è il vettore $(1,\dots,1)^T$ m volte

$\boxed{\text{residui:}}$ $\xi = \lambda - a^* t - b^* 1$ sono tali che $\bar{\xi} = \bar{\lambda} - a^* \bar{t} - b^* = 0$

cioè la media dei residui è nulla.

$$Var(\xi) = \frac{1}{m} \sum_i (\xi_i - \bar{\xi})^2$$

per cui

$$m\, Var(\xi) = \xi \cdot \xi \cancel{- m \bar{\xi}^2} = \lambda\cdot\lambda + (a^*)^2 t\cdot t + (b^*)^2 m - 2a^* \lambda \cdot t$$

$$- 2 b^* m \bar{\lambda} + 2 a^* b^* m \bar{t} = \lambda\cdot\lambda + (a^*)^2 t \cdot t + (\overbrace{\bar{\lambda} - a^* \bar{t}}^{b^*})^2 m$$

$$- 2a^* (\underbrace{m\, Cov(t,\lambda) + m \bar{t} \bar{\lambda}}_{\lambda\cdot t}) - 2(\underbrace{\bar{\lambda} - a^* \bar{t}}_{b^*}) m \bar{\lambda} + 2a^* (\underbrace{\bar{\lambda} - a^* \bar{t}}_{b^*}) m \bar{t}$$

$$= \underbrace{m\, Var(\lambda) + \cancel{m \bar{\lambda}^2}}_{\lambda\cdot\lambda} + (a^*)^2 (\underbrace{m\, Var(t) + \cancel{m \bar{t}^2}}_{t\cdot t}) + \cancel{\bar{\lambda}^2 m} + \cancel{(a^*)^2 \bar{t}^2 m}$$

$$\cancel{- 2a^* \bar{t} \bar{\lambda} m} - 2a^* m\, Cov(t,\lambda) \cancel{- 2a^* m \bar{t} \bar{\lambda}} \cancel{- 2 m \bar{\lambda}^2} \cancel{+ 2a^* \bar{t} \bar{\lambda} m}$$

$$\cancel{+ 2a^* \bar{t} \bar{\lambda} m} \cancel{- 2 (a^*)^2 m \bar{t}^2}$$

$$= m\, Var(\lambda) + \underbrace{\frac{Cov^2(t,\lambda)}{Var^{\cancel{2}}(t)}}_{(a^*)^2 =} m \cancel{Var(t)} - 2 \frac{Cov^2(t,\lambda) m}{Var(t)}$$

$$= m \left[Var(\lambda) - \frac{Cov^2(t,\lambda)}{Var(t)} \right] = m\, Var(\lambda) \left[1 - Corr^2(t,\lambda) \right]$$

dove $Corr(t,\lambda) = \dfrac{Cov(t,\lambda)}{\sqrt{Var(t)\, Var(\lambda)}} \in [-1,1]$ <u>correlazione</u>