Exercise3.R

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### Exercise 3  
  
remove(list = ls())  
  
euro = read.table(file = "Europe.txt", header = T, dec =".")  
attach(euro)  
europe = data.frame(CPI, UNE, INP, BOP, PRC, UN)  
europe = na.omit(europe)  
ls(europe)

## [1] "BOP" "CPI" "INP" "PRC" "UN" "UNE"

X = scale(europe, center = T, scale = T)  
R = cor(europe)  
E = eigen(R)$vectors  
  
# i)  
A1hat = X%\*%E[,1]%\*%t(E[,1])  
head(A1hat,5)

## [,1] [,2] [,3] [,4] [,5] [,6]  
## 1 -0.5660436 -0.4131536 -0.3217987 0.4032920 0.6883677 -0.02347820  
## 2 1.0154376 0.7411651 0.5772815 -0.7234740 -1.2348774 0.04211804  
## 3 0.2549705 0.1861023 0.1449520 -0.1816601 -0.3100706 0.01057559  
## 4 -1.0526220 -0.7683059 -0.5984211 0.7499670 1.2800975 -0.04366036  
## 5 -0.6885770 -0.5025904 -0.3914596 0.4905940 0.8373810 -0.02856060

AE1 = (dim(X)[1]-1)\*sum(eigen(R)$values[2:6])  
AE1

## [1] 97.11576

# ii)  
A2hat = X%\*%E[,1:2]%\*%t(E[,1:2])  
head(A2hat, 5)

## [,1] [,2] [,3] [,4] [,5] [,6]  
## 1 -0.3242375 -0.89125343 0.43842950 1.10504305 0.5172357 -0.82318795  
## 2 0.9231616 0.92361347 0.28716965 -0.99127032 -1.1695714 0.34729651  
## 3 0.3139868 0.06941505 0.33049678 -0.01038758 -0.3518378 -0.18460519  
## 4 -1.0729105 -0.72819144 -0.66220720 0.69108732 1.2944562 0.02343844  
## 5 -0.5872209 -0.70299193 -0.07280039 0.78474171 0.7656489 -0.36376896

AE2 = (dim(X)[1]-1)\*sum(eigen(R)$values[3:6])  
AE2

## [1] 57.18878

# iii)  
A3hat = X%\*%E[,1:3]%\*%t(E[,1:3])  
head(A3hat, 5)

## [,1] [,2] [,3] [,4] [,5] [,6]  
## 1 -0.3856722 -1.1109001 0.5970611 1.0433610 0.4527950 -0.5999865  
## 2 0.7990121 0.4797432 0.6077384 -1.1159197 -1.2997955 0.7983505  
## 3 0.1447466 -0.5356673 0.7674949 -0.1803092 -0.5293588 0.4302699  
## 4 -1.0107256 -0.5058625 -0.8227760 0.7535226 1.3596837 -0.2024887  
## 5 -0.6380826 -0.8848371 0.0585305 0.7336752 0.7122985 -0.1789808

AE3 = (dim(X)[1]-1)\*sum(eigen(R)$values[4:6])  
AE3

## [1] 33.29049