analisis factorial

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#Activar librerias

```
library(polycor)
```

```
## Warning: package 'polycor' was built under R version 4.1.3
```

```
library(psych)
```

```
## Warning: package 'psych' was built under R version 4.1.3
```

```
##
## Attaching package: 'psych'
```

```
## The following object is masked from 'package:polycor':
##
##     polyserial
```

```
library(ggcorrplot)
```

```
## Warning: package 'ggcorrplot' was built under R version 4.1.3
```

```
## Loading required package: ggplot2
```

```
##
## Attaching package: 'ggplot2'
```

```
## The following objects are masked from 'package:psych':
##
##     %+%, alpha
```

#Extracion de los datos

```
x<-bfi
```

#Exploracion de la matriz dimension y tipos de variables

```
dim(x)
```

```
## [1] 2800   28
```

```
str(x)
```

```
## 'data.frame':    2800 obs. of  28 variables:
##  $ A1       : int  2 2 5 4 2 6 2 4 4 2 ...
##  $ A2       : int  4 4 4 4 3 6 5 3 3 5 ...
##  $ A3       : int  3 5 5 6 3 5 5 1 6 6 ...
##  $ A4       : int  4 2 4 5 4 6 3 5 3 6 ...
##  $ A5       : int  4 5 4 5 5 5 5 1 3 5 ...
##  $ C1       : int  2 5 4 4 4 6 5 3 6 6 ...
##  $ C2       : int  3 4 5 4 4 6 4 2 6 5 ...
##  $ C3       : int  3 4 4 3 5 6 4 4 3 6 ...
##  $ C4       : int  4 3 2 5 3 1 2 2 4 2 ...
##  $ C5       : int  4 4 5 5 2 3 3 4 5 1 ...
##  $ E1       : int  3 1 2 5 2 2 4 3 5 2 ...
##  $ E2       : int  3 1 4 3 2 1 3 6 3 2 ...
##  $ E3       : int  3 6 4 4 5 6 4 4 NA 4 ...
##  $ E4       : int  4 4 4 4 4 5 5 2 4 5 ...
##  $ E5       : int  4 3 5 4 5 6 5 1 3 5 ...
##  $ N1       : int  3 3 4 2 2 3 1 6 5 5 ...
##  $ N2       : int  4 3 5 5 3 5 2 3 5 5 ...
##  $ N3       : int  2 3 4 2 4 2 2 2 2 5 ...
##  $ N4       : int  2 5 2 4 4 2 1 6 3 2 ...
##  $ N5       : int  3 5 3 1 3 3 1 4 3 4 ...
##  $ O1       : int  3 4 4 3 3 4 5 3 6 5 ...
##  $ O2       : int  6 2 2 3 3 3 2 2 6 1 ...
##  $ O3       : int  3 4 5 4 4 5 5 4 6 5 ...
##  $ O4       : int  4 3 5 3 3 6 6 5 6 5 ...
##  $ O5       : int  3 3 2 5 3 1 1 3 1 2 ...
##  $ gender   : int  1 2 2 2 1 2 1 1 1 2 ...
##  $ education: int  NA NA NA NA NA 3 NA 2 1 NA ...
##  $ age      : int  16 18 17 17 17 21 18 19 19 17 ...
```

nombre de las variables

```
colnames(x)
```

```
##  [1] "A1"        "A2"        "A3"        "A4"        "A5"        "C1"
##  [7] "C2"        "C3"        "C4"        "C5"        "E1"        "E2"
## [13] "E3"        "E4"        "E5"        "N1"        "N2"        "N3"
## [19] "N4"        "N5"        "O1"        "O2"        "O3"        "O4"
## [25] "O5"        "gender"    "education" "age"
```

creacion de una matriz de datos en donde se incluyen las variables 1 a la 25 y las primeras 200 observaciones

