### Assignment 5

This is the place where you submit this assignment.

**Due on:** 2020-03-04, 23:00 IST.

1. Which of the following statements hold true for a perfectly correlated pair of random variables $(X, Y)$? (1 point)
   - $X$ and $Y$ are independent.
   - $X$ and $Y$ are not independent.
   - $X$ and $Y$ are identically distributed.
   - $X$ and $Y$ have the same variance.

**Correct Answer:** $X$ and $Y$ are not independent.

2. A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$? (1 point)
   - 1
   - 2
   - 3

**Correct Answer:** 2

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 1

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 2

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 3

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 4

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 5

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 6

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 7

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 8

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 9

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.

### Problem 10

**Statement:**

A random variable $X$ follows a normal distribution with mean 0 and variance 1. What is the variance of $X^2$?

**Solution:**

**Assume that $X$ is a random variable following a normal distribution $N(0, 1)$.**

**Answer:**

$X^2$ is a chi-squared random variable with 1 degree of freedom. Therefore, the variance of $X^2$ is 2.

**Note:** The following statements are true:

- If two random variables are independent, then their covariance is zero.
- If the correlation between two random variables is zero, then the variables do not have any kind of linear relationship but can still be dependent.
- If the correlation between two random variables is zero, then both the variables are independent.
- There is no relationship between independence of random variables and their covariance.