Exercise section 13

Mehrab Atighi

11/18/2021

Exercise section 13 part 1

```
library(psych)
Data = data.frame(Kind = c(1,8,9,9,1,9,9) ,
                  Intelligent = c(5,9,8,9,9,7,7),
                  Happy = c(5,7,9,9,1,7,9) ,
                  Likeable = c(1,9,9,9,1,9,9) ,
                  Just = c(1,8,8,9,9,9,7))

fa1 = fa(Data ,nfactors = 5 , rotate = "varimax")

## In smc, smcs < 0 were set to .0
## In smc, smcs < 0 were set to .0
## In smc, smcs < 0 were set to .0

## In factor.scores, the correlation matrix is singular, an approximation is
used

fa2 = fa(Data ,nfactors = 5 )

## Loading required namespace: GPArotation

## In factor.scores, the correlation matrix is singular, an approximation is
used

fa1$loadings
## Loadings:
##             MR1    MR2    MR3    MR4    MR5
## Kind         0.946  0.261  0.179
## Intelligent         0.990 -0.109
## Happy        0.980                -0.131
## Likeable     0.940  0.285  0.129  0.125
## Just         0.255  0.875  0.405
##
##                  MR1   MR2   MR3   MR4   MR5
## SS loadings    2.807 1.902 0.234 0.037 0.000
## Proportion Var 0.561 0.380 0.047 0.007 0.000
## Cumulative Var 0.561 0.942 0.989 0.996 0.996
```

```
fa2$loadings
```

```
##
## Loadings:
##             MR1    MR2    MR3    MR4    MR5
## Kind         0.969 -0.231
## Intelligent  0.519  0.806  0.276
## Happy        0.784 -0.586  0.165
## Likeable     0.970 -0.210
## Just         0.703  0.666 -0.228
##
##                  MR1   MR2   MR3   MR4   MR5
## SS loadings    3.258 1.533 0.163 0.026 0.000
## Proportion Var 0.652 0.307 0.033 0.005 0.000
## Cumulative Var 0.652 0.958 0.991 0.996 0.996
```

Variables	Principal Component Loadings f_1	Principal Component Loadings f_2	Varimax Rotated Loadings f_1	Varimax Rotated Loadings f_2	Communalities, $\hat{h}_i^2$
Kind	.969	−.231	**.951**	.298	.993
Intelligent	.519	.807	.033	**.959**	.921
Happy	.785	−.587	**.975**	−.103	.960
Likeable	.971	−.210	**.941**	.317	.987
Just	.704	.667	.263	**.933**	.940
Variance accounted for	3.263	1.538	2.811	1.991	4.802
Proportion of total variance	.653	.308	.562	.398	.960
Cumulative proportion	.653	.960	.562	.960	.960

با توجه به تصویر میبینیم که مقادیر ضرایبی که برای دو عاملی که داریم بدست آمده است، دقیقا مشابه خروجی کتاب می‌باشد.و اندک تغییری هم که دارد برای رند شدن مقادیر هست.

