**Create a Covariance Matrix in R**

**Step 1: Load the data frame.**

Let’s create a data frame that contains different parameter’s scores of 10 different products

data <- data.frame(Appearance = c(8, 8, 8, 9, 7, 9, 9, 7, 8, 9),

                   Thickness = c(8, 8, 7, 7, 7, 8, 9, 8, 7, 9),

                   Spredability= c(7, 9, 9, 9, 8, 8, 7, 8, 6, 7))

data

   Appearance Thickness Spreadability

1           8         8            7

2           8         8            9

3           8         7            9

4           9         7            9

5           7         7            8

6           9         8            8

7           9         9            7

8           7         8            8

9           8         7            6

10          9         9            7

**Step 2: Create the covariance matrix.**

Now let’s create the covariance matrix using the cov() function:

cov(data)

Appearance  Thickness Spreadability

Appearance    0.62222222  0.2666667  -0.06666667

Thickness     0.26666667  0.6222222  -0.26666667

Spreadability -0.06666667 -0.2666667   1.06666667

**Step 3: Inference.**

The values along the diagonals of the matrix are simply the variances of each product.

The variance of the appearance scores is 0.62

The variance of the thickness scores is 0.62

The variance of the spreadability scores is 1.06

The other values in the matrix represent the covariances between the various products

The covariance between the appearance and thickness scores is 0.26

The covariance between the appearance and spreadability scores is -0.066

The covariance between the thickness and spreadability scores is –0.266

A positive number for covariance indicates that two variables tend to increase or decrease simultaneously.

For example, appearance and thickness have a positive covariance (0.26), which indicates that products that score high on appearance also tend to score high on thickness.

A negative number for covariance indicates that as one variable increases, a second variable tends to decrease.

For example, appearance and spreadability have a negative covariance (-0.066), which indicates that product which scores high on appearance tend to score low on spreadability.

**Note:-**

Covariance can vary between -∞ and +∞

Covariance is affected by the changes in scale.

Covariance is zero indicates if one variable move and the other doesn’t.