# d)  
euro = read.table(file = "Europe.txt", header = T, dec =".")  
attach(euro)  
europe = data.frame(euro)  
europe = na.omit(europe)  
Country = ï..Country  
numbers = cbind(CPI, UNE, INP, BOP, PRC, UN)  
S = cov(numbers)  
  
R = cor(numbers)  
  
Ehat = eigen(R)$vectors  
Lamhat = eigen(R)$values  
Lam = diag(x = c(Lamhat),nrow = 6, ncol = 6)  
round(Lam, digits = 4)

## [,1] [,2] [,3] [,4] [,5] [,6]  
## [1,] 2.2648 0.0000 0.0000 0.0000 0.0000 0.000  
## [2,] 0.0000 1.5357 0.0000 0.0000 0.0000 0.000  
## [3,] 0.0000 0.0000 0.9192 0.0000 0.0000 0.000  
## [4,] 0.0000 0.0000 0.0000 0.7077 0.0000 0.000  
## [5,] 0.0000 0.0000 0.0000 0.0000 0.4418 0.000  
## [6,] 0.0000 0.0000 0.0000 0.0000 0.0000 0.131

Lamhatsqu = sqrt(Lam)  
round(Lamhatsqu, digits = 4)

## [,1] [,2] [,3] [,4] [,5] [,6]  
## [1,] 1.5049 0.0000 0.0000 0.0000 0.0000 0.0000  
## [2,] 0.0000 1.2392 0.0000 0.0000 0.0000 0.0000  
## [3,] 0.0000 0.0000 0.9587 0.0000 0.0000 0.0000  
## [4,] 0.0000 0.0000 0.0000 0.8412 0.0000 0.0000  
## [5,] 0.0000 0.0000 0.0000 0.0000 0.6647 0.0000  
## [6,] 0.0000 0.0000 0.0000 0.0000 0.0000 0.3619

ltil = Ehat%\*%Lamhatsqu  
Ltil = round(ltil, digits = 4)  
  
c = diag(1-((Ltil[,1])^2+(Ltil[,2])^2),6,6)  
round(R-Ltil[,1:2]%\*%t(Ltil[,1:2])-c, digits = 4)

## CPI UNE INP BOP PRC UN  
## CPI 0.0000 -0.0534 -0.2626 0.1823 0.0414 0.0442  
## UNE -0.0534 0.0000 -0.0733 0.1570 0.1280 -0.2820  
## INP -0.2626 -0.0733 0.0000 -0.1256 -0.0054 0.2085  
## BOP 0.1823 0.1570 -0.1256 0.0000 -0.0023 0.1298  
## PRC 0.0414 0.1280 -0.0054 -0.0023 0.0000 -0.0940  
## UN 0.0442 -0.2820 0.2085 0.1298 -0.0940 0.0000