



# Variance

## 1 Definition

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

### 1.1 Notation

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

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

## 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.*

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

□