R을 활용한 QbDOE실습

LP#43 반복수가 같은 일원배치

- 실습 파일 불러오기

```
> df<- read.csv("/Users/unixking/Desktop/choi/csv/One-way ANOVA.csv", header = T)
> df
   group power
1      1  8.44
2      1  8.36
3      1  8.28
4      2  8.59
5      2  8.91
6      2  8.60
7      3  9.34
8      3  9.41
9      3  9.69
10     4  8.92
11     4  8.92
12     4  8.74
```

- group을 문자열로 변경

```
> df$group = factor(df$group, labels = c("temp1", "temp2", "temp3", "temp4"))
> df
   group power
1  temp1  8.44
2  temp1  8.36
3  temp1  8.28
4  temp2  8.59
5  temp2  8.91
6  temp2  8.60
7  temp3  9.34
8  temp3  9.41
9  temp3  9.69
10 temp4  8.92
11 temp4  8.92
12 temp4  8.74
```

- 반복수가 같은 일원배치법 실시

```
> model_fin = aov(power ~ group, data = df)
> summary(model_fin)
            Df Sum Sq Mean Sq F value   Pr(>F)
group        3 1.9788  0.6596   31.19 9.17e-05 ***
Residuals    8 0.1692  0.0211
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

LP#47 반복없는 이원배치

- 실습 파일 불러오기

```
> options(scipen=999) #지수 없애기
> df<- read.csv("/Users/unixking/Desktop/choi/csv/Two-way ANOVA.csv", header = T)
> df
   power group1 group2
1   97.6      1      1
2   97.3      1      2
3   96.7      1      3
4   98.6      2      1
5   98.2      2      2
6   96.9      2      3
7   99.0      3      1
8   98.0      3      2
9   97.9      3      3
10  98.0      4      1
11  97.7      4      2
12  96.5      4      3
```

- group을 문자열로 변경

```
> df$group1 = factor(df$group1, labels = c("temp1", "temp2", "temp3", "temp4"))
> df$group2 = factor(df$group2, labels = c("pres1", "pres2", "pres3"))
> df
   power group1 group2
1   97.6  temp1  pres1
2   97.3  temp1  pres2
3   96.7  temp1  pres3
4   98.6  temp2  pres1
5   98.2  temp2  pres2
6   96.9  temp2  pres3
7   99.0  temp3  pres1
8   98.0  temp3  pres2
9   97.9  temp3  pres3
10  98.0  temp4  pres1
11  97.7  temp4  pres2
12  96.5  temp4  pres3
```

- 반복없는 이원배치법 실시

```
> model_fin = aov(power ~ group1+group2, data = df)
> summary(model_fin)
            Df Sum Sq Mean Sq F value  Pr(>F)
group1       3   2.22  0.7400   7.929 0.01647 *
group2       2   3.44  1.7200  18.429 0.00274 **
Residuals    6   0.56  0.0933
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

LP#3-2-2-2-1 난괴법

- 실습 파일 불러오기

```
> options(scipen=999) #지수 없애기
> df<- read.csv("/Users/unixking/Desktop/choi/csv/RBD.csv", header = T)
> df
  power group1 group2
1  13.1      1      1
2  12.9      1      2
3  13.4      1      3
4  12.4      2      1
5  12.7      2      2
6  12.5      2      3
7  12.3      3      1
8  12.0      3      2
9  12.2      3      3
```

- group을 문자열로 변경

```
> df$group1 = factor(df$group1, labels = c("temp1", "temp2", "temp3"))
> df$group2 = factor(df$group2, labels = c("humid1", "humid2", "humid3"))
> df
  power group1 group2
1  13.1  temp1 humid1
2  12.9  temp1 humid2
3  13.4  temp1 humid3
4  12.4  temp2 humid1
5  12.7  temp2 humid2
6  12.5  temp2 humid3
7  12.3  temp3 humid1
8  12.0  temp3 humid2
9  12.2  temp3 humid3
```

- 난괴법 실시

```
> model_fin = aov(power ~ group1+group2, data = df)
> summary(model_fin)
            Df Sum Sq Mean Sq F value Pr(>F)
group1       2 1.4289  0.7144  16.075 0.0122 *
group2       2 0.0422  0.0211   0.475 0.6530
Residuals    4 0.1778  0.0444
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

- 풀링 실시

```
> #풀링하기!
> model_fin2 = aov(power ~ group1, data = df)
> summary(model_fin2)
            Df Sum Sq Mean Sq F value  Pr(>F)
group1       2  1.429  0.7144   19.48 0.00238 **
Residuals    6  0.220  0.0367
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

LP#48 반복있는 이원배치

- 실습 파일 불러오기

```
> options(scipen=999) #지수 없애기
> df<- read.csv("/Users/unixking/Desktop/choi/csv/1two-way ANOVA.csv", header = T)
> df
   power group1 group2
1    305      1      1
2    302      1      1
3    335      1      2
4    337      1      2
5    366      1      3
6    364      1      3
7    372      1      4
8    374      1      4
9    376      1      5
10   373      1      5
11   348      1      6
12   350      1      6
13   322      2      1
14   325      2      1
15   350      2      2
16   348      2      2
17   326      2      3
18   324      2      3
19   330      2      4
20   330      2      4
21   327      2      5
22   330      2      5
23   310      2      6
24   308      2      6
25   320      3      1
26   322      3      1
27   342      3      2
28   344      3      2
29   338      3      3
30   336      3      3
31   348      3      4
32   348      3      4
33   350      3      5
34   350      3      5
35   330      3      6
36   328      3      6
```

