

EE23010 Assignment

Sayyam Palrecha* EE22BTECH11047

Question 62

Let X be a random variable with the probability density function $f(x)$ such that

$$f(x) = \begin{cases} \frac{1}{2\sqrt{3}}, & -\sqrt{3} \leq x \leq \sqrt{3} \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

Then the value of X is?

Solution:

The mean of X

$$\mu_X = \int_{-\infty}^{\infty} xf(x)dx \quad (2)$$

$$= \frac{1}{2\sqrt{3}} \int_{-\sqrt{3}}^{\sqrt{3}} xdx \quad (3)$$

$$= 0 \quad (4)$$

The variance of X is:

$$\sigma_X^2 = \int_{-\infty}^{\infty} (x - \mu_X)^2 f(x)dx \quad (5)$$

From (3)

$$\sigma_X^2 = \frac{1}{2\sqrt{3}} \int_{-\sqrt{3}}^{\sqrt{3}} x^2 dx \quad (6)$$

$$= \frac{1}{2\sqrt{3}} \left(\frac{6\sqrt{3}}{3} \right) \quad (7)$$

$$= 1 \quad (8)$$

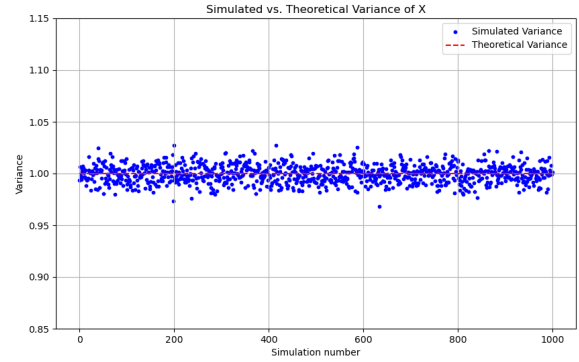


Fig. 0. Theoretical vs Simulated variance