2019150445 신백록

1. a)

$$\begin{vmatrix} 5-\lambda & 2 \\ 2 & 2-\lambda \end{vmatrix} \overset{set}{=} 0$$

$\rightarrow \lambda_1 = 6,\ \lambda_2 = 1$

$$\begin{pmatrix} 5 & 2 \\ 2 & 2 \end{pmatrix}\begin{pmatrix} y_{11} \\ y_{12} \end{pmatrix} = 6\begin{pmatrix} y_{11} \\ y_{12} \end{pmatrix} \qquad \begin{pmatrix} 5 & 2 \\ 2 & 2 \end{pmatrix}\begin{pmatrix} y_{21} \\ y_{22} \end{pmatrix} = \begin{pmatrix} y_{21} \\ y_{22} \end{pmatrix}$$

$$\rightarrow \Upsilon_1 = \begin{pmatrix} 1/\sqrt{5} \\ 2/\sqrt{5} \end{pmatrix} \qquad \rightarrow \Upsilon_2 = \begin{pmatrix} 1/\sqrt{5} \\ -2/\sqrt{5} \end{pmatrix}$$

b) $\dfrac{\lambda_1}{\lambda_1+\lambda_2} = \dfrac{6}{7}$

c) $\rho = \begin{pmatrix} 1 & \frac{2}{\sqrt{10}} \\ \frac{2}{\sqrt{10}} & 1 \end{pmatrix}$

$$\begin{vmatrix} 1-\lambda & 2/\sqrt{10} \\ 2/\sqrt{10} & 1-\lambda \end{vmatrix} = 0$$

$\rightarrow \lambda_1 = 1+\frac{\sqrt{10}}{5},\ \lambda_2 = 1-\frac{\sqrt{10}}{5}$

$$\begin{pmatrix} 1 & 2/\sqrt{10} \\ 2/\sqrt{10} & 1 \end{pmatrix}\begin{pmatrix} y_{11} \\ y_{12} \end{pmatrix} = \left(1+\frac{\sqrt{10}}{5}\right)\begin{pmatrix} y_{11} \\ y_{12} \end{pmatrix} \qquad \begin{pmatrix} 1 & 2/\sqrt{10} \\ 2/\sqrt{10} & 1 \end{pmatrix}\begin{pmatrix} y_{21} \\ y_{22} \end{pmatrix} = \left(1-\frac{\sqrt{10}}{5}\right)\begin{pmatrix} y_{21} \\ y_{22} \end{pmatrix}$$

$\rightarrow y_{11} = y_{12}$ $\qquad \rightarrow y_{21} = -y_{22}$

$\rightarrow \Upsilon_1 = \begin{pmatrix} \frac{1}{2} \\ \frac{1}{2} \end{pmatrix}$ $\qquad \rightarrow \Upsilon_2 = \begin{pmatrix} \frac{1}{2} \\ -\frac{1}{2} \end{pmatrix}$

& $\dfrac{1+\frac{\sqrt{10}}{5}}{2} \approx 0.815$ explained by the first principal component.

d) Not Same.

The principal components & proportion explained by the first principal component are different.

2. a)

Since first Component takes $\frac{4478.9}{4673} \approx 0.96$ Proportion of total Variance, data Can be Summarized in one dimension.

b) Since first Principal Component takes $\frac{5.66}{6} \approx 0.94$ Proportion of total Variance, data Can be Summarized in one dimension

c) eigenvalues & eigenvectors are difference. Because Covariance mattix gives large weights to large variance variables But Correlation mattix gives same weights to variables.

It came from same data.

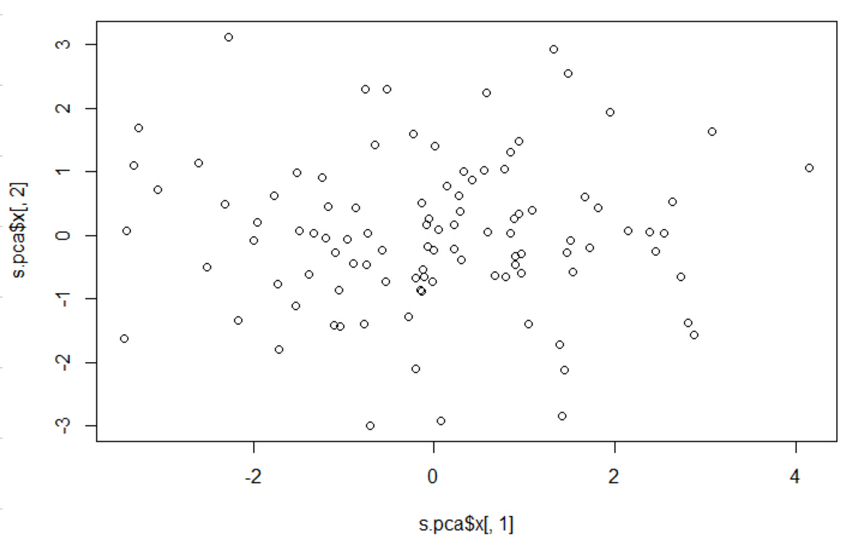
3. a) Since five stocks are equally important, i will use R.

b) $\lambda_1=2.44, \lambda_2=1.41, \lambda_3=0.5, \lambda_4=0.4, \lambda_5=0.26$

c) $\frac{2.44+1.41}{5}=0.77$, It means 77% Can be explained by first two components.

d) Yes. first two Components takes 77% & three components takes 87% of total Variance.

e)



4. a) We must use R Since units of each variabe are differ.

b) $\lambda_1=2.37, \lambda_2=1.39, \lambda_3=1.2, \lambda_4=0.73, \lambda_5=0.65, \lambda_6=0.54, \lambda_7=0.16$

c) Using first three Component is good.

d) About 70% of total variance Can be explained by these three Principal Components

e) Yes. only three will be fine.