중간고사

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#4

A = matrix(c(9,-2,-2,9),2,2)  
A.inv = solve(A)  
  
eigen(A.inv)

## eigen() decomposition  
## $values  
## [1] 0.14285714 0.09090909  
##   
## $vectors  
## [,1] [,2]  
## [1,] 0.7071068 -0.7071068  
## [2,] 0.7071068 0.7071068

#7

library(car)

## 필요한 패키지를 로딩중입니다: carData

dat <- read.table('T1-5.DAT')  
colnames(dat) <- c('Wind','Solar\_radiation','CO','NO','NO2','O3','HC')  
  
Y1 = dat$NO2  
Y2 = dat$O3  
X1 = dat$Wind  
X2 = dat$Solar\_radiation

#7-(a)

X = matrix(cbind(Y1,Y2),42,2)  
  
mu0 = c(10,10)  
xbar <- colMeans(X)  
S <- cov(X)  
S.inv <- solve(S)  
n = 42  
p = 2  
T2 <- n\*(xbar-mu0)%\*%S.inv%\*%(xbar-mu0)  
  
  
#critical value  
  
  
c.value <- (n-1)\*p/(n-p)\*qf(0.95,p,n-p)  
  
T2

## [,1]  
## [1,] 0.5244556

c.value

## [1] 6.62504

library(DescTools)

##   
## 다음의 패키지를 부착합니다: 'DescTools'

## The following object is masked from 'package:car':  
##   
## Recode

HotellingsT2Test(X,mu = mu0, test = "f")

##   
## Hotelling's one sample T2-test  
##   
## data: X  
## T.2 = 0.25583, df1 = 2, df2 = 40, p-value = 0.7755  
## alternative hypothesis: true location is not equal to c(10,10)

#7-(b)

#mu1  
  
mu1 = mean(Y1)  
v1 = Var(Y1)  
f = p\*(n-1)/(n-p)\*qf(0.95,p,n-p)  
  
c(mu1 - sqrt(f)\*sqrt(v1/n), mu1+sqrt(f)\*sqrt(v1/n))

## [1] 8.708786 11.386452

#mu2  
mu2 = mean(Y2)  
v2 = Var(Y2)  
f = p\*(n-1)/(n-p)\*qf(0.95,p,n-p)  
  
c(mu2 - sqrt(f)\*sqrt(v2/n), mu1+sqrt(f)\*sqrt(v2/n))

## [1] 7.194214 12.258167

#7-(c)

mod <- lm(cbind(Y1,Y2)~X1+X2,data = dat)  
manova.dat <- Anova(mod)  
  
summary(manova.dat)

##   
## Type II MANOVA Tests:  
##   
## Sum of squares and products for error:  
## Y1 Y2  
## Y1 455.13558 82.91455  
## Y2 82.91455 1077.96628  
##   
## ------------------------------------------  
##   
## Term: X1   
##   
## Sum of squares and products for the hypothesis:  
## Y1 Y2  
## Y1 4.528901 16.86513  
## Y2 16.865132 62.80390  
##   
## Multivariate Tests: X1  
## Df test stat approx F num Df den Df Pr(>F)  
## Pillai 1 0.0596202 1.204603 2 38 0.311  
## Wilks 1 0.9403798 1.204603 2 38 0.311  
## Hotelling-Lawley 1 0.0634001 1.204603 2 38 0.311  
## Roy 1 0.0634001 1.204603 2 38 0.311  
##   
## ------------------------------------------  
##   
## Term: X2   
##   
## Sum of squares and products for the hypothesis:  
## Y1 Y2  
## Y1 5.149668 23.85153  
## Y2 23.851532 110.47228  
##   
## Multivariate Tests: X2  
## Df test stat approx F num Df den Df Pr(>F)  
## Pillai 1 0.0968515 2.037514 2 38 0.14435  
## Wilks 1 0.9031485 2.037514 2 38 0.14435  
## Hotelling-Lawley 1 0.1072376 2.037514 2 38 0.14435  
## Roy 1 0.1072376 2.037514 2 38 0.14435