Testing of Homogeneity Of Covariance Matrix

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In checking homogeneity of covariance matrices for populations, the null and alternative hypotheses are respectively,

vs : at least one equality does not hold.

## Example 1

In this example, we work on Psychological test data. We use boxM() function from heplots package, which depends on car and carData packages.

setwd("D:/LianZuo/Applied Statistics Course Materials/STAT 577 - Applied Multivariate Statistics/data-577")  
PT=read.table("Psychological tests.DAT", header=F)  
colnames(PT)=c("gender", "t1","t2", "t3", "t4")  
gender=as.factor(PT$gender)  
  
#install.packages("heplots")  
library(car)  
library(carData)  
library(heplots)  
boxM(PT[, 2:5],PT[, 1])

Box's M-test for Homogeneity of Covariance Matrices  
  
data: PT[, 2:5]  
Chi-Sq (approx.) = 13.551, df = 10, p-value = 0.1945

#or, boxM(PT[, c("t1","t2", "t3", "t4")], PT[, "gender"])

The test statistic value is found to be 13.551 with a p-value of 0.1945. Therefore, we fail to reject the null hypothesis and conclude that the population covariance matrices are not significnatly different.

## Example 2

We work on iris data to check the homogeneity of covariance matrices.

names(iris)

[1] "Sepal.Length" "Sepal.Width" "Petal.Length" "Petal.Width" "Species"

result <- boxM(iris[, 1:4], iris[, "Species"])  
result

Box's M-test for Homogeneity of Covariance Matrices  
  
data: iris[, 1:4]  
Chi-Sq (approx.) = 140.94, df = 20, p-value < 2.2e-16