Projekt *„Nowa oferta edukacyjna Uniwersytetu Wrocławskiego odpowiedzią na współczesne potrzeby rynku pracy i gospodarki opartej na wiedzy”*

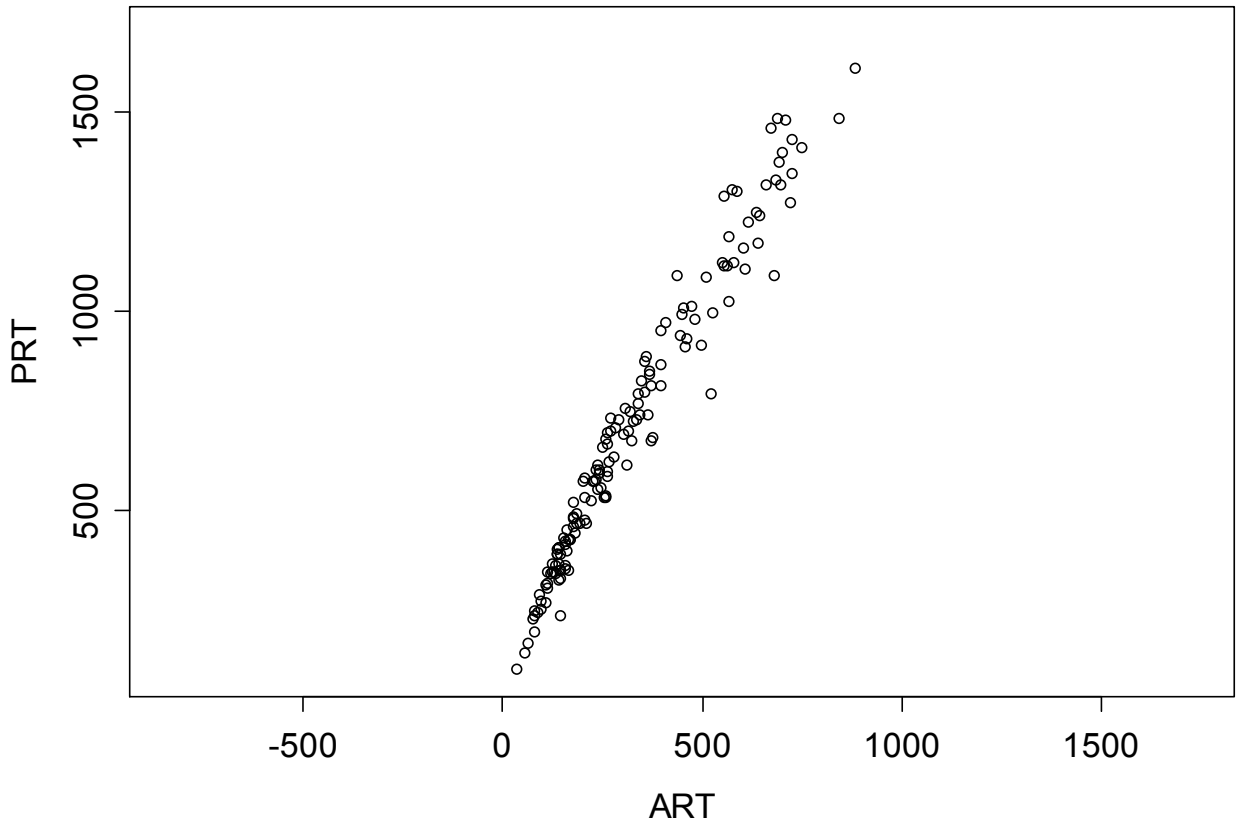
```
# Składowe główne

korki <- read.csv2("cork.csv",header=T)
attach(korki)
```

ART.	:	Total area of the defects (in pixels)
N	:	Total number of defects
PRT	:	Total perimeter of the defects (in pixels)
ARM	:	Average area of the defects (in pixels)=ART/N
PRM	:	Average perimeter of the defects (in pixels)=PRT/N
ARTG	:	Total area of big defects (in pixels)
NG	:	Number of big defects (bigger than a specified threshold)
PRTG	:	Total perimeter of big defects (in pixels)
RAAR	:	Areas ratio of the defects =ARTG/ART
RAN	:	Ratio of the number of defects=NG/N

```
print(korki[1:5,])
```

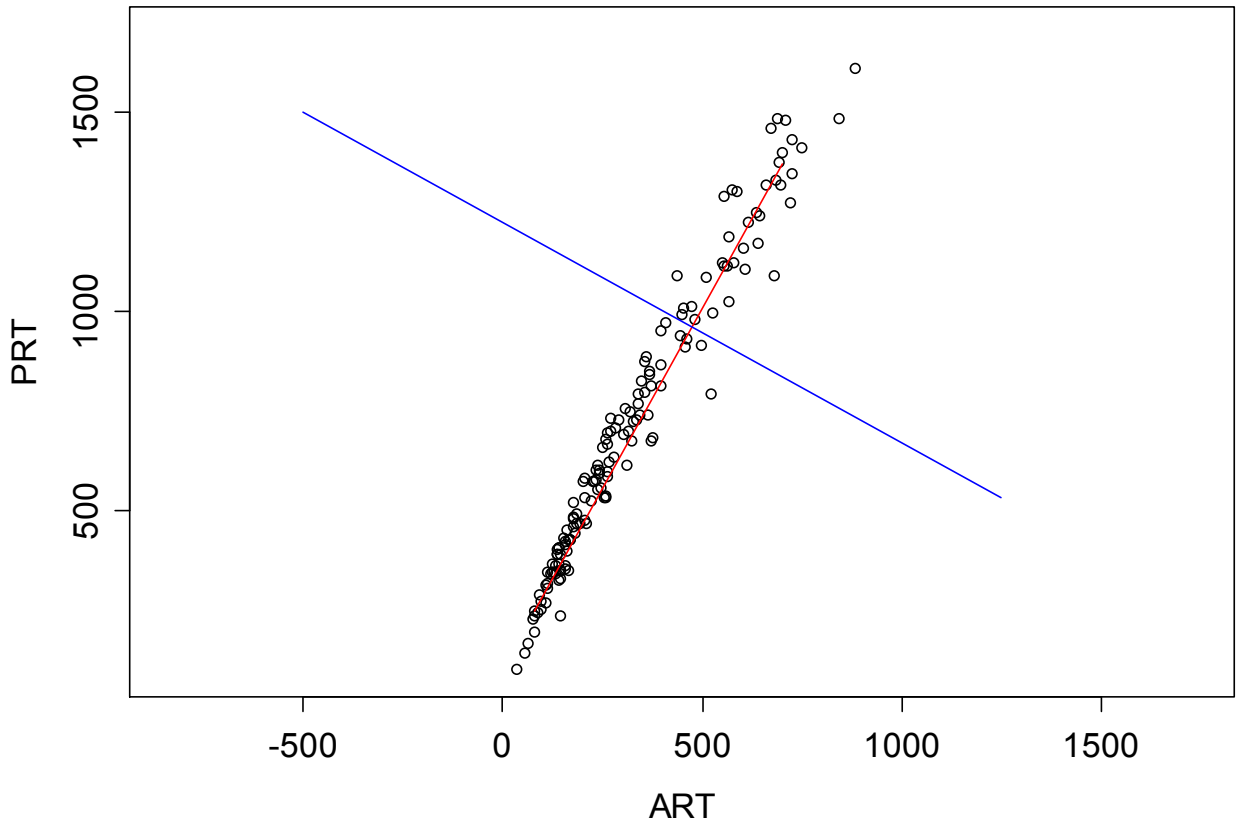
```
  C ART  N PRT  ARM  PRM ARTG NG PRTG  RAAR  RAN
1 1  81 41 250 1.98 6.10  9.0  1   12 11.11 2.44
2 1  80 42 238 1.91 5.67  0.0  0    0  0.00 0.00
3 1  81 26 196 3.12 7.54  9.8  2   15 12.04 6.73
4 1 125 63 368 1.98 5.84 20.0  1   18 16.00 1.59
5 1 146 45 350 3.24 7.78 42.8  3   43 29.28 6.11
```

```
plot(ART,PRT,xlim=c(0,900),ylim=c(100,1700),asp=1)
```




```
p<-prcomp(cbind(ART,PRT))
p

Standard deviations:
[1] 412.13619  34.11041

Rotation:
           PC1        PC2
ART 0.4831547 -0.8755350
PRT 0.8755350  0.4831547
```

```
p1 <- c(ART[1],700)
p2 <- c(PRT[1],PRT[1]+(700-p1[1])*0.8755350/0.4831547)
lines(p1,p2,col="red")
ll=-2000
q1 <- c(-500,-500-0.8755350*ll)
q2 <- c(1500,1500+0.4831547*ll)
lines(q1,q2,col="blue")
```




```
round(cor(korki[,2:10]),2)
```

```
      ART    N  PRT  ARM  PRM ARTG   NG PRTG RAAR
ART  1.00 0.80 0.98 0.87 0.88 0.96 0.94 0.97 0.86
N    0.80 1.00 0.89 0.45 0.49 0.68 0.75 0.72 0.61
PRT  0.98 0.89 1.00 0.78 0.81 0.91 0.92 0.93 0.82
ARM  0.87 0.45 0.78 1.00 0.99 0.88 0.80 0.87 0.85
PRM  0.88 0.49 0.81 0.99 1.00 0.88 0.81 0.88 0.86
ARTG 0.96 0.68 0.91 0.88 0.88 1.00 0.91 0.99 0.92
NG   0.94 0.75 0.92 0.80 0.81 0.91 1.00 0.96 0.85
PRTG 0.97 0.72 0.93 0.87 0.88 0.99 0.96 1.00 0.91
RAAR 0.86 0.61 0.82 0.85 0.86 0.92 0.85 0.91 1.00
```

```
pt <- princomp(korki[,2:10],cor=T)

print(pt$sdev,digits=2)
```

```
Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8 Comp.9
 2.791  0.885  0.442  0.366  0.268  0.129  0.074  0.057  0.021
```

