Importing Packages

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import requests
from io import BytesIO
import importlib

try:
    importlib.import_module('pdfplumber')
    print('pdfplumber library is already installed.')
except ImportError:
    print('pdfplumber library is not installed. Installing now...')
    !pip install pdfplumber

import pdfplumber

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error
from statsmodels.tsa.stattools import adfuller
from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
from statsmodels.tsa.arima.model import ARIMA
import warnings
gdp = [14474.23, 14769.86, 14478.06, 15048.96, 15599.73, 16253.97, 16843.19, 17550.68]
element=0
```

```
pdfplumber library is already installed.
```

Data Carpentry For Non-Immigrant Visas Issuances

1. Function is used for cleaning and reshaping the data of every sheet in the file
2. Added two columns continent and fiscal year by extracting the data from dataset and mapped them to respective countries
3. Dropped all the empty rows from the dataset
4. Removed unknown data

```
def data_carpentry(url,sheetname):
    data = pd.read_excel(url,sheet_name=sheetname)
    data.dropna(axis = 0, how = 'all', inplace = True)
    column_names = data.columns
    fiscal_year=""
    for i in column_names[0]:
        if(i.isdigit()):
            fiscal_year+=i
    fiscal_year = int(fiscal_year)
    data['Fiscal_Year'] = fiscal_year
    column_names = list(data.columns)
    column_names[0]='Country'
    data.columns=column_names
    continents = ['Africa','Asia','Europe','North America','Oceania','South America']
    data.reset_index(inplace=True)
    list_of_continent_idx = list(data[data['Country'].isin(continents)].index)
    list_of_continent_idx.append(len(data)-5)
    data['Continent']=''
    for j in range(len(list_of_continent_idx)-1):
        #print('data.iloc[',list_of_continent_idx[j],':',list_of_continent_idx[j+1],',89]')
        data.iloc[list_of_continent_idx[j]:list_of_continent_idx[j+1],data.columns.__len__()-1] = continents[j]
    indexes_of_rows_to_be_dropped = []
    for k in range(1,len(list_of_continent_idx)):
        indexes_of_rows_to_be_dropped.append(list_of_continent_idx[k]-1)
    for l in range(len(list_of_continent_idx)-1):
        indexes_of_rows_to_be_dropped.append(list_of_continent_idx[l])
    indexes_of_rows_to_be_dropped.sort()
    data.drop(indexes_of_rows_to_be_dropped,inplace=True)
    data.drop(columns=['Total Visas','Grand Total','index'],inplace=True)
    data = data[:-5]
    return data
```

Data integration

1. Calling the data_carpentry function to clean and reshape the data for all the sheets in the dataset
2. After cleaning combining the whole data as one.

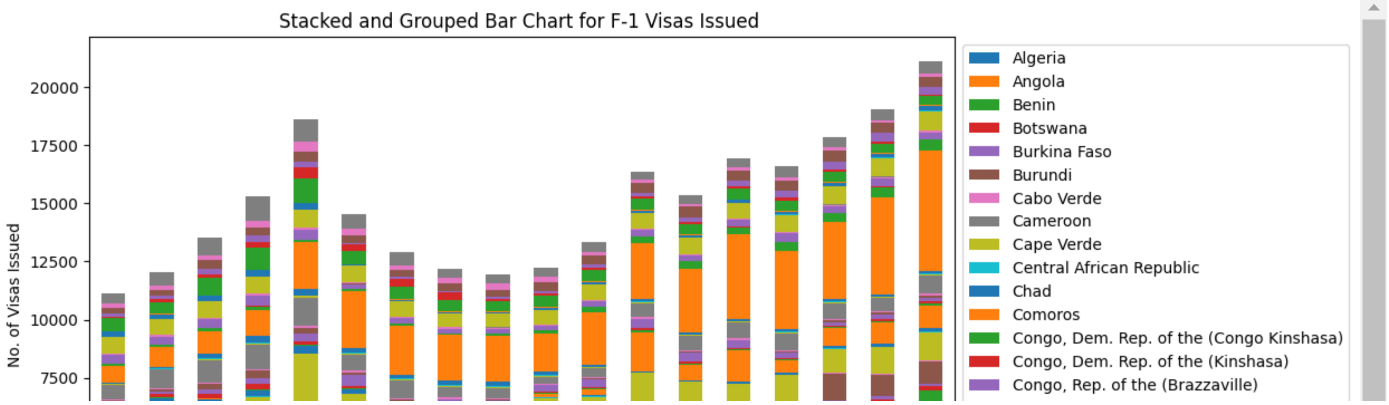
```
url='https://travel.state.gov/content/dam/visas/Statistics/Non-Immigrant-Statistics/NIVDetailTables/FYs97-14_NIVDetailTable.xls'