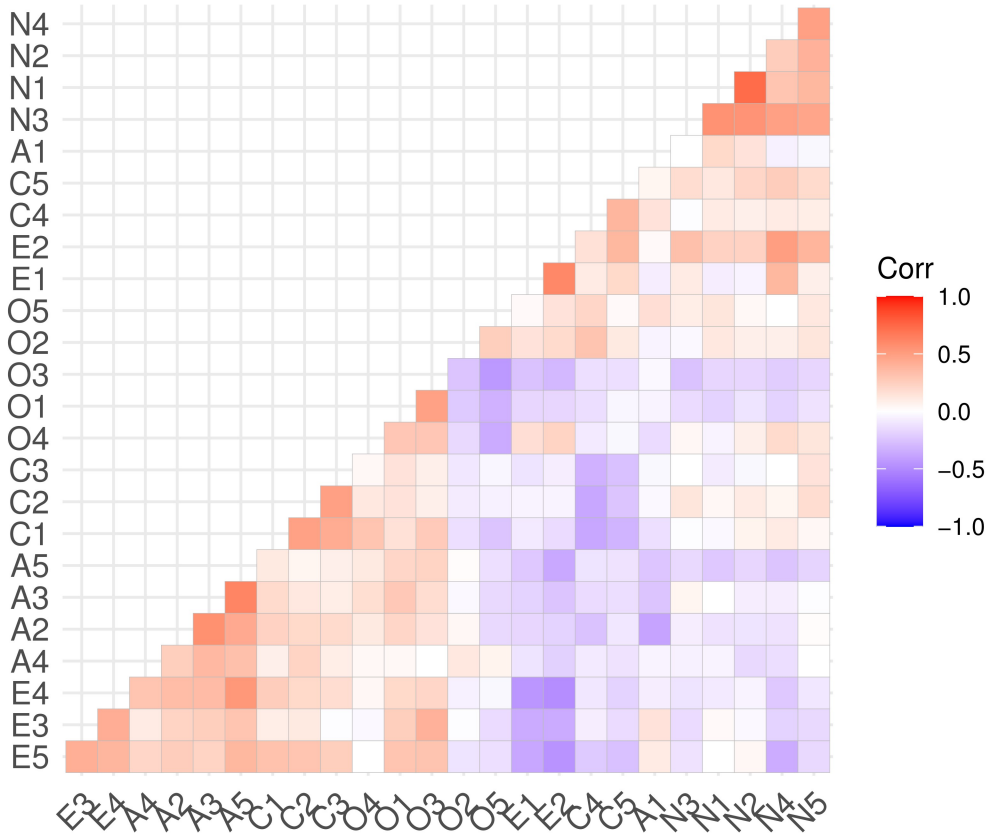
```
x1<-bfi[1:200,1:25]
```

#Matriz de correlaciones

```
R<-hetcor(x1)$correlations
```

#graficao de corelaciones

```
ggcorrplot(R,type="lower",hc.order=TRUE)
```



#factor de correlaciones se utiliza la prueba de esfericidad de Bartlett

```
p_Bartlett<-cortest.bartlett(R)
```

```
## Warning in cortest.bartlett(R): n not specified, 100 used
```

visualizacion del P-valor

```
p_Bartlett$p.value
```

```
## [1] 5.931663e-60
```

HO=LAS VARIABLES ESTAN CORRELACIONASDAS. Ha=LAS VARIABLES NO CORRELACION. NO RECHAZO HO, YA QUE NO ESTAN CORRELACIONADAS.

##CRITERIO KAISER-MEYER-OLKIN ME PERMITE IDENTIFICAR SI LOS DATOS QUE VOY A ANALISAR SON ADECUADOS PARA UN ANALISIS FACTORIAL

```
KMO(R)
```

```
## Kaiser-Meyer-Olkin factor adequacy
## Call: KMO(r = R)
## Overall MSA =  0.76
## MSA for each item =
##   A1   A2   A3   A4   A5   C1   C2   C3   C4   C5   E1   E2   E3   E4   E5   N1
## 0.66 0.77 0.69 0.73 0.75 0.74 0.79 0.76 0.76 0.74 0.80 0.81 0.79 0.81 0.83 0.70
##   N2   N3   N4   N5   O1   O2   O3   O4   O5
## 0.67 0.82 0.79 0.82 0.79 0.65 0.81 0.62 0.77
```

