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**Experiment No-06**

**Topic**- HOTELLING’S T2 DISTRIBUTION

**Problem-** Suppose we are given the data matrix for the random sample of size n=3 from a BVND as X̰=

Evaluate the value of the Hotelling’s T2 statistics forµ̰ = and hence test the hypothesis

H0:µ̰=

**Theory-**

Let, X̰1, X̰2,............ X̰n be a random sample from a Np(µ̰ , ) population.

Then, = is the sample mean vector

Where, = , the sample mean of Xi , i=1,2,……p and

Sij= )( )

The sample mean square of Xi ,Xj i.j=1,2,p

S=(Sij)pxp

The Hotelling’s T2-statistic is given by

T2= ()/ ()

The size of the critical region is given by (α) for testing H0:µ̰= is given bys

α= P[T2/µ=µ0>p,n-p(α)]

**=** P[ (X̰-)/S-1 (X̰-)>p,n-p(α)

Finally the calculated value is compared with the tabulated value and conclusions are drawn accordingly.

**Calculation-**

The R-programming for obtaining a solution of the given problem is as follows -

x=array(c(6,10,8,9,6,3),dim=c(3,2))

x

x1=x[,1]

x1

x2=x[,2]

x2

x1\_bar=mean(x1)

x1\_bar

x2\_bar=mean(x2)

x2\_bar

x\_bar=array(c(x1\_bar,x2\_bar),dim=c(2,1))

x\_bar

n=3

s11=var(x1)\*(n/(n-1))

s11

s12=cov(x1,x2)\*(n/(n-1))

s12

s21=s12

s21

s22=var(x2)\*(n/(n-1))

s22

s=array(c(s11,s12,s21,s22),dim=c(2,2))

s

mu=array(c(9,5),dim=c(2,1))

mu

d=x\_bar-mu

d

t2\_obs=n\*t(d)%\*%solve(s)%\*%d

t2\_obs

p=2

t2\_tab=(((n-1)\*p)/(n-p))\*qf(0.95,2,1)

t2\_tab

**Conclusion-**

1. The value of Hotelling T2 statistic for µ= is 0.5185185
2. The calculated value of the Hotelling’s T2 statistic is 0.5185185and the tabulated value is 798.

Since, the calculated value of T2(i.e. 0.5185185)is less than the tabulated value of F (i.e. 798) at 5% level of significance ; Hence we accept our null hypothesis and conclude that µ=.