df_14 = data_carpentry(url,'FY14')
df_13 = data_carpentry(url,'FY13')
df_12 = data_carpentry(url,'FY12')
df_11 = data_carpentry(url,'FY11')
df_10 = data_carpentry(url,'FY10')
df_09 = data_carpentry(url,'FY09')
df_08 = data_carpentry(url,'FY08')
df_07 = data_carpentry(url,'FY07')
df_06 = data_carpentry(url,'FY06')
df_05 = data_carpentry(url,'FY05')
df_04 = data_carpentry(url,'FY04')
df_03 = data_carpentry(url,'FY03')
df_02 = data_carpentry(url,'FY02')
df_01 = data_carpentry(url,'FY01')
df_00 = data_carpentry(url,'FY00')
df_99 = data_carpentry(url,'FY99')
df_98 = data_carpentry(url,'FY98')
df_97 = data_carpentry(url,'FY97')
#df_12.to_csv('fun_data12.csv')
df = pd.concat([df_14,df_13,df_12,df_11,df_10,df_09,df_08,df_07,df_06,
                df_05,df_04,df_03,df_02,df_01,df_00,df_99,df_98,df_97], axis=0)

df.reset_index(inplace=True)
df.fillna(0,inplace=True)
df.to_csv('Data_All_Years.csv')