#EXTRAER FACTORES minres: minimo residuo mle:max verosimilitud paf:ejes principales alpha:alfa minchi:minimos cuadrados minrak: rango minimo

```
modelo1<-fa(R,nfactor=3, rotate="none",fm="mle")
```

```
modelo2<-fa(R,nfactor=3, rotate="none",fm="minres")
```

extraer el resultado de las comunidalidades, ahi se encuentra la proporcion varianza explicada. Se interpreta de tal forma que numero cercano a 1, el factor explica mejor la variable.

```
C1<-sort(modelo1$communality, decreasing = TRUE)
```

```
C2<-sort(modelo2$communality, decreasing = TRUE)
```

```
head(cbind(C1,C2))
```

```
##           C1        C2
## N1 0.7576920 0.6809294
## E2 0.6802809 0.6564523
## N2 0.6797943 0.5866483
## E1 0.5219674 0.5394762
## N3 0.5198285 0.4942059
## N4 0.4839516 0.4744005
```

Estraccion de unicidades La unicidad es el cuadrado del coeficiente del factor unico, y se expresa como la porcion de la varianza explicada por el factor unico. Es decir, no puede ser explicada por otros factores.

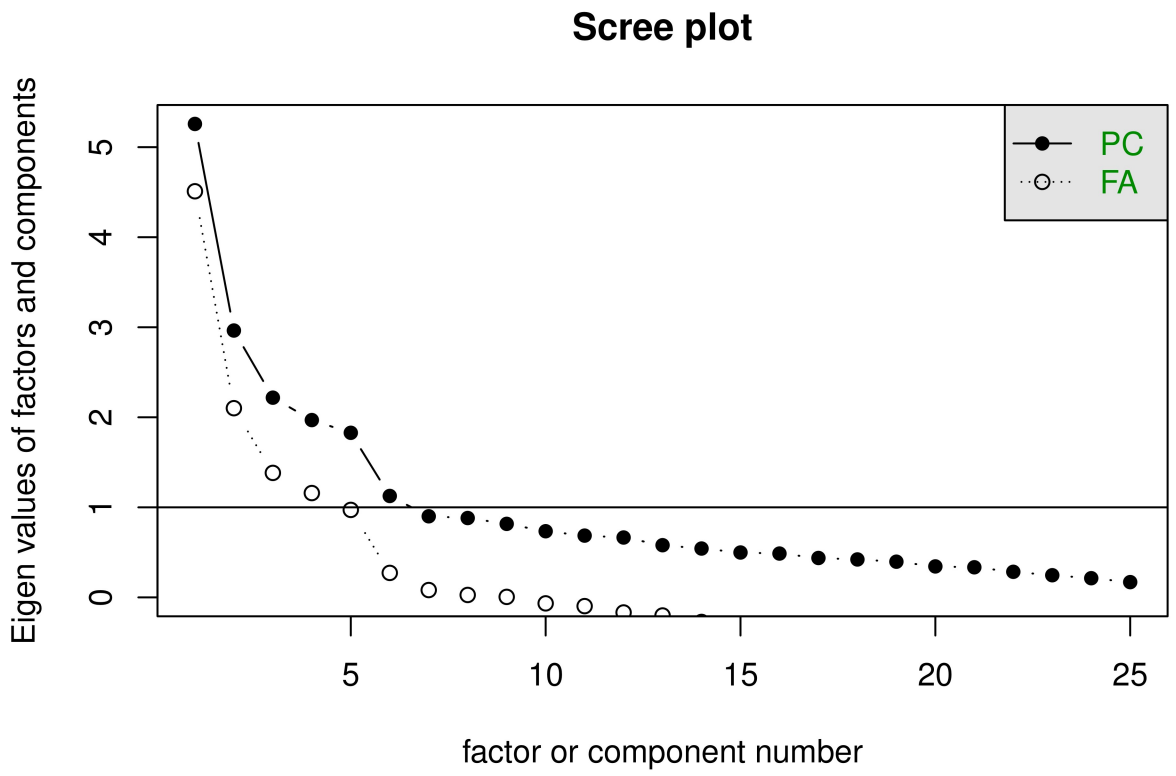
```
u1<-sort(modelo1$uniquenesses, decreasing = TRUE)
```

```
u2<-sort(modelo2$uniquenesses, decreasing = TRUE)
```

```
head(cbind(u1,u2))
```

```
##           u1        u2
## O2 0.9460554 0.9293483
## A4 0.8928892 0.8908844
## A1 0.8607240 0.8822080
## O5 0.8533481 0.8272041
## C5 0.8136600 0.7931685
## O1 0.7986908 0.7904667
```

```
scree(R)
```

