquad r: 2$

$$L = \begin{array}{c} \begin{array}{ccccc} \beta_0 & \beta_1 & \beta_2 & \beta_3 & \beta_4 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & -1 \end{bmatrix} \end{array} \qquad \underline{\beta} = \begin{bmatrix} \beta_0 \\ \vdots \\ \beta_4 \end{bmatrix}$$

$$\begin{cases} H_0: \underline{L}\underline{\beta} = 0 \\ H_a: \underline{L}\underline{\beta} \neq 0 \end{cases}$$

MF: $Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \varepsilon_i$

MR: $Y_i = \beta_0 + \beta_4 X_{1i} + \beta_4 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \varepsilon_i$

$$Y_i = \beta_0 + \beta_3 X_{3i} + \beta_4 (X_{1i} + X_{2i} + X_{4i}) + \varepsilon_i$$

$$X_{4i}^* = X_{1i} + X_{2i} + X_{3i}$$

$$Y_i = \beta_0 + \beta_3 X_{3i} + \beta_4 X_{4i}^* + \varepsilon_i$$

$$F_0 = \frac{\dfrac{SSE(MR) - SSE(MF)}{2}}{\dfrac{SSE(MF)}{n-5}} \sim F_{2,\, n-5}$$