years_hard = list(df[df['Continent'] == 'South America']['Fiscal_Year'].unique())
```

Univariate and Bivariate Analysis for F-1 visa's issued of South American countries

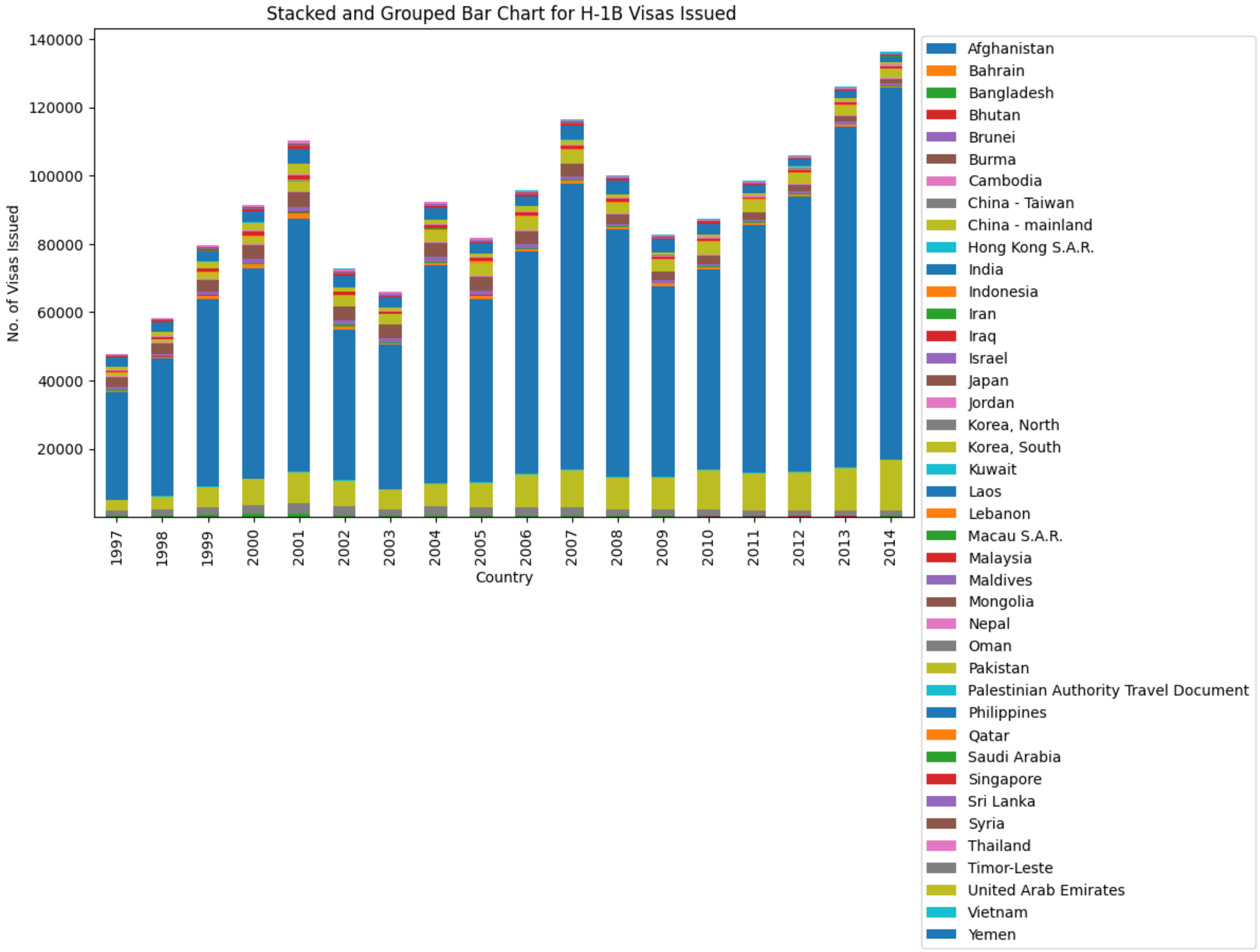
1. Collected the unique years from the dataset
2. Identified the unique countries of South America
3. Collected number of F-1 visa's issued to each country

