Homework6_class8
Please use the rice production data.

```
# rice production data ###################################################
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import os
path='/Users/sudip/Downloads'
data = pd.read_csv(os.path.join(path, 'rice production across different countries from 1961 to 2021.csv'))
##########################################################################
```

It reads rice production from three different countries.
Use the following countries:
'United States of America', 'Bangladesh', 'France'

Use the same data and make three pairs:
['United States of America', 'Bangladesh']
['United States of America', 'France']
['Bangladesh', 'France']

Q7. Find out the eigenvectors and eigenvalues for each of the pairs. 10 pts

USA and Bangladesh
E-value: [1.86423728 0.16909605]
E-vector [[0.70710678 -0.70710678]
 [0.70710678 0.70710678]]

USA and France
E-value: [1.23731966 0.79601367]
E-vector [[0.70710678 -0.70710678]
 [0.70710678 0.70710678]]

Bangladesh and France
E-value: [1.25069251 0.78264082]
E-vector [[0.70710678 -0.70710678]
 [0.70710678 0.70710678]]

The code is attached in class_matrix.ipynb.

Q8. Find out the angle using the eigenvectors.10 pts

USA and Bangladesh
First eigen vectors angle with x-axis
45.02282465335689
Second eigen vectors angle with x-axis
-45.02282465335691
Angle between the first and second eigenvectors: 90.0 degrees.

USA and France
First eigen vectors angle with x-axis
45.02282465335683
Second eigen vectors angle with x axis
-45.02282465335699
Angle between the first and second eigenvectors: 90.0 degrees.

Bangladesh and France
First eigen vectors angle with x axis
45.02282465335689
Second eigen vectors angle with x axis
-45.02282465335693
Angle between the first and second eigenvectors: 90.0 degrees.

The code is attached in class_matrix.ipynb.

Q9. What fraction of the variance is explained by the first eigenvectors for each pair? 10 pts

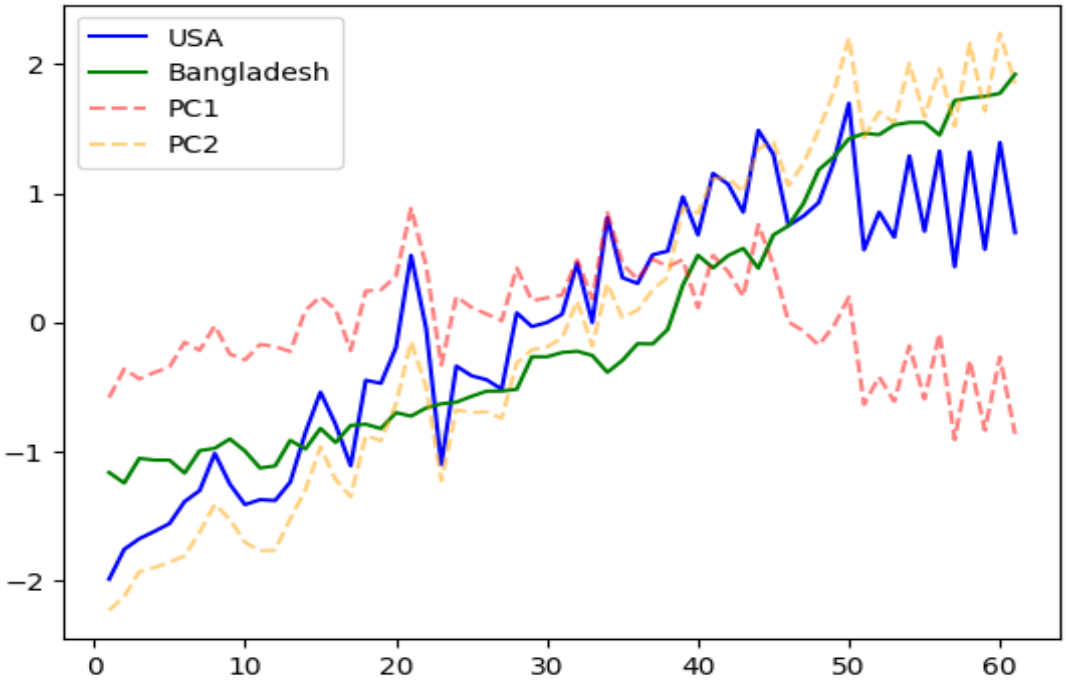
fraction of the variance is explained by the first eigenvectors between USA and Bangladesh
91.68380075224223