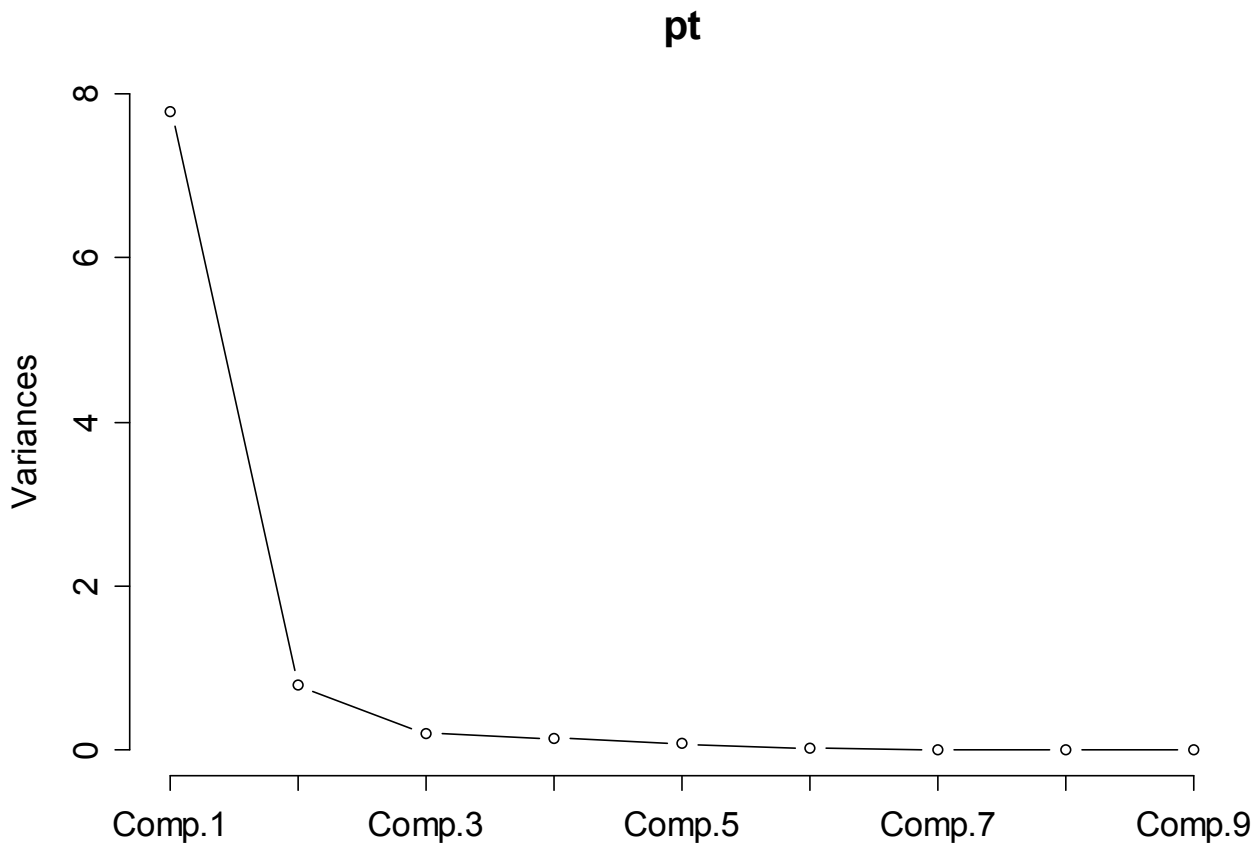
```
print(pt$sdev^2,digits=2)
```

```
Comp.1  Comp.2  Comp.3  Comp.4  Comp.5  Comp.6  Comp.7  Comp.8  Comp.9
7.79029 0.78258 0.19550 0.13427 0.07162 0.01652 0.00552 0.00324 0.00045
```

```
print(pt$sdev^2/9,digits=2)
```

```
Comp.1  Comp.2  Comp.3  Comp.4  Comp.5  Comp.6  Comp.7  Comp.8  Comp.9
0.86559 0.08695 0.02172 0.01492 0.00796 0.00184 0.00061 0.00036 0.00005
```

```
screeplot(pt,type="lines")
```



Expected value (%) of the kth-longest eigenvalue

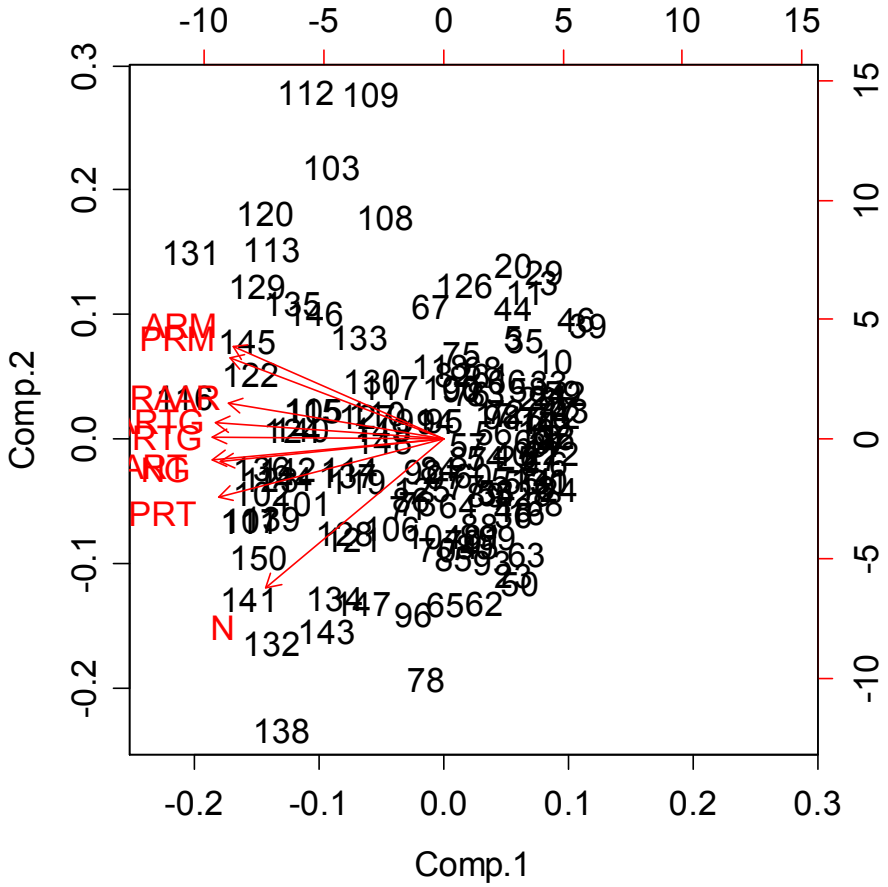
k	2	3	4	5	6	7	8	9	10
1	75,0%	61,1%	52,1%	45,7%	40,8%	37,0%	34,0%	31,4%	29,3%
2	25,0%	27,8%	27,1%	25,7%	24,2%	22,8%	21,5%	20,3%	19,3%
3		11,1%	14,6%	15,7%	15,8%	15,6%	15,2%	14,8%	14,3%
4			6,3%	9,0%	10,3%	10,9%	11,1%	11,1%	11,0%
5				4,0%	6,1%	7,3%	7,9%	8,3%	8,5%
6					2,8%	4,4%	5,4%	6,1%	6,5%
7						2,0%	3,3%	4,2%	4,8%
8							1,6%	2,6%	3,4%
9								1,2%	2,1%
10									1,0%

```
summary(pt)
print(pt$loadings,digits=2)

Loadings:
     Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8 Comp.9
ART  -0.354         -0.222          0.205  0.175  0.687         -0.512
N    -0.272 -0.715 -0.174  0.337 -0.143  0.249 -0.400         -0.169
PRT  -0.344 -0.277 -0.228          0.126 -0.429  0.295          0.676
ARM  -0.322  0.445 -0.368         -0.140  0.641                 0.352
PRM  -0.327  0.396 -0.395  0.191 -0.157 -0.555 -0.290         -0.354
ARTG -0.349         0.251 -0.114  0.651         -0.284  0.538
NG   -0.341 -0.109  0.206 -0.620 -0.596                 0.293
PRTG -0.353         0.232 -0.304  0.206         -0.254 -0.787
RAAR -0.329  0.172  0.645  0.586 -0.237          0.214
```

```
pt$scores[1:5,1:2]
```

```
       Comp.1     Comp.2
[1,] 3.190144  0.3839860
[2,] 3.527847  0.2108006
[3,] 2.877543  1.3817594
[4,] 2.708373 -0.3283071
[5,] 1.930358  0.9097105
```

```
biplot(pt)
```




```
pt1 <- prcomp(korki[,2:10],scale=T)
# "sdev", "rotation", "center", "scale", "x"
round(pt1$rotation,2)
```

```
       PC1   PC2   PC3   PC4   PC5   PC6   PC7   PC8   PC9
ART   0.35 -0.10 -0.22  0.09 -0.21  0.17  0.69 -0.01  0.51
N     0.27 -0.71 -0.17 -0.34  0.14  0.25 -0.40  0.03  0.17
PRT   0.34 -0.28 -0.23 -0.08 -0.13 -0.43  0.29 -0.05 -0.68
ARM   0.32  0.45 -0.37 -0.05  0.14  0.64 -0.07 -0.01 -0.35
PRM   0.33  0.40 -0.40 -0.19  0.16 -0.56 -0.29  0.04  0.35
ARTG  0.35  0.08  0.25  0.11 -0.65  0.03 -0.28  0.54 -0.02
NG    0.34 -0.11  0.21  0.62  0.60 -0.06  0.00  0.29 -0.02
PRTG  0.35  0.01  0.23  0.30 -0.21  0.00 -0.25 -0.79  0.05
RAAR  0.33  0.17  0.65 -0.59  0.24  0.01  0.21 -0.02 -0.01
```