- group을 문자열로 변경

```
> df$group1 = factor(df$group1, labels = c("gyp1", "gyp2", "gyp3"))
> df$group2 = factor(df$group2, labels = c("add1", "add2", "add3","add4", "add5", "add6"))
> df
   power group1 group2
1    305   gyp1   add1
2    302   gyp1   add1
3    335   gyp1   add2
4    337   gyp1   add2
5    366   gyp1   add3
6    364   gyp1   add3
7    372   gyp1   add4
8    374   gyp1   add4
9    376   gyp1   add5
10   373   gyp1   add5
11   348   gyp1   add6
12   350   gyp1   add6
13   322   gyp2   add1
14   325   gyp2   add1
15   350   gyp2   add2
16   348   gyp2   add2
17   326   gyp2   add3
18   324   gyp2   add3
19   330   gyp2   add4
20   330   gyp2   add4
21   327   gyp2   add5
22   330   gyp2   add5
23   310   gyp2   add6
24   308   gyp2   add6
25   320   gyp3   add1
26   322   gyp3   add1
27   342   gyp3   add2
28   344   gyp3   add2
29   338   gyp3   add3
30   336   gyp3   add3
31   348   gyp3   add4
32   348   gyp3   add4
33   350   gyp3   add5
34   350   gyp3   add5
35   330   gyp3   add6
36   328   gyp3   add6
```

- 반복있는 이원배치 실시

```
> model_fin = aov(power ~ group1+group2+group1:group2, data = df)
> summary(model_fin)
              Df Sum Sq Mean Sq F value               Pr(>F)    
group1         2   3088  1544.1   694.9 <0.0000000000000002 ***
group2         5   5549  1109.8   499.4 <0.0000000000000002 ***
group1:group2 10   4826   482.6   217.2 <0.0000000000000002 ***
Residuals     18     40     2.2                                 
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

LP#3-4 반복없는 삼원배치법

- 실습 파일 불러오기

```
> options(scipen=999) #지수 없애기
> df<- read.csv("/Users/unixking/Desktop/choi/csv/Three-way ANOVA.csv", header = T)
> df
   power group1 group2 group3
1     74      1      1      1
2     86      1      1      2
3     76      1      1      3
4     72      1      2      1
5     91      1      2      2
6     87      1      2      3
7     48      1      3      1
8     65      1      3      2
9     56      1      3      3
10    61      2      1      1
11    78      2      1      2
12    71      2      1      3
13    62      2      2      1
14    81      2      2      2
15    77      2      2      3
16    55      2      3      1
17    72      2      3      2
18    63      2      3      3
19    50      3      1      1
20    70      3      1      2
21    60      3      1      3
22    49      3      2      1
23    68      3      2      2
24    64      3      2      3
25    52      3      3      1
26    69      3      3      2
27    60      3      3      3
```

- group을 문자열로 변경

```
> df$group1 = factor(df$group1, labels = c("pres1", "pres2", "pres3"))
> df$group2 = factor(df$group2, labels = c("time1", "time2", "time3"))
> df$group3 = factor(df$group3, labels = c("temp1", "temp2", "temp3"))
> df
   power group1 group2 group3
1     74  pres1  time1  temp1
2     86  pres1  time1  temp2
3     76  pres1  time1  temp3
4     72  pres1  time2  temp1
5     91  pres1  time2  temp2
6     87  pres1  time2  temp3
7     48  pres1  time3  temp1
8     65  pres1  time3  temp2
9     56  pres1  time3  temp3
10    61  pres2  time1  temp1
11    78  pres2  time1  temp2
12    71  pres2  time1  temp3
13    62  pres2  time2  temp1
14    81  pres2  time2  temp2
15    77  pres2  time2  temp3
16    55  pres2  time3  temp1
17    72  pres2  time3  temp2
18    63  pres2  time3  temp3
19    50  pres3  time1  temp1
20    70  pres3  time1  temp2
21    60  pres3  time1  temp3
22    49  pres3  time2  temp1
23    68  pres3  time2  temp2
24    64  pres3  time2  temp3
25    52  pres3  time3  temp1
26    69  pres3  time3  temp2
27    60  pres3  time3  temp3
```

- 반복없는 삼원배치 실시

```
> model_fin = aov(power ~ group1 + group2 + group3+ group1:group2 + group1:group3 + group2:group3, data = df)
> summary(model_fin)
              Df Sum Sq Mean Sq F value       Pr(>F)
group1         2  743.6   371.8 164.574 0.0000003170 ***
group2         2  753.4   376.7 166.738 0.0000003012 ***
group3         2 1381.0   690.5 305.623 0.0000000279 ***
group1:group2  4  651.9   163.0  72.139 0.0000025907 ***
group1:group3  4    9.0     2.3   1.000       0.4609
group2:group3  4   56.6    14.1   6.262       0.0138 *
Residuals      8   18.1     2.3
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

- 풀링 실시

```
> #풀링하기!
> model_fin2 = aov(power ~ group1 + group2 + group3+ group1:group2 + group2:group3, data = df)
> summary(model_fin2)
              Df Sum Sq Mean Sq F value          Pr(>F)
group1         2  743.6   371.8 164.574 0.0000000018942 ***
group2         2  753.4   376.7 166.738 0.0000000017562 ***
group3         2 1381.0   690.5 305.623 0.0000000000509 ***
group1:group2  4  651.9   163.0  72.139 0.0000000273841 ***
group2:group3  4   56.6    14.1   6.262         0.00584 **
Residuals     12   27.1     2.3
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```