repeated measure

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2/21/2020

```
######## Richard Johnson Ed. 5 p. 281 ########
x1 <- c(426,253,359,432,405,324,310,326,375,286,349,429,348,412,347,434,364,420,397)
x2 <- c(609,236,433,431,426,438,312,326,447,286,382,410,377,473,326,458,367,395,556)
x3 <- c(556,392,349,522,513,507,410,350,547,403,473,488,447,472,455,637,432,508,645)
x4 <- c(600,395,357,600,513,539,456,504,548,422,497,547,514,446,468,524,469,531,625)
x <- cbind(x1, x2, x3, x4)
n <- nrow(x)
j <- matrix(1, n, n)
C <- matrix(c(-1,-1,1,1,1,-1,1,-1,1,-1,-1,1), ncol = 4, byrow = TRUE) #contrast
matrix, sesuaikan dengan soal
S <- 1/(n-1) * t(x) %*% (diag(n) - j/n) %*% x
cat("Matriks x\n\n")
```

```
## Matriks x
```

```
x
```

```
##        x1  x2  x3  x4
##  [1,] 426 609 556 600
##  [2,] 253 236 392 395
##  [3,] 359 433 349 357
##  [4,] 432 431 522 600
##  [5,] 405 426 513 513
##  [6,] 324 438 507 539
##  [7,] 310 312 410 456
##  [8,] 326 326 350 504
##  [9,] 375 447 547 548
## [10,] 286 286 403 422
## [11,] 349 382 473 497
## [12,] 429 410 488 547
## [13,] 348 377 447 514
## [14,] 412 473 472 446
## [15,] 347 326 455 468
## [16,] 434 458 637 524
## [17,] 364 367 432 469
## [18,] 420 395 508 531
## [19,] 397 556 645 625
```

```r
cat("Matriks C\n\n")

## Matriks C

C

##      [,1] [,2] [,3] [,4]
## [1,]   -1   -1    1    1
## [2,]    1   -1    1   -1
## [3,]    1   -1   -1    1

cat("Matriks S\n\n")

## Matriks S

S

##          x1       x2       x3       x4
## x1 2819.287 3568.415 2943.497 2295.357
## x2 3568.415 7963.135 5303.991 4065.459
## x3 2943.497 5303.991 6851.316 4499.640
## x4 2295.357 4065.459 4499.640 4878.988

# Uji Beda Rata-rata pada Repeated Measure (Statistic Uji T2 Hotelling's)
xbar <- matrix(c(mean(x1), mean(x2), mean(x3), mean(x4)), 4)
p <- ncol(x) - 1
a <- .05
T2 = n * t(C %*% xbar) %*% solve(C %*% S %*% t(C)) %*% (C %*% xbar)
T2tab = p*(n-1) / (n-p) * qf(1 - a, p, n - p)

if(T2 > T2tab){
  cat(T2, ">", T2tab, "\nTolak H0")
}else{
  cat(T2, "<", T2tab,"\nGagal tolak H0")
}

## 116.0163 > 10.93119
## Tolak H0

# Menghitung Selang Kepercayaan
# C1 =  (miu3 + miu 4) - (miu1 + miu2) #
b = 1 #baris pada matrix C
C1 <- (C[b,1:4] %*% xbar) + c(-1,1) * (T2tab * (C[b,1:4]%*%S%*%C[b,1:4]) / n)^0.5

cat("(miu3 + miu 4) - (miu1 + miu2)\n")

## (miu3 + miu 4) - (miu1 + miu2)

cat("Selang (95%) \n", C1[1], C1[2])

## Selang (95%)
##  135.6503 282.9813
```

```r
# C2 =  (miu1 + miu 3) - (miu2 + miu4) #
b = 2 #baris pada matrix C
C2 <- (C[b,1:4] %*% xbar) + c(-1,1) * (T2tab * (C[b,1:4]%*%S%*%C[b,1:4]) / n)^0.5

cat("(miu1 + miu 3) - (miu2 + miu4)\n")

## (miu1 + miu 3) - (miu2 + miu4)

cat("Selang (95%) \n", C2[1], C2[2])

## Selang (95%)
##  -114.7271 -5.37818

# C3 =  (miu1 + miu 4) - (miu2 + miu3) #
b = 3 #baris pada matrix C, menunjukkan interaksi
C3 <- (C[b,1:4] %*% xbar) + c(-1,1) * (T2tab * (C[b,1:4]%*%S%*%C[b,1:4]) / n)^0.5

cat("(miu1 + miu 4) - (miu2 + miu3)\n")

## (miu1 + miu 4) - (miu2 + miu3)

cat("Selang (95%) \n", C3[1], C3[2])

## Selang (95%)
##  -78.72858 53.14964
```