SQB7007 Group Assignment

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Load data

```
setwd("~/Library/CloudStorage/OneDrive-Personal/Masters in Statistics/SQB7007/Data")
library(haven)
dat <- read_sav("1546826-US_DatCEV3_09052018_Data_Download_10.7.20.sav")

var_description <- list()
for (col in colnames(dat)){
  var_description <- append(var_description,attr(dat[[col]], which="label"))
}
```

EDA

```
table(dat$cqHidCondition)
```

```
##
##   1   2   3   4   5
## 564 555 586 544 552
```

```
table(dat$cqhidS5)
```

```
##
##    1    2    3    4
##  181  687  909 1024
```

Variable Selection

```
dat_sub <- dat[,c("cqP7_1","cqP8_1", "cqPT19_1", "cqPT19_2", "cqHidCondition", "cqhidS5",
                  "cqhidAge", "cqHid2")]
dat_sub$cqHidCondition<-as.factor(dat_sub$cqHidCondition)
dat_sub$cqhidS5<-as.factor(dat_sub$cqhidS5)
dat_sub$cqhidAge<-as.factor(dat_sub$cqhidAge)
dat_sub$cqHid2<-as.factor(dat_sub$cqHid2)
```

Testing for Equality of Covariance Matrices

```
library(heplots)
```

```
## Loading required package: car
```

```
## Loading required package: carData
```

```
## Loading required package: broom
```

```
boxm_treatment <- boxM(cbind(cqP7_1,cqP8_1, cqPT19_1, cqPT19_2)~cqHidCondition, data=dat_sub)
summary(boxm_treatment)
```

```
## Summary for Box's M-test of Equality of Covariance Matrices
##
## Chi-Sq:   48.3228
## df:   40
## p-value: 0.172
##
## log of Covariance determinants:
##        1        2        3        4        5   pooled
## 7.025689 6.751840 7.205062 7.326377 7.222056 7.160213
##
## Eigenvalues:
##           1         2         3         4         5    pooled
## 1 16.129481 16.013031 17.774326 15.358597 16.063435 16.081095
## 2  7.047367  7.460579  8.328691  6.860000  7.498975  7.359954
## 3  6.072231  5.499274  6.108066  6.381140  6.991995  6.448989
## 4  1.630131  1.302374  1.488830  2.260639  1.625764  1.686392
##
## Statistics based on eigenvalues:
##                      1         2            3           4           5     pooled
## product   1125.169902 855.63197 1346.2281660 1519.865246 1369.301279 1287.18481
## sum         30.879210  30.27526   33.6999128   30.860375   32.180169   31.57643
## precision    1.018302   0.87248    0.9884215    1.234648    1.048525    1.05697
## max         16.129481  16.01303   17.7743262   15.358597   16.063435   16.08110
```

```
boxm_educ <- boxM(cbind(cqP7_1,cqP8_1, cqPT19_1, cqPT19_2)~cqhidS5, data=dat_sub)
summary(boxm_educ)
```

```
## Summary for Box's M-test of Equality of Covariance Matrices
##
## Chi-Sq:   61.15906
## df:   30
## p-value: 0.0006649
##
## log of Covariance determinants:
##        1        2        3        4   pooled
## 7.592128 7.053498 7.145064 6.813585 7.122228
##
## Eigenvalues:
##           1         2         3         4    pooled
## 1 17.120850 14.265183 14.415456 17.873472 15.529163
## 2  7.117078  9.039276  7.831109  6.691127  7.482356
## 3  6.109922  6.601704  6.336865  4.873415  6.324583
## 4  2.662910  1.359028  1.772294  1.561567  1.686266
##
## Statistics based on eigenvalues:
##                      1            2           3           4      pooled
## product   1982.527076 1156.8987883 1267.832523 910.1274362 1239.208395
## sum         33.010759   31.2651907   30.355724  30.9995799   31.022368
## precision    1.354807    0.9363074    1.088005   0.9514949    1.053539
## max         17.120850   14.2651829   14.415456  17.8734715   15.529163
```

```r
boxm_age <- boxM(cbind(cqP7_1,cqP8_1, cqPT19_1, cqPT19_2)~cqhidAge, data=dat_sub)
summary(boxm_age)
```

```
## Summary for Box's M-test of Equality of Covariance Matrices
##
## Chi-Sq:   104.3472
## df:   30
## p-value: 3.776e-10
##
## log of Covariance determinants:
##        1        2        3        4   pooled
## 7.422807 6.711697 6.864858 6.998438 7.046066
##
## Eigenvalues:
##           1         2         3         4    pooled
## 1 14.728216 16.483190 14.900020 15.352488 15.014331
## 2  8.113028  6.473898  9.143850  6.444680  7.527079
## 3  7.148079  4.912748  5.871106  5.631231  6.039404
## 4  1.959575  1.567910  1.197662  1.965167  1.682445
##
## Statistics based on eigenvalues:
##                      1           2           3           4      pooled
## product   1673.725902 821.9641683 958.0102563 1094.921351 1148.331898
## sum         31.948898  29.4377468  31.1126378   29.393566   30.263259
## precision    1.188541   0.9465413   0.8461935    1.102844    1.042308
## max         14.728216  16.4831900  14.9000198   15.352488   15.014331
```

```r
boxm_gender <- boxM(cbind(cqP7_1,cqP8_1, cqPT19_1, cqPT19_2)~cqHid2, data=dat_sub)
summary(boxm_gender)
```

```
## Summary for Box's M-test of Equality of Covariance Matrices
##
## Chi-Sq:   27.19323
## df:   10
## p-value: 0.002427
##
## log of Covariance determinants:
##        1        2   pooled
## 6.970769 7.269568 7.159124
##
## Eigenvalues:
##           1         2    pooled
## 1 17.228572 15.220752 15.985065
## 2  6.550200  8.286980  7.540566
## 3  5.710785  6.667023  6.326686
## 4  1.652596  1.707533  1.686062
##
## Statistics based on eigenvalues:
##                      1           2     pooled
## product   1065.041013 1435.930544 1285.78427
## sum         31.142153   31.882287   31.53838
## precision    1.009157    1.084595    1.05671
## max         17.228572   15.220752   15.98506
```