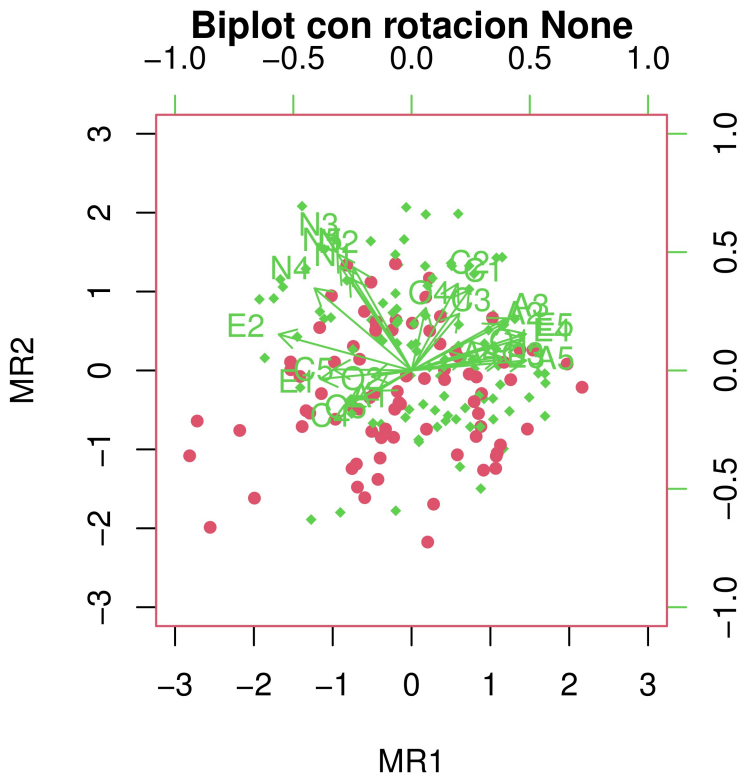


#rotacion de la matriz

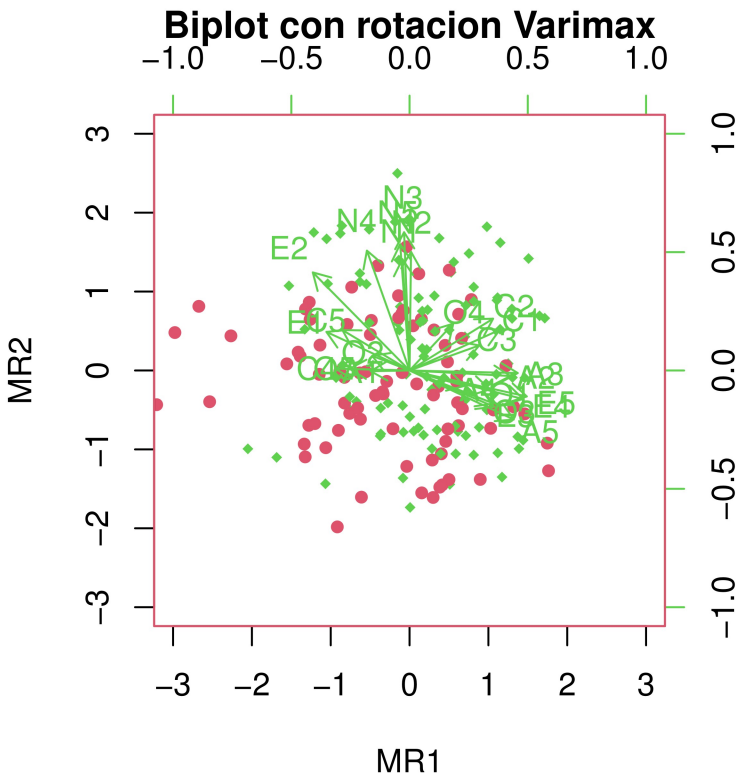
```
library(GPArotation)
```

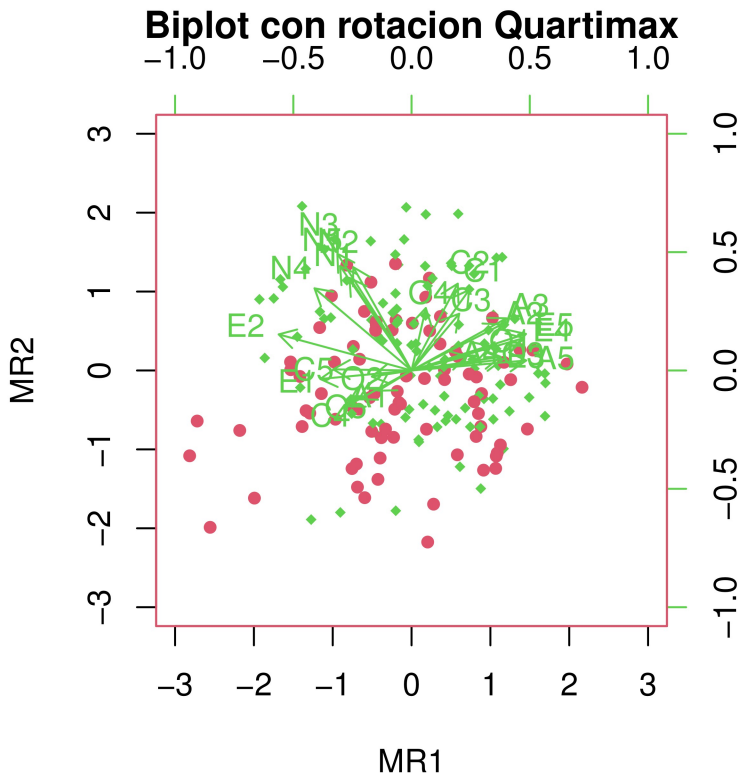
```
rot<-c("None","Varimax","Quartimax","Promax")
bi_mod<-function(tipo){
  biplot.psych(fa(x1,nfactors=2,
  fm="minres",rotate=tipo),
  main=paste("Biplot con rotacion", tipo),