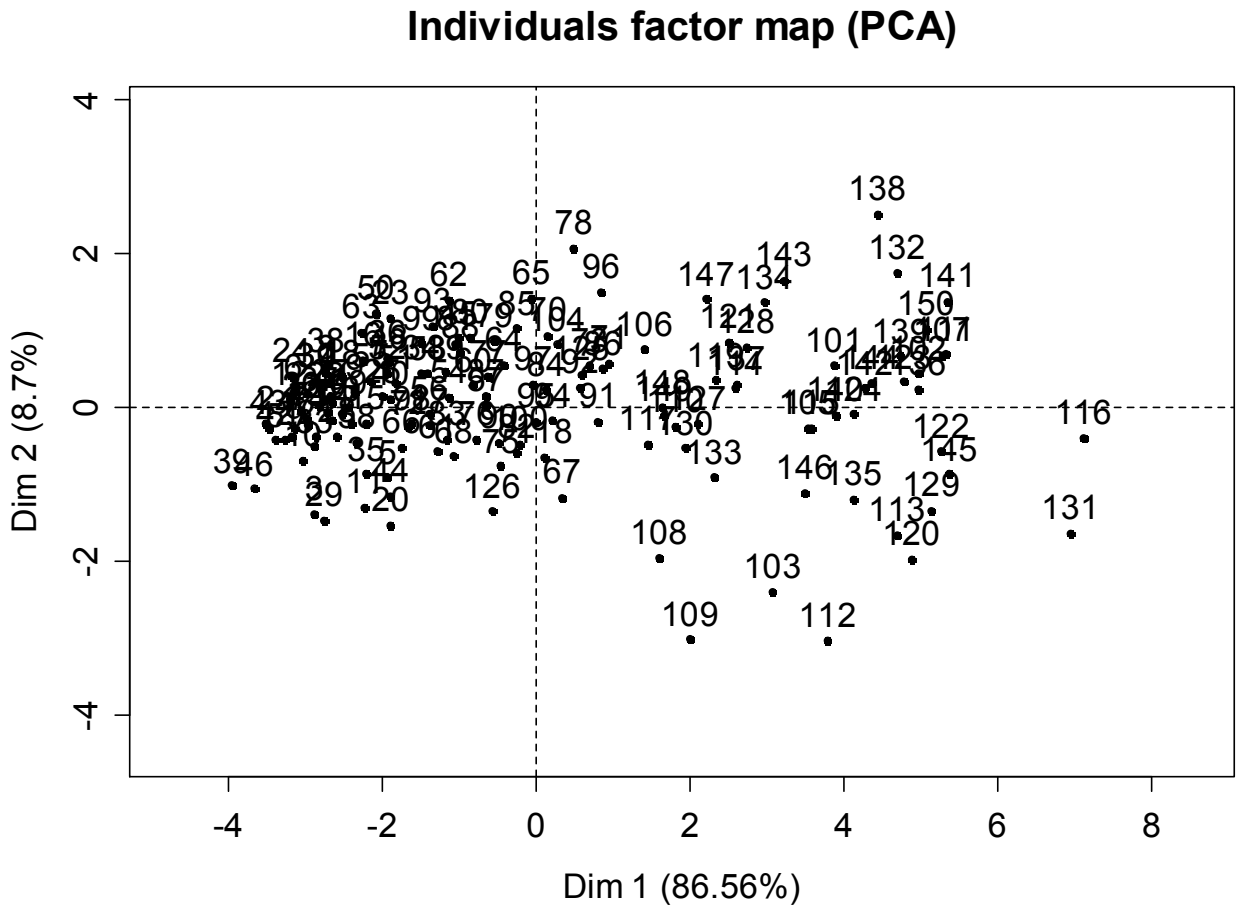
```
round(pt1$x[1:5,1:2],2)
```

```
       PC1   PC2
[1,] -3.18  0.38
[2,] -3.52  0.21
[3,] -2.87  1.38
[4,] -2.70 -0.33
[5,] -1.92  0.91
```

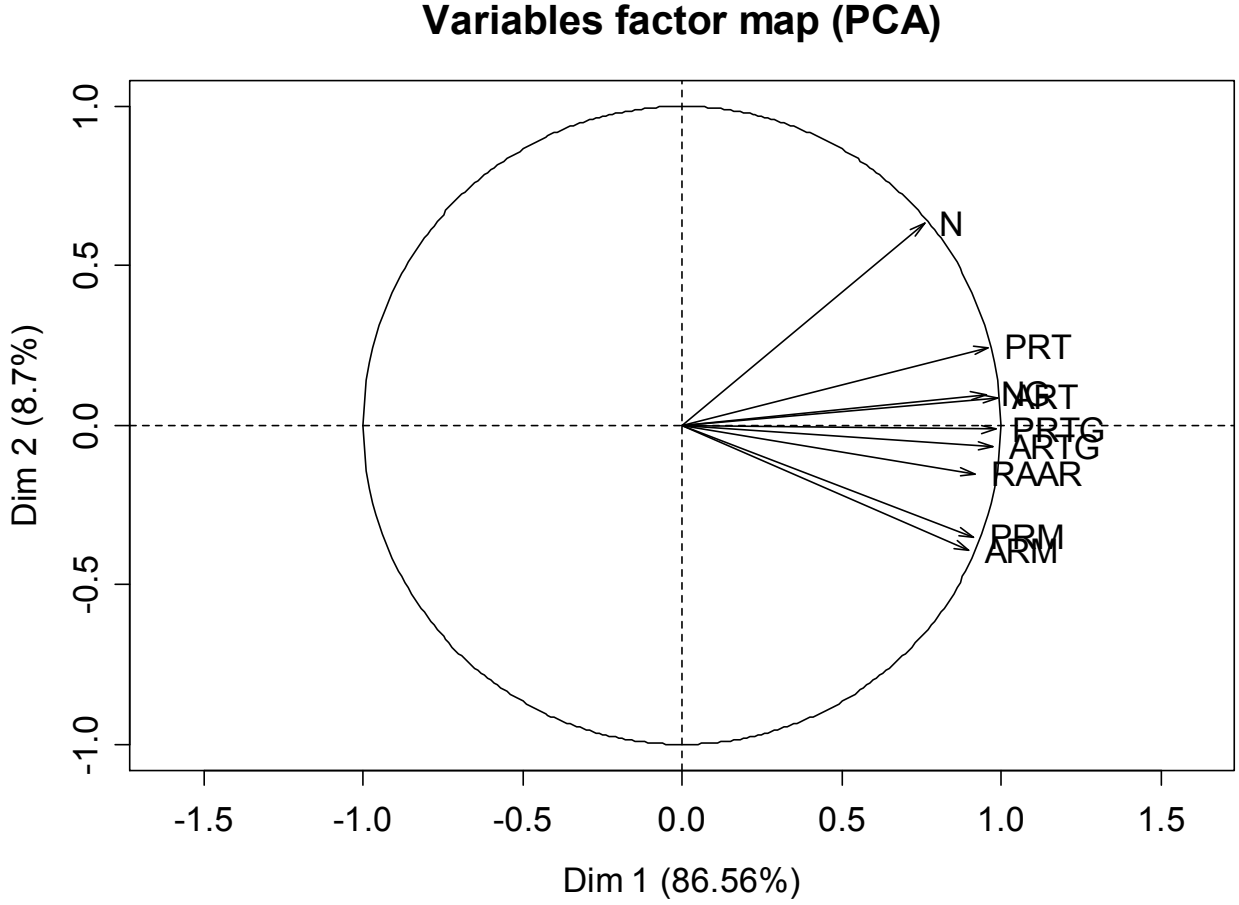
```
round(pt1$center,2)
   ART      N    PRT    ARM    PRM   ARTG     NG   PRTG   RAAR
324.03  78.47 710.39   3.88   8.68 150.48   5.87 125.25  33.02

round(pt1$scale,2)
   ART      N    PRT    ARM    PRM   ARTG     NG   PRTG   RAAR
201.35  26.57 361.22   1.63   2.28 171.27   5.50 130.49  25.20


library("psych")
library("GPArotation")
vss(korki[,2:10],fm="pc")

Very Simple Structure
Call: VSS(x = x, n = n, rotate = rotate, diagonal = diagonal, fm = fm,
    n.obs = n.obs, plot = plot, title = title)
VSS complexity 1 achieves a maximimum of 0.99  with  1  factors
VSS complexity 2 achieves a maximimum of 1  with  2  factors

The Velicer MAP criterion achieves a minimum of 0.22  with  1  factors

Korelacje cząstkowe po usunięciu k składowych

Velicer MAP
[1] 0.22 0.28 0.27 0.35 0.26 0.38 0.47 1.00

Very Simple Structure Complexity 1
[1] 0.99 0.66 0.38 0.36 0.32 0.32 0.32 0.32

Very Simple Structure Complexity 2
[1] 0.00 1.00 0.83 0.79 0.80 0.79 0.79 0.79


principal(korki[,2:10], nfactors=2, rotate="varimax")
principal(korki[,2:10], nfactors=2, rotate="none")

Principal Components Analysis
Call: principal(r = korki[, 2:10], nfactors = 2, rotate = "none")
Standardized loadings based upon correlation matrix
      PC1   PC2   h2    u2
ART  0.99  0.09 0.98 0.017
N    0.76  0.63 0.98 0.025
PRT  0.96  0.25 0.98 0.016
ARM  0.90 -0.39 0.96 0.035
PRM  0.91 -0.35 0.96 0.043
ARTG 0.97 -0.07 0.95 0.046
NG   0.95  0.10 0.91 0.086
PRTG 0.99 -0.01 0.97 0.028
RAAR 0.92 -0.15 0.87 0.132

                PC1  PC2
SS loadings    7.79 0.78
Proportion Var 0.87 0.09
Cumulative Var 0.87 0.95

Test of the hypothesis that 2 factors are sufficient.

The degrees of freedom for the null model are  36  and the objective function
was  27.2
The degrees of freedom for the model are 19  and the objective function was
7.46
The number of observations was  150  with Chi Square =  1072.39  with prob <
1.8e-215
```

```
library("FactoMineR")
fac <- PCA(korki[,2:10])
print(fac$eig,digits=2)
```

```
       eigenvalue              perc of variance      cum perc of variance
comp 1    7.79029                 86.559                    87
comp 2    0.78258                  8.695                    95
comp 3    0.19550                  2.172                    97
comp 4    0.13427                  1.492                    99
comp 5    0.07162                  0.796                   100
comp 6    0.01652                  0.184                   100
comp 7    0.00552                  0.061                   100
comp 8    0.00324                  0.036                   100
comp 9    0.00045                  0.005                   100
```



*




```
print(fac$var$coord,digits=2)
```

