Least-Squares:

- Before $e_i = y_i - E[y_i]$

$$= y_i - b_0 - b_1 x_{1i} - b_2 x_{2i}$$

$$\vdots$$

- New vector $e = y - X \cdot b$ from $y = Xb + e$ subtract Xb on both sides

- $SSQR = \sum_{i=1}^{N} e_i^2 = e_1^2 + e_2^2 + \dots + e_N^2$

New $SSQR = e^T \cdot e$

For a colum vector $e = \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_N \end{bmatrix}$ its transpose e^T

is defined as the row vector $e^T = \begin{bmatrix} e_1 & e_2 & e_3 & \cdots & e_N \end{bmatrix}$

By definition of dot-product:

$$\boxed{e^T \cdot e} = \begin{bmatrix} e_1 & e_2 & \cdots & e_N \end{bmatrix} \cdot \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_N \end{bmatrix} = e_1^2 + e_2^2 + \dots + e_N^2$$

cross product of e, in R: crossprod()