Plotting stacked and grouped bar chart for number of F-1 visa's issued to each South American countries for all the years identified

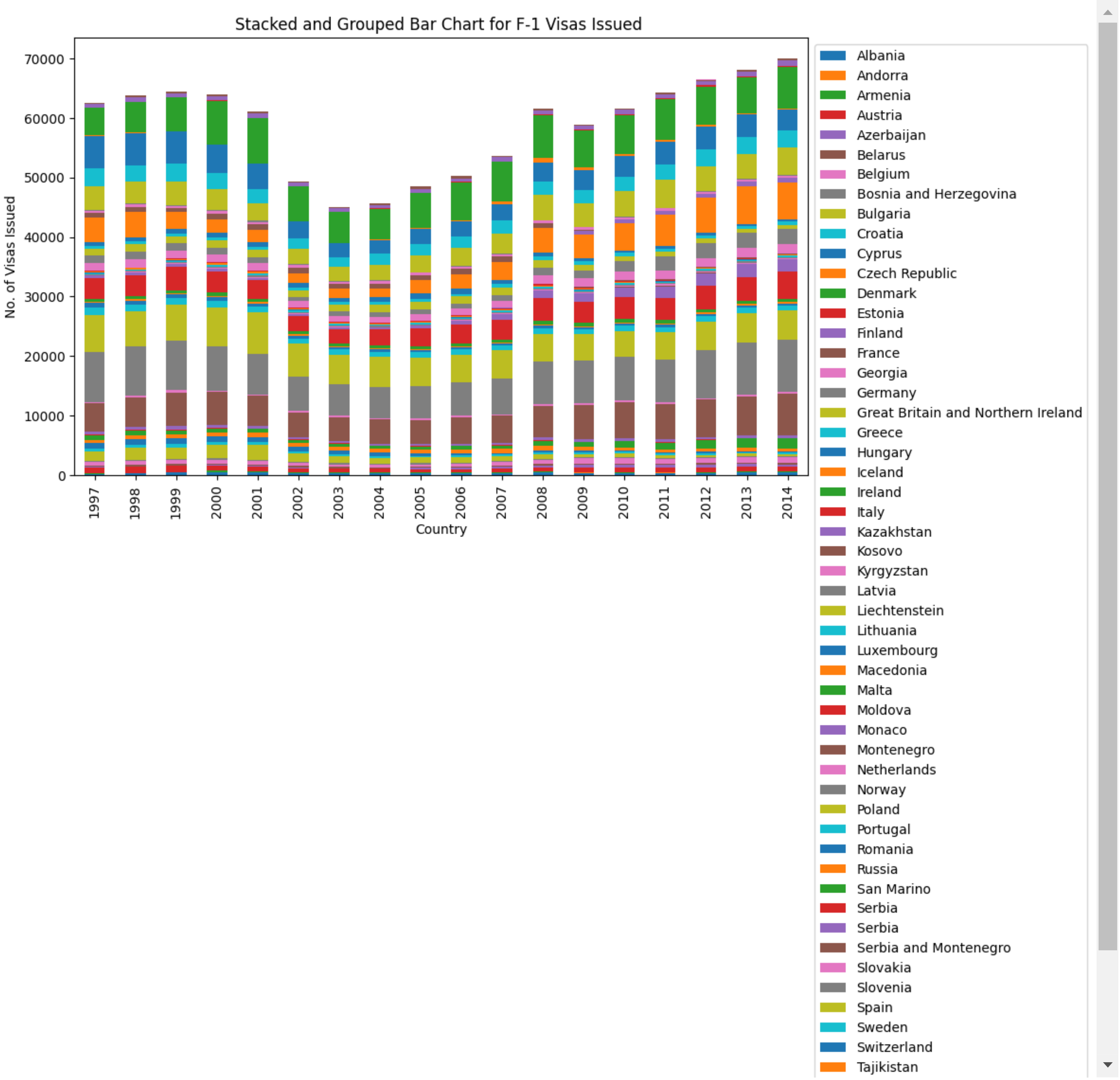
```
years_hard = list(df['Fiscal_Year'].unique())
#years_hard = [1999]
def data_visualization(continent,visatype):
    countries=[]
    for i in range(len(years_hard)):
        countries.append(list(df[(df['Continent'] == continent) & (df['Fiscal_Year']==years_hard[i])]['Country'].unique()))