	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
ART	0.99	0.087	0.098	-0.033	-0.055
N	0.76	0.632	0.077	0.123	0.038
PRT	0.96	0.245	0.101	0.029	-0.034
ARM	0.90	-0.394	0.163	0.019	0.037
PRM	0.91	-0.350	0.175	0.070	0.042
ARTG	0.97	-0.068	-0.111	-0.042	-0.174
NG	0.95	0.096	-0.091	-0.227	0.159
PRTG	0.99	-0.012	-0.103	-0.112	-0.055
RAAR	0.92	-0.152	-0.285	0.215	0.063

```
print(fac$var$cor,digits=2)
```

	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
ART	0.99	0.087	0.098	-0.033	-0.055
N	0.76	0.632	0.077	0.123	0.038
PRT	0.96	0.245	0.101	0.029	-0.034
ARM	0.90	-0.394	0.163	0.019	0.037
PRM	0.91	-0.350	0.175	0.070	0.042
ARTG	0.97	-0.068	-0.111	-0.042	-0.174
NG	0.95	0.096	-0.091	-0.227	0.159
PRTG	0.99	-0.012	-0.103	-0.112	-0.055
RAAR	0.92	-0.152	-0.285	0.215	0.063

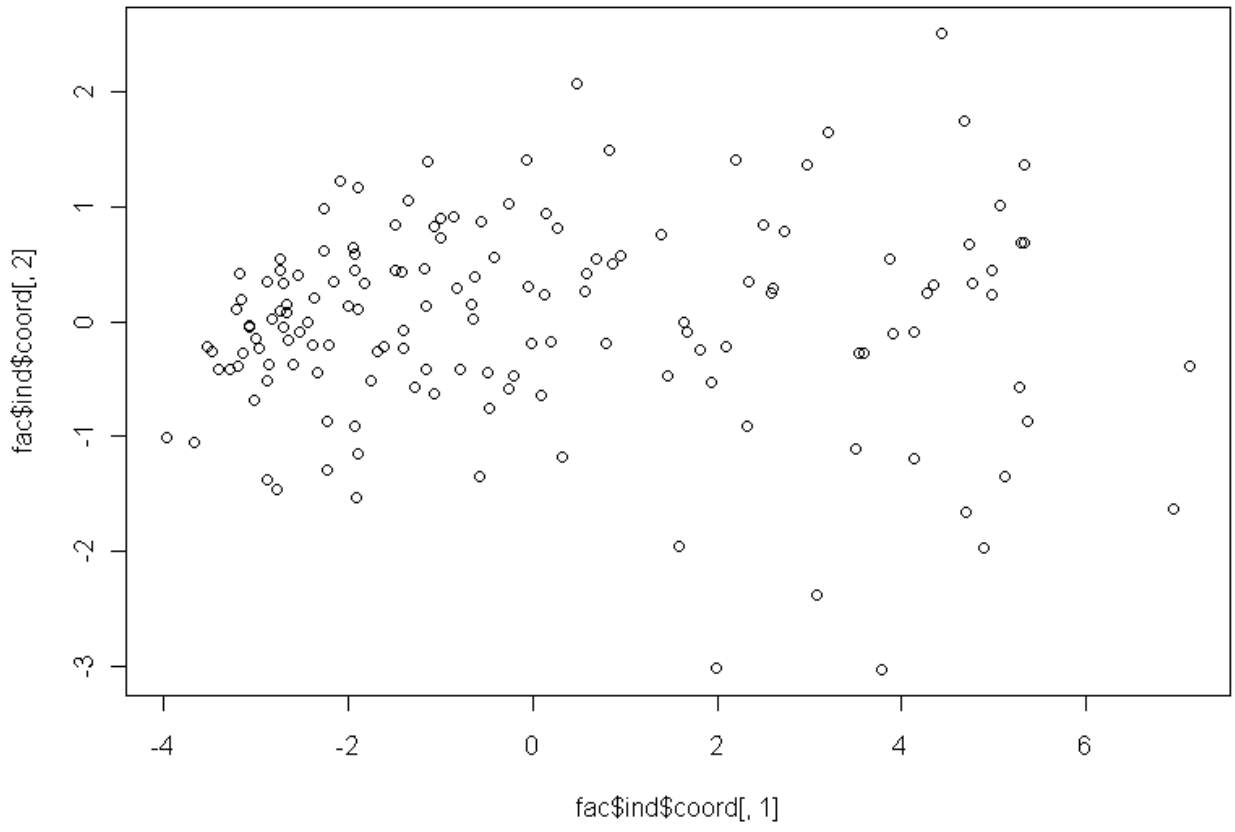
```
print(fac$ind$coord[1:10,],digits=2)
```

```
   Dim.1 Dim.2  Dim.3  Dim.4  Dim.5
1   -3.2 -0.38 -0.531 -0.345 -0.151
2   -3.5 -0.21 -0.266 -0.485 -0.336
3   -2.9 -1.38 -0.222 -0.490  0.094
4   -2.7  0.33 -0.461  0.011 -0.142
5   -1.9 -0.91 -0.438 -0.019  0.204
6   -3.2  0.20 -0.131 -0.411 -0.204
7   -2.4 -0.20  0.068 -0.045 -0.103
8   -2.7  0.45 -0.077 -0.122 -0.161
9   -2.4  0.20 -0.073 -0.126 -0.029
10  -3.0 -0.69 -0.271 -0.362 -0.113
```

```
print(korki[1:5,])
```

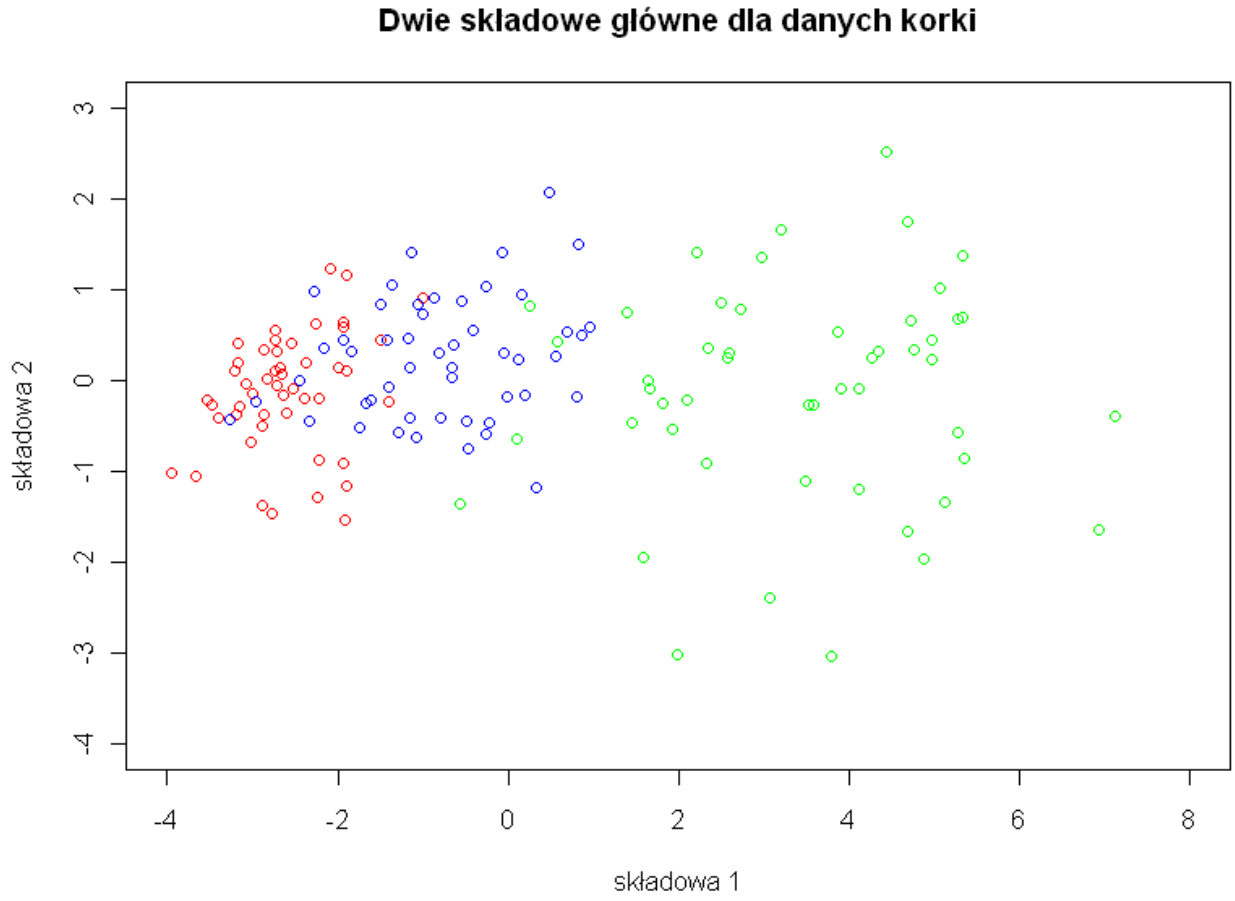
```
  C ART  N PRT  ARM  PRM ARTG NG PRTG  RAAR  RAN
1 1  81 41 250 1.98 6.10  9.0  1   12 11.11 2.44
2 1  80 42 238 1.91 5.67  0.0  0    0  0.00 0.00
3 1  81 26 196 3.12 7.54  9.8  2   15 12.04 6.73
4 1 125 63 368 1.98 5.84 20.0  1   18 16.00 1.59
5 1 146 45 350 3.24 7.78 42.8  3   43 29.28 6.11
```

```
plot(fac$ind$coord[,1],fac$ind$coord[,2])
```

