

## VARIANCE

## **Definition**

The *variance* of a square-integrable real-valued random variable is the expectation of its square less its expectation squared.

## **Notation**

Let  $(X, \mathcal{A}, \mu)$  be a probability space and f be a random variable. We denote the variance of f by  $\operatorname{var} f$ . We defined it by

$$\operatorname{var} f = \mathsf{E}(f^2) - (\mathsf{E}(f))^2.$$

## Results

Proposition 1. If a random variable on a probability space is square integrable then it is integrable.

*Proof.* The  $L^p$  spaces are nested for finite measures.

Proposition 2. The variance of a square-integrable real-valued random variable is the expectation of the square of the difference between the random variable and its expectation.

Proof.

$$\operatorname{var} f = \operatorname{E}((f - \operatorname{E}(f))^2)$$