    #print(countries)
    c_a=[]
    for inner_list in countries:
        c_a.extend(inner_list)

    visas=[]
    for i in range(len(years_hard)):
        visas.append(list(df[ (df['Continent'] == continent) & (df['Fiscal_Year']==years_hard[i])][visatype]))
    v_a=[]
    for inner_list in visas:
        v_a.extend(inner_list)

    years =[]
    for i in range(len(years_hard)):
          for j in range(visas[i].__len__()):
              years.append(years_hard[i])

    # print(c_a)
    # print(years)
    # print(v_a)

    # print(len(c_a))
    # print(len(years))
    # print(len(v_a))

    data = {
    'Country': c_a,
    'Year': years,
    'No_of_Visas': v_a
    }
    df_plot = pd.DataFrame(data)

    fig, ax = plt.subplots(figsize=(10, 6))

    df_plot.pivot(index='Year', columns='Country', values='No_of_Visas').plot(kind='bar', stacked=True, ax=ax)
    title = 'Stacked and Grouped Bar Chart for '+visatype+' Visas Issued '
    ax.set_title(title)
    ax.set_xlabel('Country')
    ax.set_ylabel('No. of Visas Issued')

    plt.legend(loc='upper left', bbox_to_anchor=(1.0, 1.0))

    #plt.savefig('output.png', bbox_inches='tight')
    plt.show()


data_visualization('Africa','F-1')
```



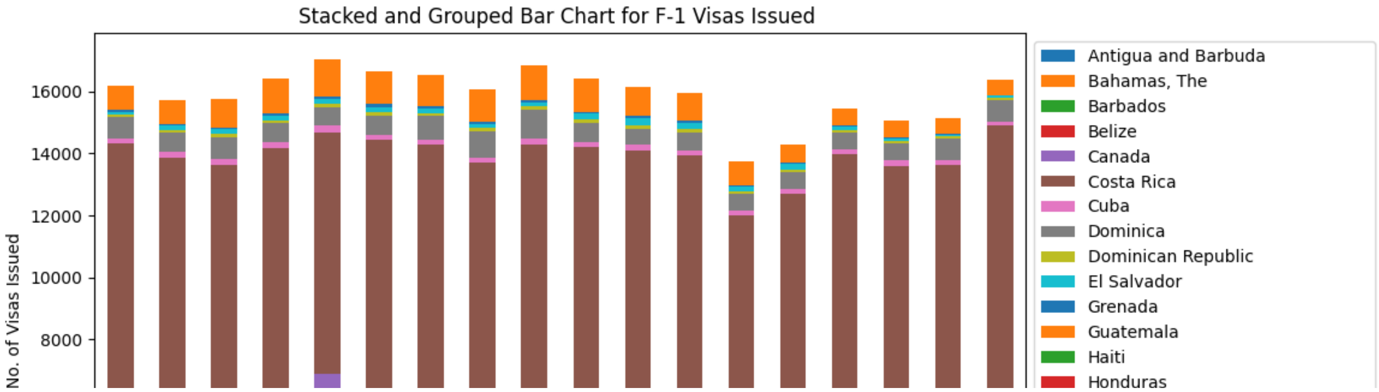
```
data_visualization('Asia','H-1B')
```



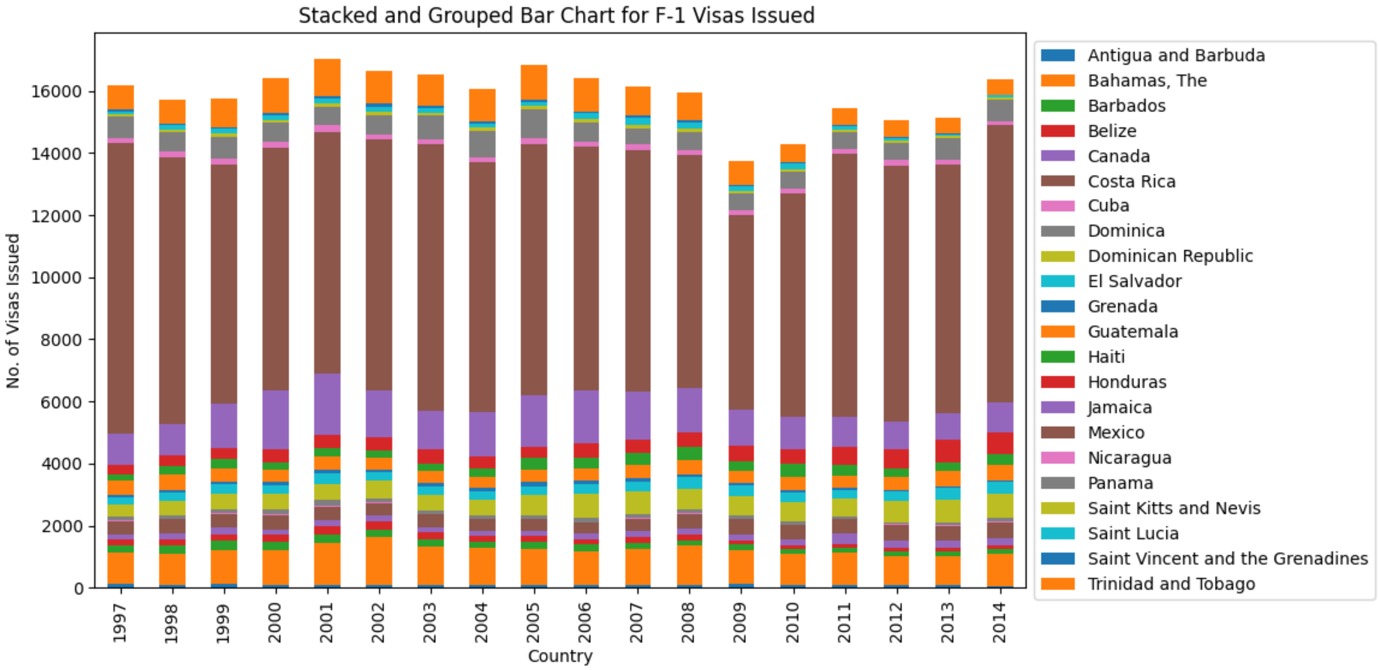
```
data_visualization('Europe','F-1')
```



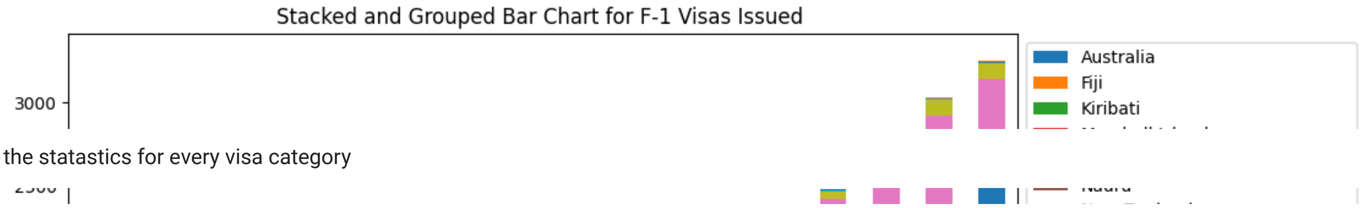
```
data_visualization('North America','F-1')
```



