EE23010 Assignment

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Question 62

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

$$p_X(x) = \begin{cases} \frac{1}{2\sqrt{3}}, & -\sqrt{3} \le x \le \sqrt{3} \\ 0, & \text{otherwise} \end{cases} \tag{1}$$

Then the valaue of X is?

Solution:

The mean of X

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

$$= \frac{1}{2\sqrt{3}} \int_{-\sqrt{3}}^{\sqrt{3}} x dx \tag{3}$$

$$= 0 \tag{4}$$

The variance of X is:

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

From (4)

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

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

$$= 1 \tag{8}$$

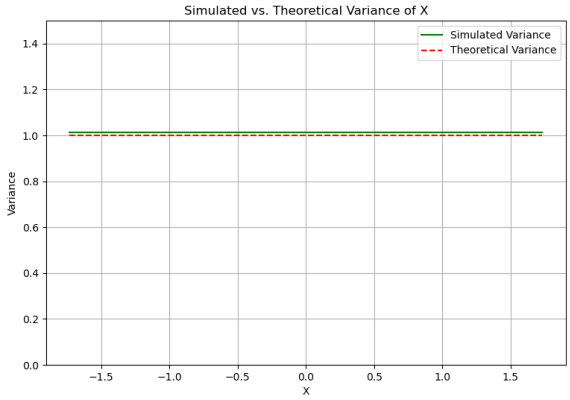

Fig. 0. Theoretical vs Simulated variance