# Taller 7. Mínimos Cuadrados

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## Punto 6

Punto teorico 6

$$\chi^2(a_0, a_1) = \sum_{i=1}^{n} (y_i - (a_0 + a_1 x_i))^2$$

Minimizar $\chi^2(a_0, a_1)$

$$= y_1^2 - 2y_i(a_0 + a_1 x_1) + (a_0 + a_1 x_1)^2$$

$$= y_1^2 - 2y_1 a_0 + 2y_1 a_1 x_1 + a_0^2 + 2a_0 a_1 x_1 + a_1^2 x_1^2$$

$$\chi^2(a_0, a_1) = \sum y_i^2 - 2a_0 \Sigma y_1 - 2a_1 \Sigma y_i x_i + N a_0^2 + 2a_0 a_1 \Sigma x_1 + a_1^2 \sum x_1^2$$

$$\frac{\partial \chi^2}{\partial a_0} = -2 \Sigma y_1 - a_1 \Sigma x_1 = \bar{y}_1 - a_1 \bar{x}_1$$

$$a_0 = \Sigma y_1 - a_1 \Sigma x_1 = \bar{y}_1 - a_1 \bar{x}_1$$ R/=

$$\frac{\partial \chi^2}{\partial a_0} = -2 \Sigma y_1 x_1 + 2a_0 \Sigma x_1 + 2a_1 \Sigma x_1^2 = 0$$

$$= -\Sigma y_1 x_1 + \left( \frac{\Sigma y_1 \cdot \Sigma x_1}{N} - a_1 \frac{\Sigma x_1 \Sigma x_1}{N} \right) + a_1 \Sigma x_1^2 = 0$$

$$a_1 = \frac{\Sigma y_1 x_1 - \frac{\Sigma y_1 \Sigma x_1}{N}}{\sum x_1^2 - \frac{(\Sigma x_1)^2}{N}}$$ R/=

Minimizar

$$\chi^2(a_0,a_1,a_2) = \sum_{i=1}^{n} \left(y_i - (a_0 + a_1 x_1 + a_2 x_1^2)\right)^2$$

$$\chi^2_{(a_0,a_1,a_2)} = y_1^2 - 2y_1 a_2 - 2y_1 a_1 x_1 - 2y_1 a_2 x_1^2 + a_0^2 + a_1^2 x_1^2 + a_2^2 x_1^4 + 2a_0 a_1 x_1 + a_0 a_2 x_1^2 + 2a_1 a_2 x_1^3$$

$$\chi^2_{(a_0,a_1,a_2)} = \Sigma y_1^2 - 2a_0 \Sigma y_1 - 2a_1 \Sigma y_1 x_1 - 2a_2 \Sigma y_1 x_1^2 + N a_0^2 + a_1^2 \Sigma x_1^2 + a_2^2 \Sigma x_1^4 + 2a_0 a_1 \Sigma x_1 + 2a_0 a_2 \Sigma x_1^2 + 2a_1 a_2 \Sigma x_1^3$$

$$\frac{\partial \chi^2}{\partial a_0} = -2\Sigma y_1 + 2N a_0 + 2a_1 \Sigma x_1 + 2a_2 \Sigma x_1^2 = 0.$$

$$\sum_{i=1}^{n} [a_0 + a_1 x_1 + a_2 x_1^2] = \frac{y_1}{N} = \overline{y_1}$$

$$\frac{\partial \chi^2}{\partial a_1} = -2\Sigma y_1 x_1 + 2a_1 \Sigma x_1^2 + 2a_2 \Sigma x_1^3 = 0.$$

$$\sum_{i=1}^{n} [a_0 x_i + a_1 x_i^2 + a_2 x_i^3] = \frac{y_i x_i}{N} = \overline{x_i y_i}$$

$$\frac{\partial \chi^2}{\partial a_2} = -2\Sigma y_1 x_1^2 + 2a_1 \Sigma x_1^3 + 2a_2 \Sigma x_1^4 = 0.$$

$$\sum_{i=1}^{n} [a_0 x_i^2 + a_1 x_i^3 + a_2 x_i^4] = \frac{x_i^2 y_i}{N} = \overline{x_i^2 y_1}$$

Sistema de ecuaciones

$$\sum_{i=1}^{n} [a_0 + a_1 x_1 + a_2 x_1^2] = \frac{y_1}{N} = \overline{y_1}$$

$$\sum_{i=1}^{n} [a_0 x_i + a_1 x_i^2 + a_2 x_i^3] = \frac{y_i x_i}{N} = \overline{x_i y_i}$$

$$\sum_{i=1}^{n} [a_0 x_i^2 + a_1 x_i^3 + a_2 x_i^4] = \frac{x_i^2 y_i}{N} = \overline{x_i^2 y_1}$$

R/=