

Regresió Linear

Exercici 6



La siguiente tabla muestra el consumo por cada 100km de un vehículo en distintas rutas y su velocidad media.

Y	Consumo	11	15	19	16
X	Velocidad media	50	63	90	75

- Ajuste un modelo lineal simple que explique el consumo por cada 100km en función de la velocidad media.
- ¿Es cierto que por cada km/hora que aumenta la velocidad, el consumo se incrementa en 0.3 litros a los 100km? Usa un contraste de hipótesis al nivel de significación 5%.

$$\bar{X} = \frac{1}{4}(50 + 63 + 90 + 75) = 69.5$$

$$\bar{Y} = \frac{1}{4}(11 + 15 + 19 + 16) = 15.25$$

$$S_{xy} = \frac{1}{4} \sum x_i y_i - \bar{X} \bar{Y} = 41.375$$

$$S_{x^2} = \frac{1}{4} \sum x_i^2 - \bar{X}^2 = 218.25$$

$$Y = \beta_0 + \beta_1 X$$

$$\hat{\beta}_1 = \frac{S_{xy}}{S_{x^2}} = \frac{41.375}{218.25} = 0.1896$$

$$\hat{\beta}_0 = \bar{Y} - \hat{\beta}_1 \cdot \bar{X} = 15.25 - 0.1896 \cdot 69.5 = 2.0728$$

$$Y = 2.0728 + 0.1896 \cdot X$$

b)

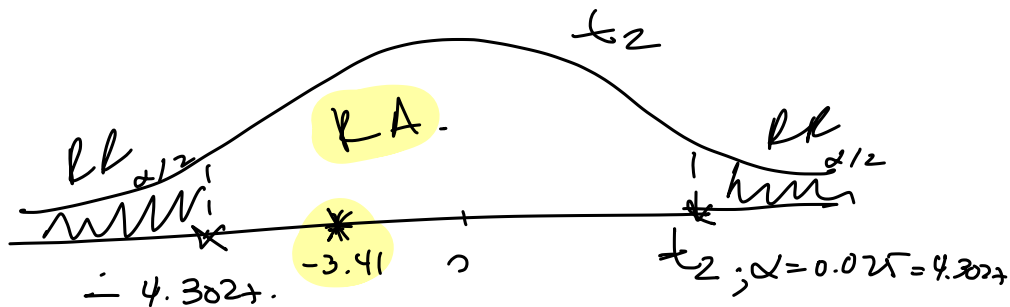
$$H_0: \beta_1 = 0.3$$

$$H_1: \beta_1 \neq 0.3$$

$$\alpha = 0.05.$$

$$t_{n-2} \sim \hat{T} = \frac{\hat{\beta}_1 - \beta_A}{\sqrt{\frac{S_R^2}{(n-1) S_X^2}}} = \frac{0.1896 - 0.3}{\sqrt{\frac{0.68605}{(4-1) \cdot 218.25}}} = -3.41$$

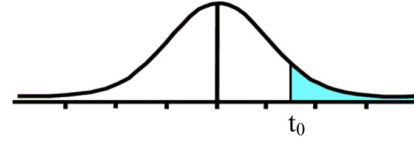
$$S_R^2 = \frac{1}{n-2} \sum e_i^2$$



X (acetic acid)	50	63	90	75
Y (carvone)	11	15	19	16
\hat{Y} (carvone estimated)	11.5528	14.0176	18.8938	16.2928
$e_i^2 = (y_i - \hat{y}_i)^2$	0.31	0.9651	0.0113	0.0857
				<u>Sum.</u> 1.3721

$$s_e^2 = \frac{1}{2} \cdot 1.3721 = 0.68605$$

Tabla t-Student



Grados de libertad	0.25	0.1	0.05	0.025	0.01	0.005
1	1.0000	3.0777	6.3137	12.7062	31.8210	63.6559
2	0.8165	1.8856	2.9200	4.3027	6.9645	9.9250
3	0.7649	1.6377	2.3534	3.1824	4.5407	5.8408
4	0.7407	1.5332	2.1318	2.7765	3.7469	4.6041
5	0.7267	1.4759	2.0150	2.5706	3.3649	4.0321
6	0.7176	1.4398	1.9432	2.4469	3.1427	3.7074
7	0.7111	1.4149	1.8946	2.3646	2.9979	3.4995
8	0.7064	1.3968	1.8595	2.3060	2.8965	3.3554
9	0.7027	1.3830	1.8331	2.2622	2.8214	3.2498
10	0.6998	1.3722	1.8125	2.2281	2.7638	3.1693
11	0.6974	1.3634	1.7959	2.2010	2.7181	3.1058
12	0.6955	1.3562	1.7823	2.1788	2.6810	3.0545
13	0.6938	1.3502	1.7709	2.1604	2.6503	3.0123
14	0.6924	1.3450	1.7613	2.1448	2.6245	2.9768
15	0.6912	1.3406	1.7531	2.1315	2.6025	2.9467
16	0.6901	1.3368	1.7459	2.1199	2.5835	2.9208
17	0.6892	1.3334	1.7396	2.1098	2.5669	2.8982
18	0.6884	1.3304	1.7341	2.1009	2.5524	2.8784
19	0.6876	1.3277	1.7291	2.0930	2.5395	2.8609
20	0.6870	1.3253	1.7247	2.0860	2.5280	2.8453

Conclusion

$\hat{\tau} \in RA \Rightarrow$ No tech. Ho. ($\beta_1 = 0.3$)

No very evidence sufficient from researcher that
 $\beta_1 = 0.3$.