# Matrices de covarianzas

## Contents

Sean $m+1$ variables, con $n$ observaciones cada una:

| $y$ | $x_1$ | $x_2$ | $\cdots$ | $x_m$ |
|---|---|---|---|---|
| $y_1$ | $x_{11}$ | $x_{21}$ | $\cdots$ | $x_{m1}$ |
| $y_2$ | $x_{12}$ | $x_{22}$ | $\cdots$ | $x_{m2}$ |
| $\cdots$ | $\cdots$ | $\cdots$ | $\cdots$ | $\cdots$ |
| $y_n$ | $x_{1n}$ | $x_{2n}$ | $\cdots$ | $x_{mn}$ |

se define la covarianza entre las variables $x_j$ e $y$ como:

$$cov(x_j, y) = S_{jy} = \frac{\sum_{i=1}^{n}(x_{ji} - \bar{x}_j)(y_i - \bar{y})}{n-1}, \quad j \in [1, m], \quad i \in [1, n]$$

y la covarianza entre las variables $x_j$ e $x_k$ como:

$$cov(x_j, x_k) = S_{jk} = \frac{\sum_{i=1}^{n}(x_{ji} - \bar{x}_j)(x_{ki} - \bar{x}_k)}{n-1}, \quad j, k \in [1, m], \quad i \in [1, n]$$

Se define la matriz de covarianzas para $x_j$ y $x_k$ como:

$$S_{xx} = \begin{bmatrix} S_{11} & S_{12} & \cdots & S_{1m} \\ S_{21} & S_{22} & \cdots & S_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ S_{m1} & S_{m2} & \cdots & S_{mm} \end{bmatrix}$$

Se define la matriz de covarianzas entre $x_j$ e $y$ como:

$$S_{xy} = \begin{bmatrix} S_{1y} \\ S_{2y} \\ \cdots \\ S_{my} \end{bmatrix}$$