```
data_visualization('North America','F-1')
```



```
data_visualization('Oceania','F-1')
```



Finding the statastics for every visa category

```
df.describe()
```

	index	A-1	A-2	A-3	B-1	B-1,2	B-2	B-1,2/BCC	B-1,2/BCV	
count	3528.000000	3528.000000	3528.000000	3528.000000	3528.000000	3.528000e+03	3528.000000	3.528000e+03	3528.000000	3528.00
mean	101.886621	52.685091	417.852608	7.595805	377.298469	1.820930e+04	1901.928855	4.287022e+03	697.065760	167.06
std	59.399702	80.432519	861.691139	28.248611	3161.293127	6.453815e+04	16483.237919	6.800695e+04	16440.810344	1242.57
min	1.000000	0.000000	0.000000	-1.000000	0.000000	0.000000e+00	-6.000000	0.000000e+00	0.000000	0.00
25%	49.750000	9.000000	31.000000	0.000000	6.000000	5.560000e+02	13.000000	0.000000e+00	0.000000	3.00
50%	102.500000	27.000000	129.000000	1.000000	43.000000	2.235000e+03	90.000000	0.000000e+00	0.000000	12.00
75%	152.000000	57.000000	359.250000	5.000000	190.250000	1.028075e+04	543.500000	0.000000e+00	0.000000	57.00
max	209.000000	641.000000	8871.000000	492.000000	144278.000000	1.403617e+06	488675.000000	1.990402e+06	458902.000000	41824.00

8 rows × 94 columns

Finding the statastics for each continent