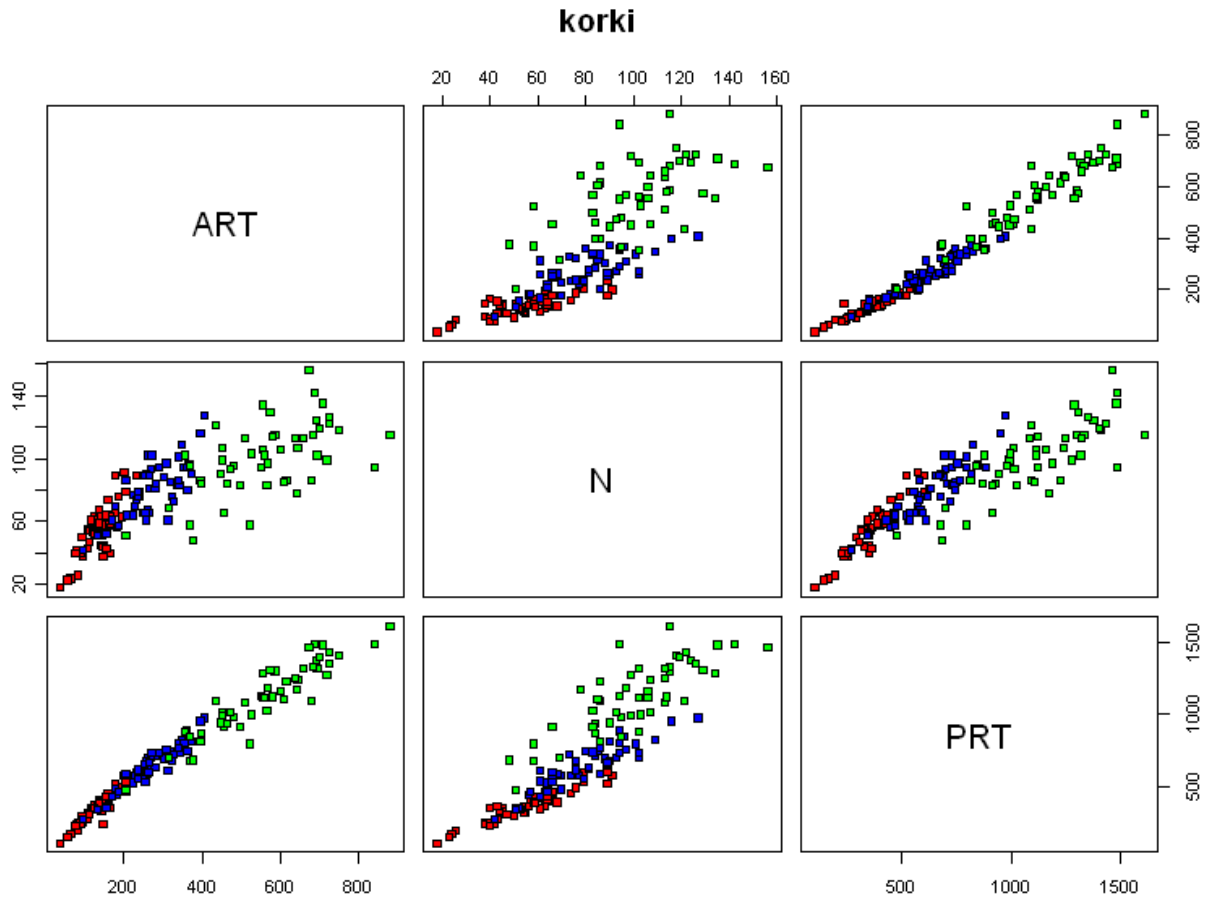


*

```
plot(fac$ind$coord[C==1,1],fac$ind$coord[C==1,2],col="red",xlim=c(-4,8),
     ylim=c(-4,3),xlab="składowa 1",ylab="składowa 2",
     main="Dwie składowe główne dla danych korki")
points(fac$ind$coord[C==2,1],fac$ind$coord[C==2,2],col="blue")
points(fac$ind$coord[C==3,1],fac$ind$coord[C==3,2],col="green")
```



```
pairs(korki[c("ART","N","PRT")], main="korki ", pch=22,
      bg=c("red", "blue","green")[unclass(korki$C)])
```




```
korki.flda <- lda(C ~ .,data=korki , CV=T)
ct <- table(korki$C, korki.flda$class)
```

```
    1  2  3
1 43  7  0
2  7 42  1
3  0  5 45
```

```
print(prop.table(ct),digits=2)
```

```
         1      2      3
1 0.2867 0.0467 0.0000
2 0.0467 0.2800 0.0067
3 0.0000 0.0333 0.3000
```

```
diag(prop.table(ct, 1))
   1    2    3
0.86 0.84 0.90
```

```
sum(diag(prop.table(ct)))
```

```
0.8666667
```

```
klas <- data.frame(korki$C,fac$ind$coord[,1],fac$ind$coord[,2])
colnames(klas) <- c("C","s1","s2")

korki.pclda1 <- lda(C ~ s1,data=klas , CV=T)
table(klas$C, korki.pclda1$class)
```

```
    1  2  3
1 47  3  0
2  9 41  0
3  0  4 46
```

```
sum(diag(prop.table(.)))
```

```
0.893333
```

```
# MDS
library("HSAUR2")
data(Forbes2000)
for10 <- Forbes2000[1:10,5:8]
```

sales	profits	assets	marketvalue

```
for10.sc <- scale(for10[1:4])
for10.dist <- as.matrix(dist(for10.sc,upper=T,diag=T))
rownames(for10.dist) <- Forbes2000$name[1:10]
colnames(for10.dist) <- Forbes2000$name[1:10]
for10.mds <- cmdscale(for10.dist,eig=T)
round(for10.mds$eig,2)
```

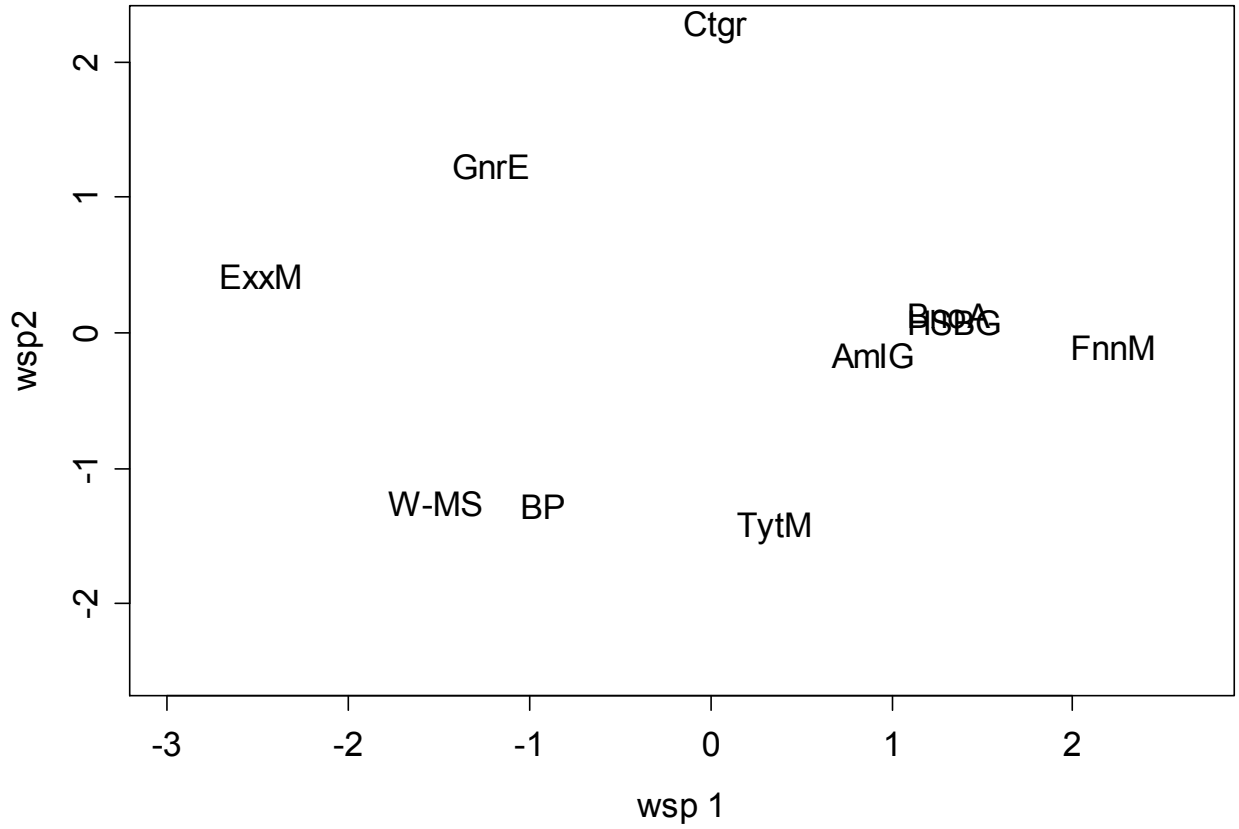
```
20.18 12.13  2.57  1.13  0.00  0.00  0.00  0.00  0.00  0.00
```