  col=c(2,3,4),pch=c(21,18),group=bfi[,"gender"])
}
sapply(rot,bi_mod)
```

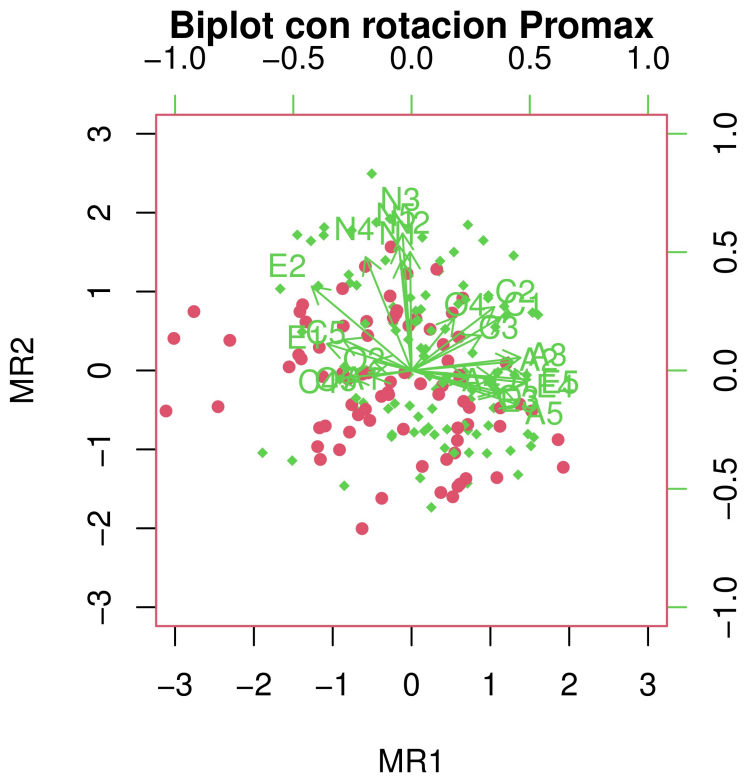
```
## Specified rotation not found, rotate='none' used
```




```
## Specified rotation not found, rotate='none' used
```


Biplot con rotacion Varimax
−1.0
−0.5
0.0
0.5
1.0
3
2
1
0
−1
−2
−3
MR2
MR1
N3
N4
E2
C2
C1
C3
A5