```
df.groupby('Continent').describe()
```

	index								A-1		...	V-3		H-2R		
	count	mean	std	min	25%	50%	75%	max	count	mean	...	75%	max	count	mean	std
Continent																
Africa	958.0	27.112735	15.372077	1.0	14.00	27.0	40.00	54.0	958.0	34.372651	...	0.0	108.0	958.0	0.498956	13.523
Asia	732.0	76.064208	11.765956	56.0	66.00	76.0	86.00	97.0	732.0	81.658470	...	0.0	674.0	732.0	0.133880	2.050
Europe	974.0	125.473306	15.703994	97.0	112.00	125.0	139.00	155.0	974.0	48.926078	...	0.0	69.0	974.0	2.701232	34.810
North America	396.0	165.500000	6.660482	152.0	160.00	165.5	171.00	179.0	396.0	60.542929	...	0.0	15310.0	396.0	296.005051	3251.997
Oceania	252.0	185.500000	4.508955	176.0	182.00	185.5	189.00	195.0	252.0	15.496032	...	0.0	2.0	252.0	4.003968	31.635
South America	216.0	200.500000	3.998837	192.0	197.75	200.5	203.25	209.0	216.0	81.648148	...	0.0	132.0	216.0	1.773148	14.066

Finding the statistics for the data which is collected above for plotting stacked chart

```
df['F-1'].describe()
```

```
count      3528.000000
mean       1688.225624
std        8436.722952
min           0.000000
25%          63.750000
50%         251.500000
75%         825.000000
max      244927.000000
Name: F-1, dtype: float64
```

```
df.groupby('Continent').describe()
```

	index								A-1		...	V-3		H-2R		
	count	mean	std	min	25%	50%	75%	max	count	mean	...	75%	max	count	mean	std
Continent																
Africa	958.0	27.112735	15.372077	1.0	14.00	27.0	40.00	54.0	958.0	34.372651	...	0.0	108.0	958.0	0.498956	13.523
Asia	732.0	76.064208	11.765956	56.0	66.00	76.0	86.00	97.0	732.0	81.658470	...	0.0	674.0	732.0	0.133880	2.050
Europe	974.0	125.473306	15.703994	97.0	112.00	125.0	139.00	155.0	974.0	48.926078	...	0.0	69.0	974.0	2.701232	34.810
North America	396.0	165.500000	6.660482	152.0	160.00	165.5	171.00	179.0	396.0	60.542929	...	0.0	15310.0	396.0	296.005051	3251.997
America	216.0	200.500000	3.998837	192.0	197.75	200.5	203.25	209.0	216.0	81.648148	...	0.0	132.0	216.0	1.773148	14.066

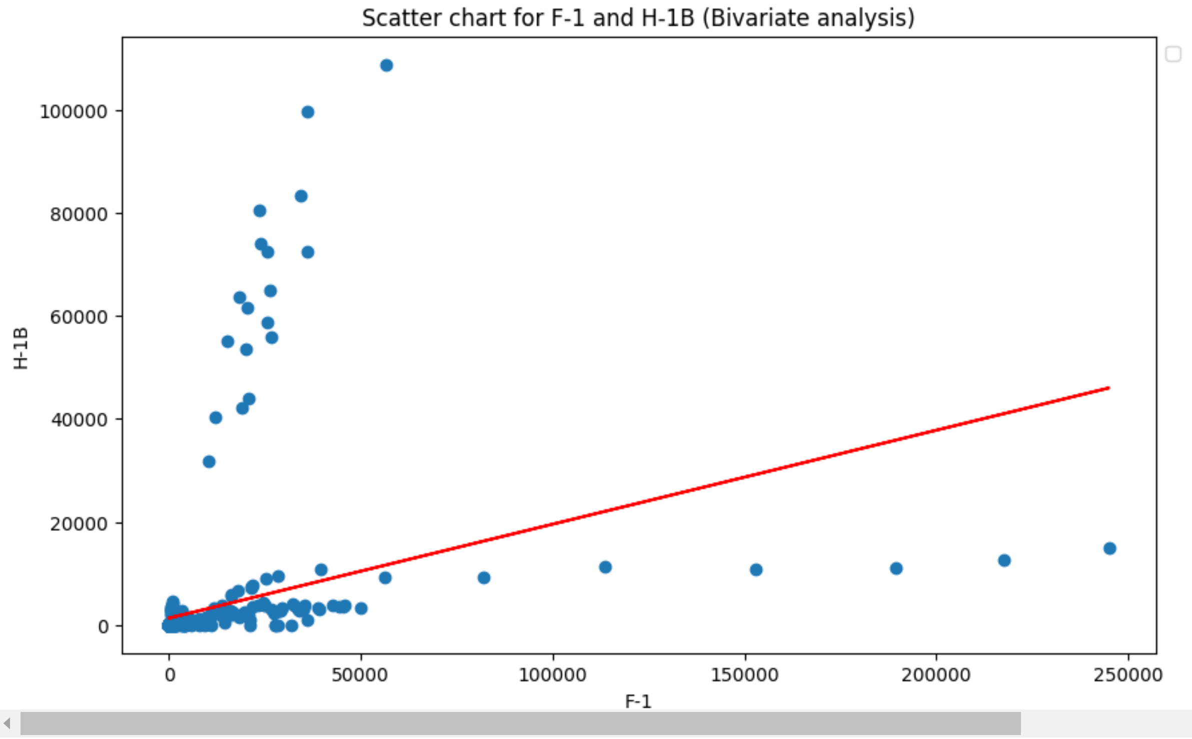
Plotting Scatter chart for two visa types issued to each Continent for all the years identified