Exercise section 13 part 2

```
Country<-
c("Belgium","Denmark","France","Germany","Greece","Ireland","Italy","Luxembou
rg","Netherlands","Portugal","Spain","United
Kingdom","Austria","Finlad","Iceland","Norway","Sweden","Swirzerland","Albani
a","Bulgaria","Czech/Slovak","Hungary","Poland","Roma
nia","USSR(Former)","Youslavia(Former)","Cyprus","Gilbralter","Malta","Turkey
")
Group<-c(rep("EU",12),rep("EFTA",6),rep("Eastern",8),rep("Other",4))
AGR<-
c(2.6,5.6,5.1,3.2,22.2,13.8,8.4,3.3,4.2,11.5,9.9,2.2,7.4,8.5,10.5,5.8,3.2,5.6
,55.5,19.0,12.8,15.3,23.6,22.0,18.5,5.0,13.5,0.0,2.6,
    44.8)
MIN<-
c(0.2,0.1,0.3,0.7,0.5,0.6,1.1,0.1,0.1,0.5,0.5,0.7,0.3,0.2,0.0,1.1,0.3,0.0,19.
4,0.0,37.3,28.9,3.9,2.6,0.0,2.2,0.3,0.0,0.6,0.9)
MAN<-
c(20.8,20.4,20.2,24.8,19.2,19.8,21.9,19.6,19.2,23.6,21.1,21.3,26.9,19.3,18.7,
14.6,19.0,24.7,0.0,35.0,0.0,0.0,24.1,37.9,28.8,38.7,19.0,6.8,27.9,15.3)
PS<-
c(0.8,0.7,0.9,1.0,1.0,1.2,0.0,0.7,0.7,0.7,0.6,1.2,1.2,1.2,0.9,1.1,0.8,0.0,0.0
,0.0,0.0,0.0,0.9,2.0,0.0,2.2,0.5,2.0,1.5,0.2)
CON<-
c(6.3,6.4,7.1,9.4,6.8,7.1,9.1,9.9,0.6,8.2,9.5,7.0,8.5,6.8,10.0,6.5,6.4,9.2,3.
4,6.7,8.4,6.4,6.3,5.8,10.2,8.1,9.1,16.9,4.6,5.2)
SER<-
c(16.9,14.5,16.7,17.2,18.2,17.8,21.6,21.2,18.5,19.8,20.1,20.2,19.1,14.6,14.5,
17.6,14.2,20.5,3.3,9.4,10.2,13.3,10.3,6.9,7.9,13.8,23.7,24.5,10.2,12.4)
FIN<-
c(8.7,9.1,10.2,9.6,5.3,8.4,4.6,8.7,11.5,6.3,5.9,12.4,6.7,8.6,8.0,7.6,9.4,107,
15.3,1.5,1.6,0.0,1.3,0.6,0.6,3.1,6.7,108,3.9,2.4)
SPS<-
c(36.9,36.3,33.1,28.4,19.8,25.5,28.0,29.6,38.3,24.6,26.7,28.4,23.3,33.2,30.7,
37.5,39.5,23.1,0.0,20.9,22.9,27.3,24.5,15.3,25.6,19.1,21.2,34.0,41.6,14.5)
TC<-
c(6.8,7.0,6.4,5.6,6.9,5.8,5.3,6.8,6.8,4.8,5.8,6.5,6.4,7.5,6.7,8.1,7.2,6.2,3.0
,7.5,6.9,8.8,5.2,6.8,8.4,7.8,6.0,5.0,7.2,4.4)
Data<-data.frame(Country,Group,AGR,MIN,MAN,PS,CON,SER,FIN,SPS,TC)
head(Data ,4)
```

```
##   Country Group  AGR MIN  MAN  PS CON  SER  FIN  SPS  TC
## 1 Belgium    EU  2.6 0.2 20.8 0.8 6.3 16.9  8.7 36.9 6.8
## 2 Denmark    EU  5.6 0.1 20.4 0.7 6.4 14.5  9.1 36.3 7.0
## 3  France    EU  5.1 0.3 20.2 0.9 7.1 16.7 10.2 33.1 6.4
## 4 Germany    EU  3.2 0.7 24.8 1.0 9.4 17.2  9.6 28.4 5.6
```

```r
fa3=fa(Data[,-c(1,2)] , nfactors =9 , rotate = "varimax")
fa4 = fa(Data[,-c(1,2)] ,nfactors = 9 )

## Loading required namespace: GPArotation

fa3$loadings

##
## Loadings:
##     MR1    MR2    MR7    MR5    MR3    MR6    MR8    MR4    MR9
## AGR -0.802 -0.265 -0.182 -0.390        -0.307
## MIN               -0.390 -0.217 -0.845 -0.255
## MAN        -0.121  0.882         0.319  0.290
## PS   0.158  0.111  0.197         0.155  0.579
## CON         0.714         0.230         0.117  0.118  0.151
## SER  0.200  0.375         0.876  0.203
## FIN         0.749 -0.117  0.105                -0.151 -0.138
## SPS  0.924        -0.138  0.149  0.260  0.124 -0.131
## TC   0.665 -0.158  0.229 -0.118 -0.162         0.358
##
##                  MR1   MR2   MR7   MR5   MR3   MR6   MR8   MR4   MR9
## SS loadings    2.018 1.340 1.090 1.071 0.984 0.612 0.188 0.044 0.000
## Proportion Var 0.224 0.149 0.121 0.119 0.109 0.068 0.021 0.005 0.000
## Cumulative Var 0.224 0.373 0.494 0.613 0.723 0.790 0.811 0.816 0.816

fa4$loadings

##
## Loadings:
##     MR1    MR2    MR3    MR4    MR5    MR6    MR7    MR8    MR9
## AGR -0.913        -0.346 -0.129                0.102
## MIN -0.653  0.262  0.609  0.294  0.127 -0.130
## MAN  0.422 -0.695 -0.493  0.216  0.130        -0.123
## PS   0.451 -0.172 -0.184  0.173 -0.155 -0.326
## CON  0.404  0.507 -0.146  0.376                0.136
## SER  0.702  0.531 -0.102 -0.259  0.374
## FIN  0.304  0.604 -0.197  0.205 -0.260  0.114 -0.122
## SPS  0.752 -0.110  0.523 -0.272 -0.255
## TC   0.324 -0.440  0.526  0.238  0.111  0.168
##
##                  MR1   MR2   MR3   MR4   MR5   MR6   MR7   MR8   MR9
## SS loadings    3.062 1.691 1.388 0.561 0.347 0.188 0.085 0.024 0.000
## Proportion Var 0.340 0.188 0.154 0.062 0.039 0.021 0.009 0.003 0.000
## Cumulative Var 0.340 0.528 0.682 0.745 0.783 0.804 0.814 0.816 0.816
```

با توجه به مشاهدات در بالا و دو روشی که بکار بردیم اگر ما از روش واریمکس هم برای دوران استفاده بکنیم، 6 تا عامل نیاز داریم تا بتوانیم 80% از واریانس کل را پوشش بدهد.