Czerwone – ujemne

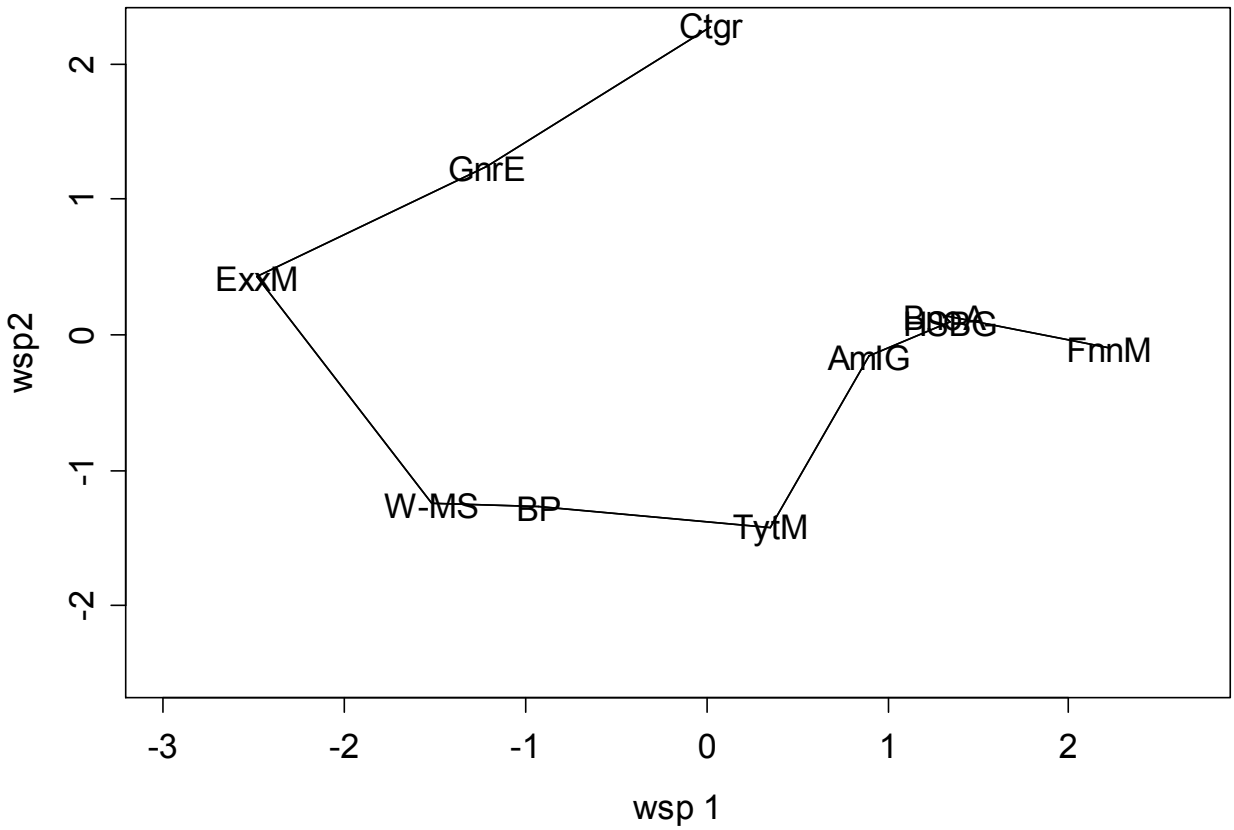
```
round(sum(abs(for10.mds$eig[1:2]))/sum(abs(for10.mds$eig)),4)
0.8974
```

Kryterium Mardii [HSAUR<304]: jeśli >0.8 dim=2=ok

```
x <- for10.mds$points[,1]
y <- for10.mds$points[,2]
plot(x,x,xlab="wsp 1",ylab="wsp2",xlim=range(x)*1.2,type="n")
(nm<-abbreviate(colnames(for10.dist)))
Citigroup    General Electric American Intl Group          ExxonMobil
   "Ctgr"             "GnrE"             "AmIG"             "ExxM"
       BP     Bank of America          HSBC Group       Toyota Motor
     "BP"             "BnoA"             "HSBG"             "TytM"
Fannie Mae     Wal-Mart Stores
    "FnnM"             "W-MS"

text(x,y,labels=nm)
```



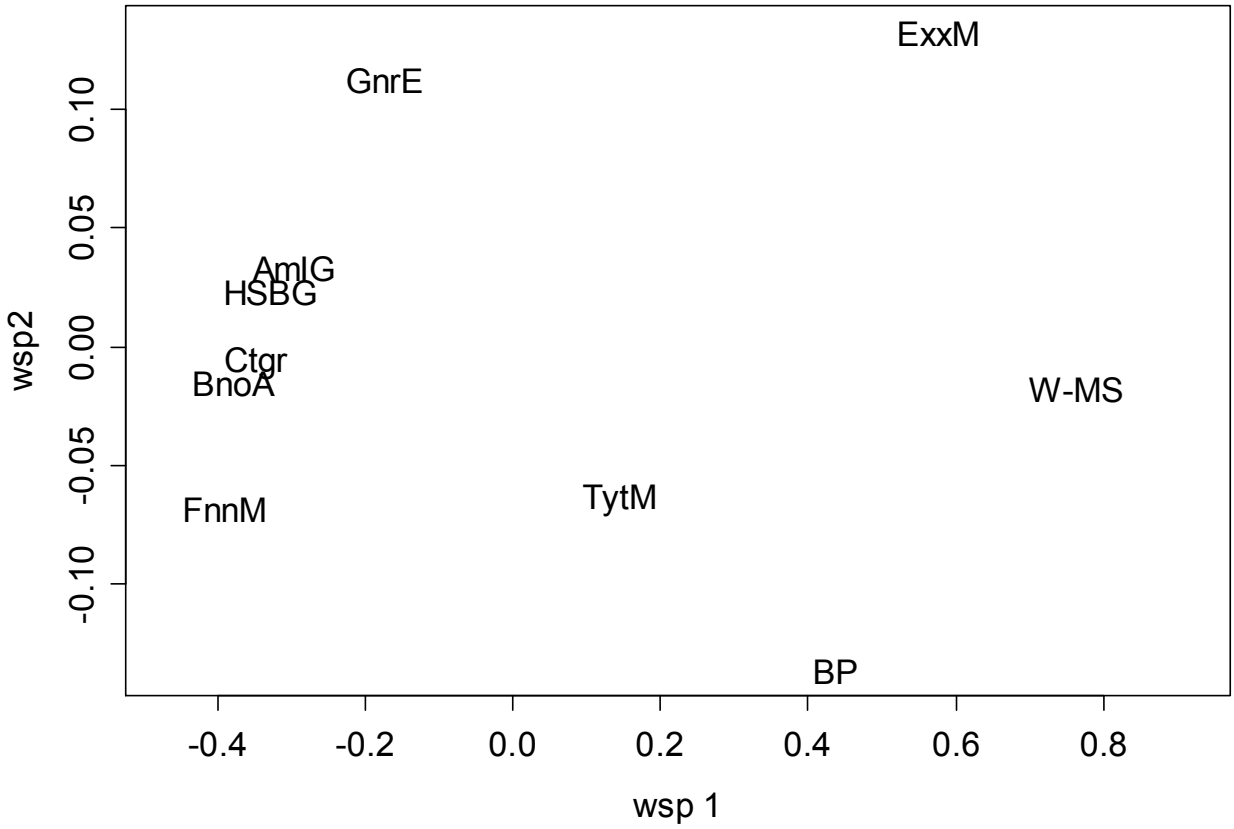
```
library("ape")
st <- mst(for10.dist) minimum spanning tree

plot(x,x,xlab="wsp 1",ylab="wsp2",xlim=range(x)*1.2,type="n")
for (i in 1:10) {
  w1 <- which(st[i,]==1)
  segments(x[i],y[i],x[w1],y[w1])
}
text(x,y,labels=nm)
```



