

P3:

```
#reading the data from table 8.4 and assigning column names
tab= read.table("T8-4.dat", sep="\t")
colnames(tab)= c("JP Morgan", "Citi", "Wells Fargo", "Royal", "Exxon")

#print the first few observations
head(tab)
```

```
##      JP Morgan      Citi Wells Fargo      Royal      Exxon
## 1  0.0130338 -0.0078431 -0.0031889 -0.0447693  0.0052151
## 2  0.0084862  0.0166886 -0.0062100  0.0119560  0.0134890
## 3 -0.0179153 -0.0086393  0.0100360  0.0000000 -0.0061428
## 4  0.0215589 -0.0034858  0.0174353 -0.0285917 -0.0069534
## 5  0.0108225  0.0037167 -0.0101345  0.0291900  0.0409751
## 6  0.0101713 -0.0121978 -0.0083768  0.0137083  0.0029895
```

```
#Principle Component Analysis
```

```
#Simple Statistics
means= colMeans(tab)
SD= apply(tab,2,sd)
```

```
stat= rbind(means,SD)
stat
```

```
##      JP Morgan      Citi Wells Fargo      Royal      Exxon
## means 0.001062781 0.0006554204 0.001626082 0.004049125 0.004038642
## SD    0.020815126 0.0209455772 0.014965701 0.026879293 0.027670818
```

```
#Calculating the covariance matrix,S
```

```
S=cov(tab)
S
```

```
##      JP Morgan      Citi Wells Fargo      Royal      Exxon
## JP Morgan  4.332695e-04 0.0002756679 1.590265e-04 6.411929e-05 8.896616e-05
## Citi       2.756679e-04 0.0004387172 1.799737e-04 1.814512e-04 1.232623e-04
## Wells Fargo 1.590265e-04 0.0001799737 2.239722e-04 7.341348e-05 6.054612e-05
## Royal      6.411929e-05 0.0001814512 7.341348e-05 7.224964e-04 5.082772e-04
## Exxon      8.896616e-05 0.0001232623 6.054612e-05 5.082772e-04 7.656742e-04
```

```
#Sample Principal components
```

```
e= eigen(S)
e_val= e$values
e_vec= e$vectors
difference= round(-1*diff(e_val),6)
prop_val= e_val/sum(e_val)
total= cumsum(prop_val)

e_value=data.frame(e_val, Difference= c(difference, ''), prop_val, total)
rownames(e_value)= c('PC1', 'PC2', 'PC3', 'PC4', 'PC5')
e_value
```

```
##          e_val Difference   prop_val    total
## PC1 0.0013676780  0.000667 0.52926066 0.5292607
## PC2 0.0007011596  0.000447 0.27133298 0.8005936
## PC3 0.0002538024  0.000111 0.09821584 0.8988095
## PC4 0.0001426026   2.4e-05 0.05518400 0.9539935
## PC5 0.0001188868           0.04600652 1.0000000
```

```
e_vector=as.data.frame(e_vec)
colnames(e_vector) = c("PC1","PC2","PC3","PC4","PC5")
rownames(e_vector) = c("JP Morgan", "Citi", "Wells Fargo", "Royal", "Exxon")
e_vector
```

```
##          PC1      PC2      PC3      PC4      PC5
## JP Morgan  0.2228228 0.6252260 0.32611218 0.6627590 0.11765952
## Citi       0.3072900 0.5703900 -0.24959014 -0.4140935 -0.58860803
## Wells Fargo 0.1548103 0.3445049 -0.03763929 -0.4970499 0.78030428
## Royal      0.6389680 -0.2479475 -0.64249741 0.3088689 0.14845546
## Exxon      0.6509044 -0.3218478 0.64586064 -0.2163758 -0.09371777
```