0928 code

# R function for implementing confidence intervals

# using simultaneous univariate intervals ideas

#

# est is the estimates of the parameter

#

# Note that the length of est must be p

confreg <- function(X,alpha=0.05){

n = dim(X)[1]

p = dim(X)[2]

s=cov(X)

simucr=matrix(0,p,2)

dg2=n-p

cr=qf((1-alpha),p,n-p)

cr1=sqrt(p\*(n-1)\*cr/(n-p))

se=sqrt(diag(s))/sqrt(n)

est = colMeans(X)

simucr[,1]=est-cr1\*se

simucr[,2]=est+cr1\*se

print("C.R. based on T^2")

print(simucr)

indvcr=matrix(0,p,2)

q=1-(alpha/2)

cr=qt(q,(n-1))

indvcr[,1]=est-cr\*se

indvcr[,2]=est+cr\*se

print("CR based on individual t")

print(indvcr)

bonfcr=matrix(0,p,2)

q=1-(alpha/(2\*p))

cr=qt(q,(n-1))

bonfcr[,1]=est-cr\*se

bonfcr[,2]=est+cr\*se

print("CR based on Bonferroni")

print(bonfcr)

asymcr=matrix(0,p,2)

cr=sqrt(qchisq((1-alpha),p))

asymcr[,1]=est-cr\*se

asymcr[,2]=est+cr\*se

print("Asymp. simu. CR")

print(asymcr)

return(list(simucr=simucr,indvcr=indvcr,bonfcr=bonfcr,asymcr=asymcr))}

Behrens function

Behrens = function(x1,x2){

# The x1 and x2 are two data matrices with xi for population i.

Behrens=NULL

n1 = dim(x1)[1]

n2 = dim(x2)[1]

p1 = dim(x1)[2]

p2 = dim(x2)[2]

if (p1 == p2){

x1bar=matrix(colMeans(x1),p1,1)

x2bar=matrix(colMeans(x2),p2,1)

dev = x1bar-x2bar

S1 = cov(x1)

S2 = cov(x2)

S1n = (1/n1)\*S1

S2n = (1/n2)\*S2

Sp = S1n+S2n

Si=solve(Sp)

T2 = t(dev)%\*%Si%\*%dev

S1s= S1n%\*%Si

S2s = S2n%\*%Si

SS1s = S1s%\*%S1s

SS2s = S2s%\*%S2s

d1 = (sum(diag(SS1s))+(sum(diag(S1s)))^2)/n1 + (sum(diag(SS2s))+(sum(diag(S2s)))^2)/n2

v = (p1+p1^2)/d1

print("Estimate of v: ")

print(v)

deg = v-p1+1

tt=T2\*deg/(v\*p1)

pvalue=1-pf(tt,p1,deg)

Behrens=cbind(Behrens,c(T2,pvalue))

row.names(Behrens)=c("Test-T2","p.value")

}

print("Test result:")

Behrens

}

Lowa basketball example

scores = matrix(c(82,65,51,66,80,75,71,79,66,68,51,66,72,55,75,59,76,62,69,56,81,55,69,57,84,62,59,56,78,53,48,49),nrow=8,byrow=T)

# difference between away and home

# points scored by Iowa

d1 = scores[,3] - scores[,1]

# Points scored by opponent

d2 = scores[,4] - scores[,2]

d = cbind(d1,d2)

# confreg function from previous lecture, default alpha = 0.05

confreg(d)

[1] "C.R. based on T^2"

[,1] [,2]

[1,] -30.458435 -1.041565

[2,] -6.006509 4.256509

[1] "CR based on individual t"

[,1] [,2]

[1,] -25.789713 -5.710287

[2,] -4.377675 2.627675

[1] "CR based on Bonferroni"

[,1] [,2]

[1,] -27.813344 -3.686656

[2,] -5.083684 3.333684

[1] "Asymp. simu. CR"

[,1] [,2]

[1,] -26.142634 -5.357366

[2,] -4.500803 2.750803

# Two-sample paired test

muhat = apply(d,2,mean)

sigma = var(d)

n = dim(d)[1]

p = dim(d)[2]

T2 = n\*muhat %\*% solve(sigma) %\*% muhat

pval = 1-pf((n-p)\*T2/((n-1)\*p),p,n-p)