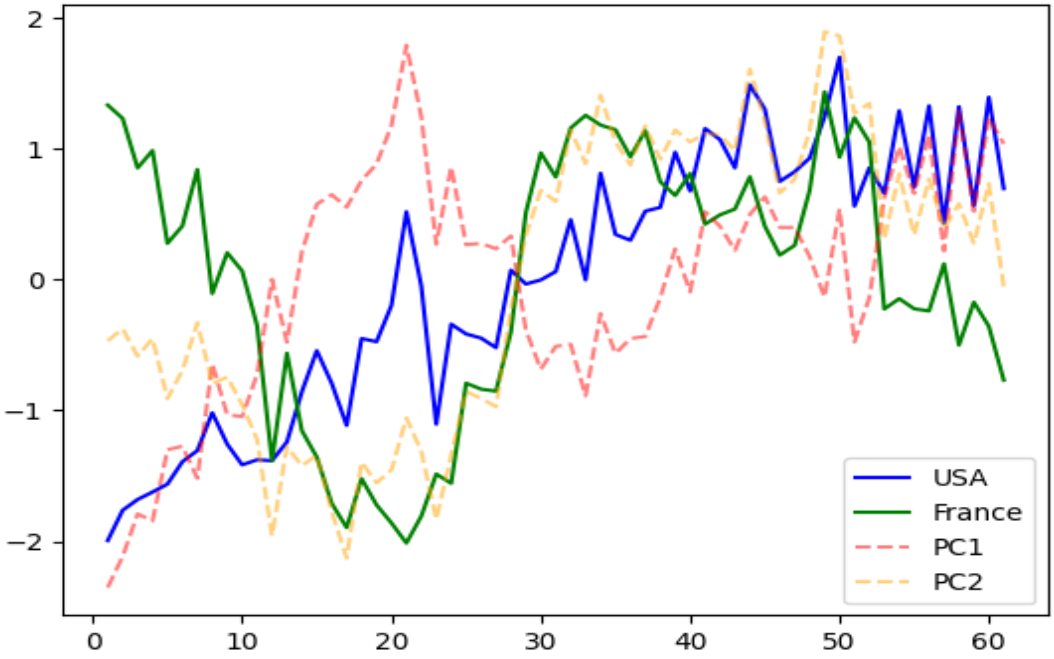
fraction of the variance is explained by the first eigenvectors between USA and France
60.85178650016868

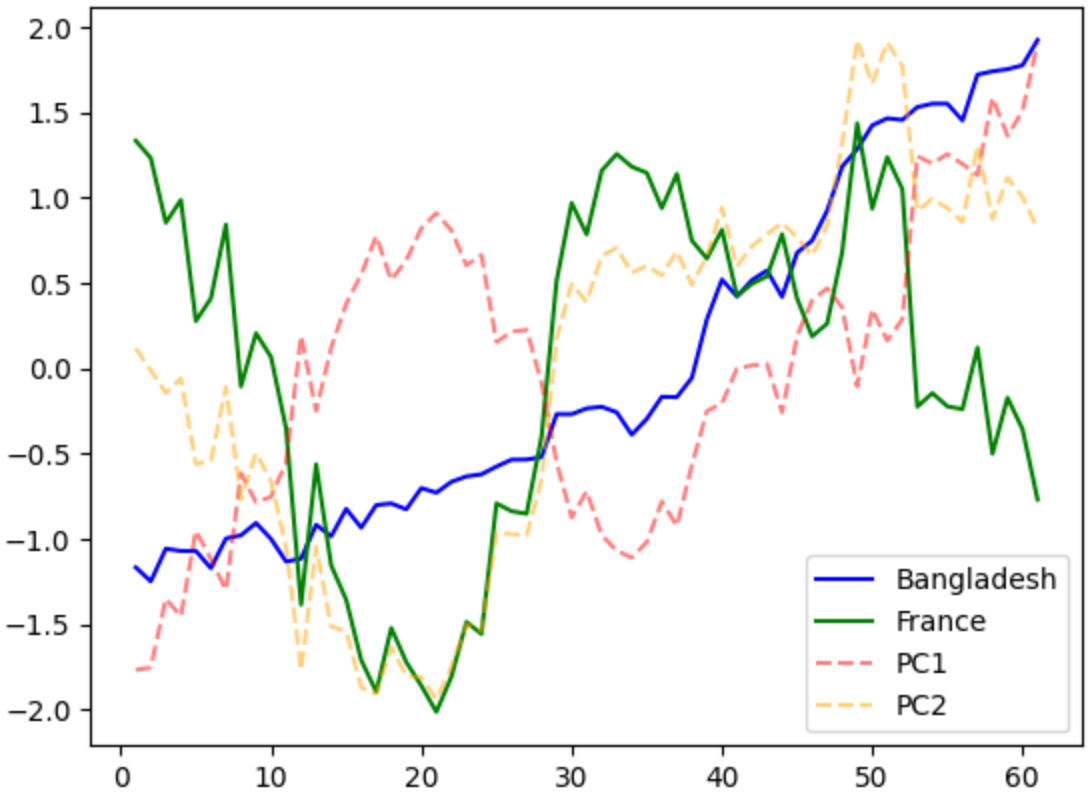
fraction of the variance is explained by the first eigenvectors between Bangladesh and France
61.50946781221517

The code is attached in class_matrix.ipynb.

Q10. Plot the original timeseries and the principal components 1 and 2 using the eigenvectors for each pair. 10 pts







The code is attached in class_matrix.ipynb.