# 15. Exercise: Correlation coefficient

## Exercise: Correlation coefficient

1/1 point (graded)

It is known that a for a standard normal random variable $X$, we have $\mathbf{E}[X^3] = 0$, $\mathbf{E}[X^4] = 3$, $\mathbf{E}[X^5] = 0$, $\mathbf{E}[X^6] = 15$. Find the correlation coefficient between $X$ and $X^3$. Enter your answer as a number.

3/sqrt(15)

✔ **Answer:** 0.77460

**Solution:**

Since $\mathbf{E}[X] = \mathbf{E}[X^3] = 0$, we have $\mathbf{Cov}(X, X^3) = \mathbf{E}[X \cdot X^3] = \mathbf{E}[X^4] = 3$. Furthermore, since $\mathbf{Var}(X) = 1$ and $\mathbf{Var}(X^3) = \mathbf{E}[X^6] = 15$, we obtain

$$\rho(X, X^3) = \frac{3}{\sqrt{1} \cdot \sqrt{15}} = \sqrt{3/5}.$$

Interestingly, even though the random variables are strongly dependent (the value of one determines the value of the other), the value of the correlation coefficient is moderate.

提交 You have used 3 of 3 attempts

Answers are displayed within the problem

## 讨论

显示讨论

**Topic:** Unit 6 / Lec. 12 / 15. Exercise: Correlation coefficient