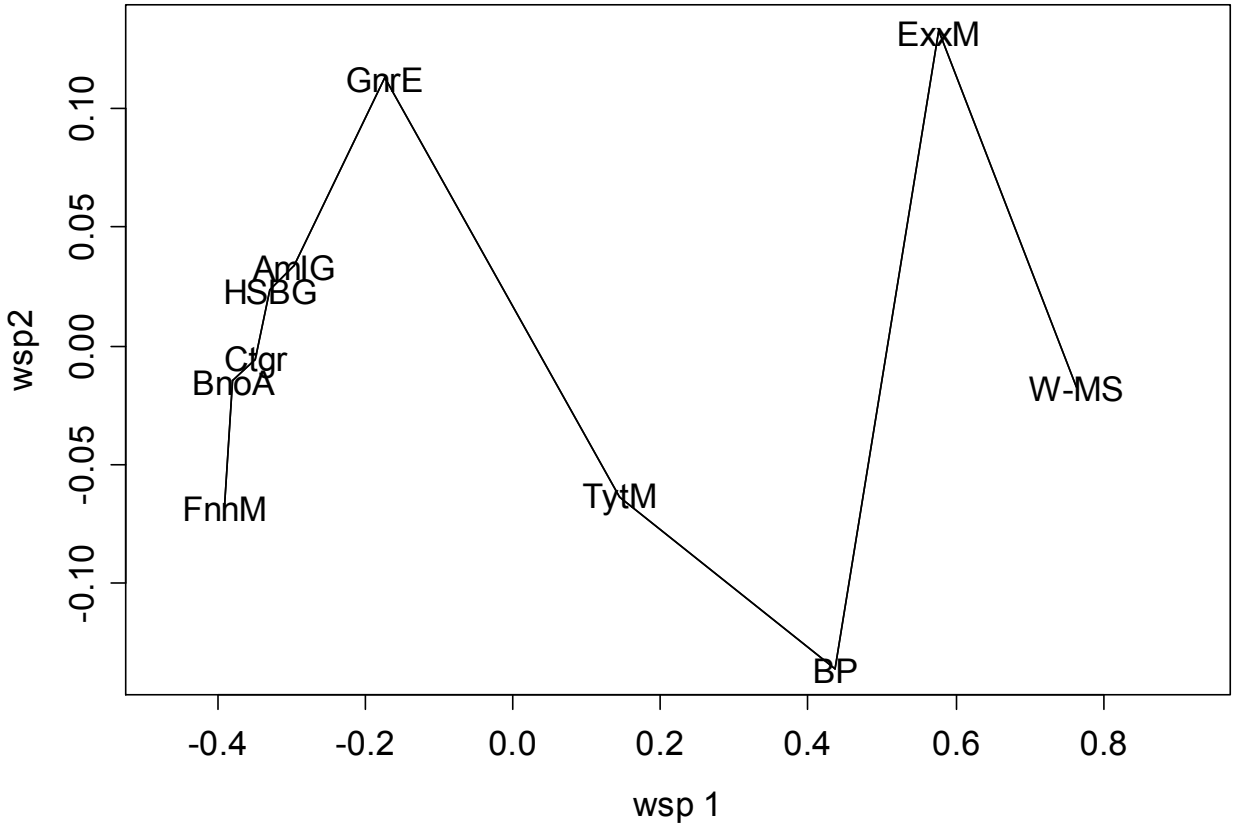

```
for10.cor <- cor(t(for10))
for10.dis <- 1-for10.cor

rownames(for10.dis) <- nm
colnames(for10.dis) <- nm
round(for10.dis,3)
```

	Ctgr	GnrE	AmIG	ExxM	BP	BnoA	HSBG	TytM	FnnM	W-MS
Ctgr	0.000	0.055	0.005	0.882	0.708	0.001	0.001	0.316	0.007	1.152
GnrE	0.055	0.000	0.027	0.594	0.537	0.069	0.044	0.205	0.099	0.887
AmIG	0.005	0.027	0.000	0.788	0.647	0.010	0.003	0.270	0.024	1.068
ExxM	0.882	0.594	0.788	0.000	0.129	0.915	0.860	0.271	0.971	0.060
BP	0.708	0.537	0.647	0.129	0.000	0.726	0.708	0.103	0.750	0.135
BnoA	0.001	0.069	0.010	0.915	0.726	0.000	0.004	0.331	0.003	1.179
HSBG	0.001	0.044	0.003	0.860	0.708	0.004	0.000	0.315	0.013	1.139
TytM	0.316	0.205	0.270	0.271	0.103	0.331	0.315	0.000	0.353	0.405
FnnM	0.007	0.099	0.024	0.971	0.750	0.003	0.013	0.353	0.000	1.220
W-MS	1.152	0.887	1.068	0.060	0.135	1.179	1.139	0.405	1.220	0.000

```
for10.nmds <- isoMDS(for10.dis) monotonic scaling
x <- for10.nmds$points[,1]
y <- for10.nmds$points[,2]
plot(x,y,xlab="wsp 1",ylab="wsp2",xlim=range(x)*1.2,type="n")
text(x,y,labels=nm)
```

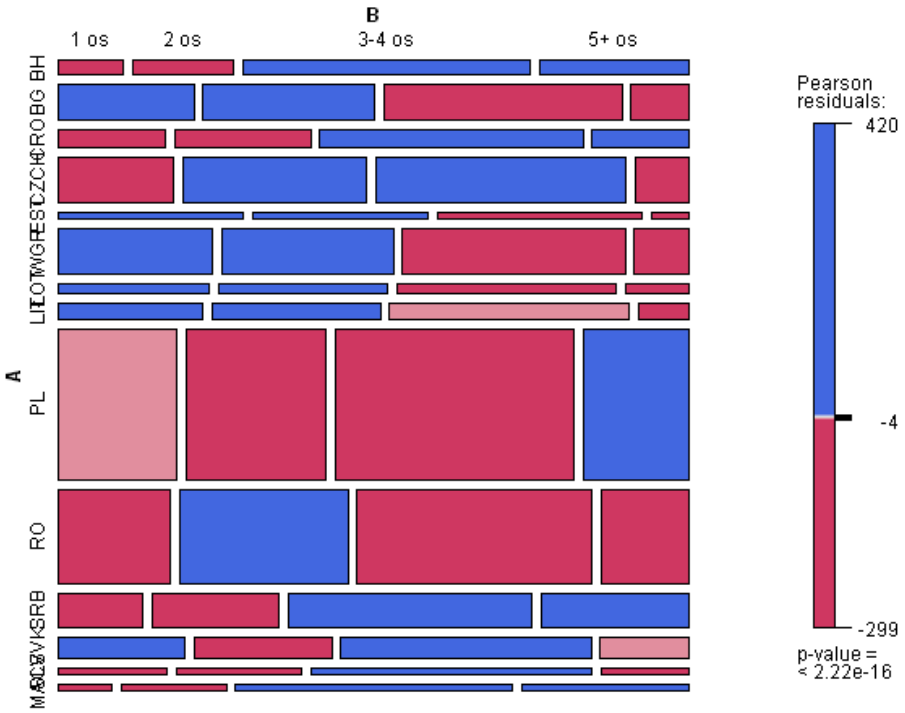


```
st <- mst(for10.dis)
plot(x,y,xlab="wsp 1",ylab="wsp2",xlim=range(x)*1.2,type="n")
for (i in 1:10) {
  w1 <- which(st[i,]==1)
  segments(x[i],y[i],x[w1],y[w1])
}
text(x,y,labels=nm)
```