Biplot con rotacion Quartimax
−1.0
−0.5
0.0
0.5
1.0
3
2
1
0
−1
−2
−3
MR2
N3
N4
E2
C2
C1
A3
A2
E4
E5
A5
C5
C4
C3
−3
−2
−1
0
1
2
3
MR1

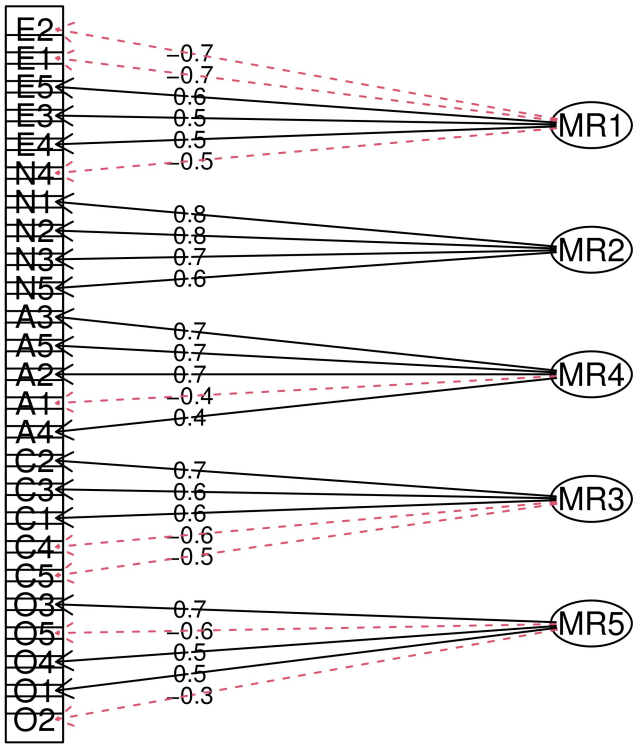



```
## $None
## NULL
##
## $Varimax
## NULL
##
## $Quartimax
## NULL
##
## $Promax
## NULL
```

#INTERPRETACION

para esto se utiliza el grafico de arbol.

```
modelo_varimax<- fa(R,nfactor=5,
                    rotate="varimax",
                    fm="minres")
fa.diagram(modelo_varimax)
```



visualizacion de la matriz de carga Rotada

```
print(modelo_varimax$loadings,cut=0)
```

```
##
## Loadings:
##    MR1    MR2    MR4    MR3    MR5
## A1  0.234  0.106 -0.422 -0.072 -0.092
## A2  0.112 -0.032  0.653  0.190  0.113
## A3  0.198  0.066  0.744  0.051  0.169
## A4  0.163 -0.048  0.413  0.137 -0.142
## A5  0.328 -0.154  0.692 -0.009  0.115
## C1  0.054  0.089  0.140  0.634  0.287
## C2  0.052  0.174  0.114  0.690  0.050
## C3  0.032  0.018  0.076  0.642  0.016
## C4 -0.058  0.087 -0.090 -0.559 -0.159
## C5 -0.241  0.228 -0.040 -0.459  0.014
## E1 -0.691 -0.006 -0.066 -0.084 -0.017
## E2 -0.713  0.345 -0.138 -0.133 -0.025
## E3  0.546  0.003  0.157 -0.008  0.221
## E4  0.522 -0.027  0.416  0.167  0.048
## E5  0.588 -0.009  0.148  0.308  0.159
## N1  0.131  0.802 -0.150 -0.074 -0.133
## N2  0.088  0.800 -0.151 -0.038 -0.008
## N3 -0.183  0.701  0.005  0.037 -0.087
## N4 -0.513  0.491 -0.006  0.004  0.034
```

```
## N5 -0.274  0.571  0.059  0.096 -0.082
## O1  0.203 -0.107  0.148  0.076  0.535
## O2 -0.099  0.096  0.144 -0.191 -0.330
## O3  0.326 -0.159  0.034  0.062  0.680
## O4 -0.240  0.122  0.169  0.105  0.548
## O5 -0.004  0.061 -0.074 -0.077 -0.636
##
##                  MR1   MR2   MR4   MR3   MR5
## SS loadings    2.823 2.667 2.223 2.103 1.867
## Proportion Var 0.113 0.107 0.089 0.084 0.075
## Cumulative Var 0.113 0.220 0.309 0.393 0.467
```