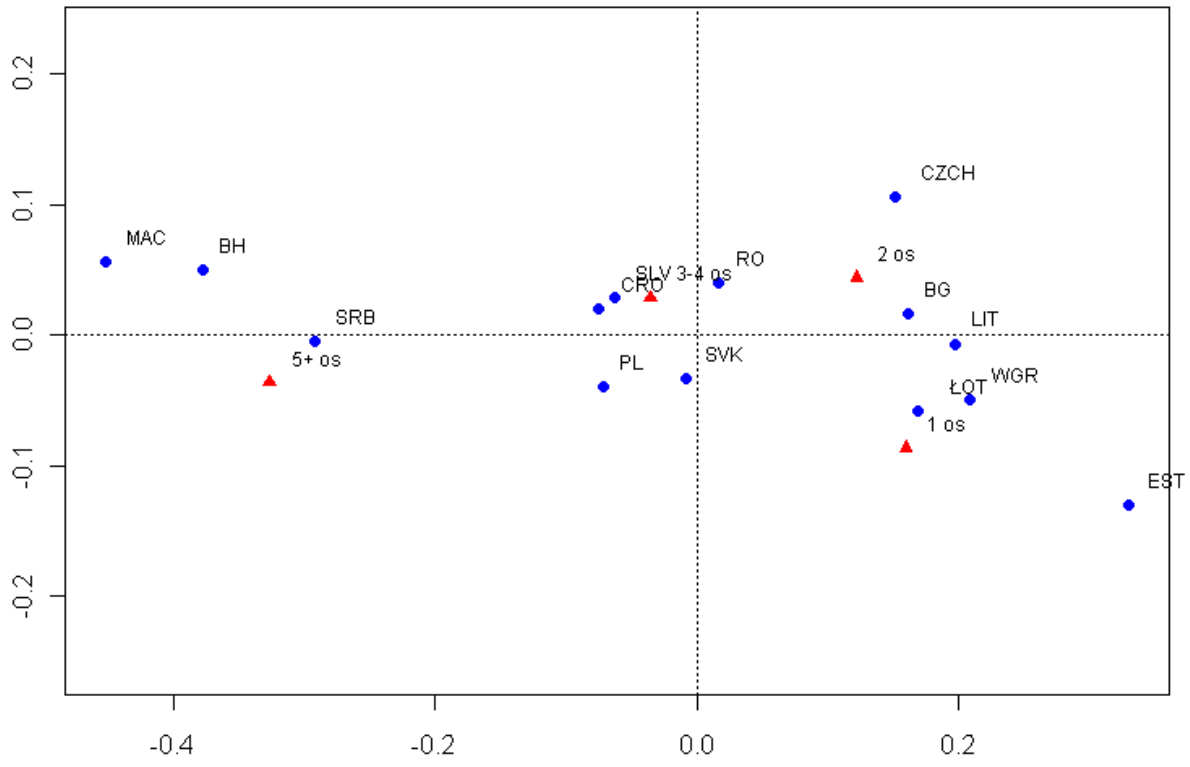
```
# CA
mieszk <- read.csv2("mieszkania Eurostat.csv")
izby <- read.csv2("izby.csv",header=F)
izby <- as.matrix(izby)
panstwa <- c("BH","BG","CRO","CZCH","EST","WGR","ŁOT","LIT","PL","RO","SRB",
             "SVK","SLV","MAC")
colnames(izby) <- c("1 os","2 os","3-4 os","5+ os")
rownames(izby) <- panstwa

round(prop.table(izby, 1),3) # row percentages
      1 os  2 os 3-4 os 5+ os
BH   0.108 0.167  0.478 0.247
BG   0.225 0.286  0.394 0.095
CRO  0.178 0.225  0.437 0.160
CZCH 0.192 0.303  0.416 0.088
EST  0.308 0.290  0.341 0.062
WGR  0.256 0.285  0.369 0.090
ŁOT  0.250 0.280  0.365 0.105
LIT  0.241 0.278  0.398 0.083
PL   0.197 0.231  0.398 0.174
RO   0.185 0.279  0.390 0.145
SRB  0.139 0.210  0.406 0.244
SVK  0.209 0.229  0.415 0.147
SLV  0.180 0.209  0.465 0.146
MAC  0.089 0.174  0.459 0.278

round(prop.table(izby, 2),3) # column percentages
      1 os  2 os 3-4 os 5+ os
BH   0.016 0.019  0.034 0.048
BG   0.080 0.079  0.069 0.045
CRO  0.033 0.033  0.040 0.040
CZCH 0.086 0.106  0.092 0.053
EST  0.021 0.015  0.012 0.006
WGR  0.118 0.103  0.084 0.056
ŁOT  0.024 0.021  0.017 0.014
LIT  0.039 0.035  0.032 0.018
PL   0.297 0.271  0.296 0.350
RO   0.174 0.204  0.180 0.181
SRB  0.047 0.055  0.068 0.110
SVK  0.045 0.038  0.044 0.042
SLV  0.014 0.013  0.018 0.015
MAC  0.005 0.008  0.014 0.022
```

```
library("vcd")
mosaic(izby,shade=T)
```

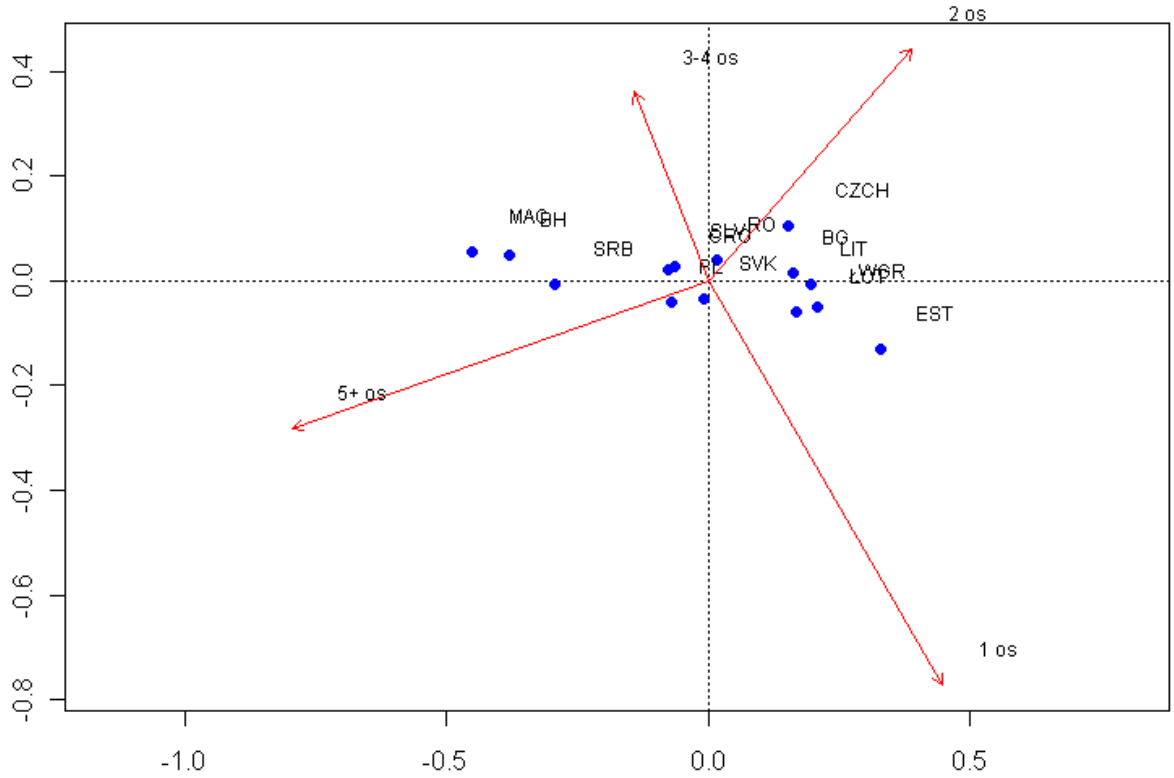



```
library("ca")
izby.ca <- ca(izby)

print(izby.ca)
Principal inertias (eigenvalues):
           1        2        3
Value      0.025236 0.002478 0.001181
Percentage 87.34%   8.58%    4.09%


 Rows:
                BH       BG       CRO      CZCH       EST       WGR       ŁOT
Mass     0.028759 0.070457  0.036794 0.088906  0.013558  0.091425  0.019128
ChiDist  0.389146 0.162888  0.097342 0.185628  0.354846  0.214562  0.179981
Inertia  0.004355 0.001869  0.000349 0.003064  0.001707  0.004209  0.000620
Dim. 1  -2.382192 1.018201 -0.470448 0.958430  2.079072  1.314085  1.066851
Dim. 2   1.010893 0.323511  0.408701 2.119837 -2.606029 -0.993995 -1.165329
               LIT        PL       RO       SRB       SVK       SLV       MAC
Mass     0.031690  0.297864 0.185078  0.066766  0.042365  0.015249  0.011961
ChiDist  0.201388  0.081524 0.060350  0.295926  0.060208  0.140845  0.455433
Inertia  0.001285  0.001980 0.000674  0.005847  0.000154  0.000303  0.002481
Dim. 1   1.241613 -0.447794 0.104331 -1.839207 -0.054956 -0.393092 -2.844225
Dim. 2  -0.134973 -0.799942 0.800366 -0.101343 -0.661003  0.583213  1.122316


 Columns:
            1 os     2 os     3-4 os     5+ os
Mass     0.197493 0.253858  0.400653  0.147996
ChiDist  0.181890 0.137008  0.058192  0.331254
Inertia  0.006534 0.004765  0.001357  0.016239
Dim. 1   1.006752 0.770964 -0.223243 -2.061540
Dim. 2  -1.734829 0.878745  0.569413 -0.733782
```

```
summary(izby.ca)
Principal inertias (eigenvalues):

 dim    value      %    cum%   scree plot
 1      0.025236  87.3  87.3   *************************
 2      0.002478   8.6  95.9   *
 3      0.001181   4.1 100.0
        -------- -----
 Total: 0.028895 100.0


Rows:
     name   mass  qlt  inr    k=1 cor ctr    k=2 cor ctr
1  |   BH |   29  962  151 | -378 946 163 |   50  17  29 |
2  |   BG |   70  996   65 |  162 986  73 |   16  10   7 |
3  |  CRO |   37  633   12 |  -75 589   8 |   20  44   6 |
4  | CZCH |   89  996  106 |  152 673  82 |  106 323 400 |
5  |  EST |   14 1000   59 |  330 866  59 | -130 134  92 |
6  |  WGR |   91 1000  146 |  209 947 158 |  -49  53  90 |
7  |   OT |   19  991   21 |  169 887  22 |  -58 104  26 |
8  |  LIT |   32  960   44 |  197 959  49 |   -7   1   1 |
9  |   PL |  298 1000   69 |  -71 761  60 |  -40 239 191 |
10 |   RO |  185  511   23 |   17  75   2 |   40 436 119 |
11 |  SRB |   67  975  202 | -292 975 226 |   -5   0   1 |
12 |  SVK |   42  320    5 |   -9  21   0 |  -33 299  19 |
13 |  SLV |   15  239   10 |  -62 197   2 |   29  42   5 |
14 |  MAC |   12  999   86 | -452 984  97 |   56  15  15 |

Columns:
    name   mass  qlt  inr    k=1 cor ctr    k=2 cor ctr
1 |  1os |  197  999  226 |  160 773 200 |  -86 225 594 |
2 |  2os |  254  901  165 |  122 799 151 |   44 102 196 |
3 | 34os |  401  609   47 |  -35 371  20 |   28 237 130 |
4 |  5os |  148  990  562 | -327 977 629 |  -37  12  80 |

plot(izby.ca)
```



```
plot(izby.ca,map ="rowgreen", arrows = c(FALSE, TRUE)) # asymmetric map
```



```
plot(izby.ca,map ="colgreen", arrows = c(TRUE,FALSE)) # asymmetric map
```