```
visaTypes=[]
def comparisonVisas(continent, visaTypes):
  countries=[]
  for i in range(len(years_hard)):
    countries.append(list(df[(df['Continent'] == continent) & (df['Fiscal_Year']==years_hard[i])]['Country'].unique()))
  c_a=[]
  for inner_list in countries:
    c_a.extend(inner_list)

  visas=[]
  for i in range(len(years_hard)):
    visas.append(list(df[(df['Continent'] == continent) & (df['Fiscal_Year']==years_hard[i])][visaTypes[0]]))

  v_a=[]
  for inner_list in visas:
    v_a.extend(inner_list)

  years =[]
  for i in range(len(years_hard)):
    for j in range(visas[i].__len__()):
      years.append(years_hard[i])

  visas_h=[]
  for i in range(len(years_hard)):
    visas_h.append(list(df[(df['Continent'] == continent) & (df['Fiscal_Year']==years_hard[i])][visaTypes[1]]))

  v_h=[]
  for inner_list in visas_h:
    v_h.extend(inner_list)


  data2 = {
      'Country': c_a,
      'Year': years,
      'Visa1': v_a,
      'Visa2': v_h
    }

  df_biplot = pd.DataFrame(data2)

  fig, ax = plt.subplots(figsize=(10, 6))

  x = df_biplot['Visa1']
  y = df_biplot['Visa2']

  fit = np.polyfit(x, y, deg=1)

  ax.set_title('Scatter chart for '+ visaTypes[0]+ ' and '+ visaTypes[1]+ ' (Bivariate analysis)')
  ax.set_xlabel(visaTypes[0])
  ax.set_ylabel(visaTypes[1])

  ax.scatter(x, y)

  ax.plot(x, fit[0] * x + fit[1], color='red')

  plt.legend(loc='upper left', bbox_to_anchor=(1.0, 1.0))

  print("The slope of the line is {} and the intercept is {}.".format(fit[0],fit[1]))
  #print(df_biplot.describe())
```

```
    #print(df_biplot.groupby('Country').describe())
```

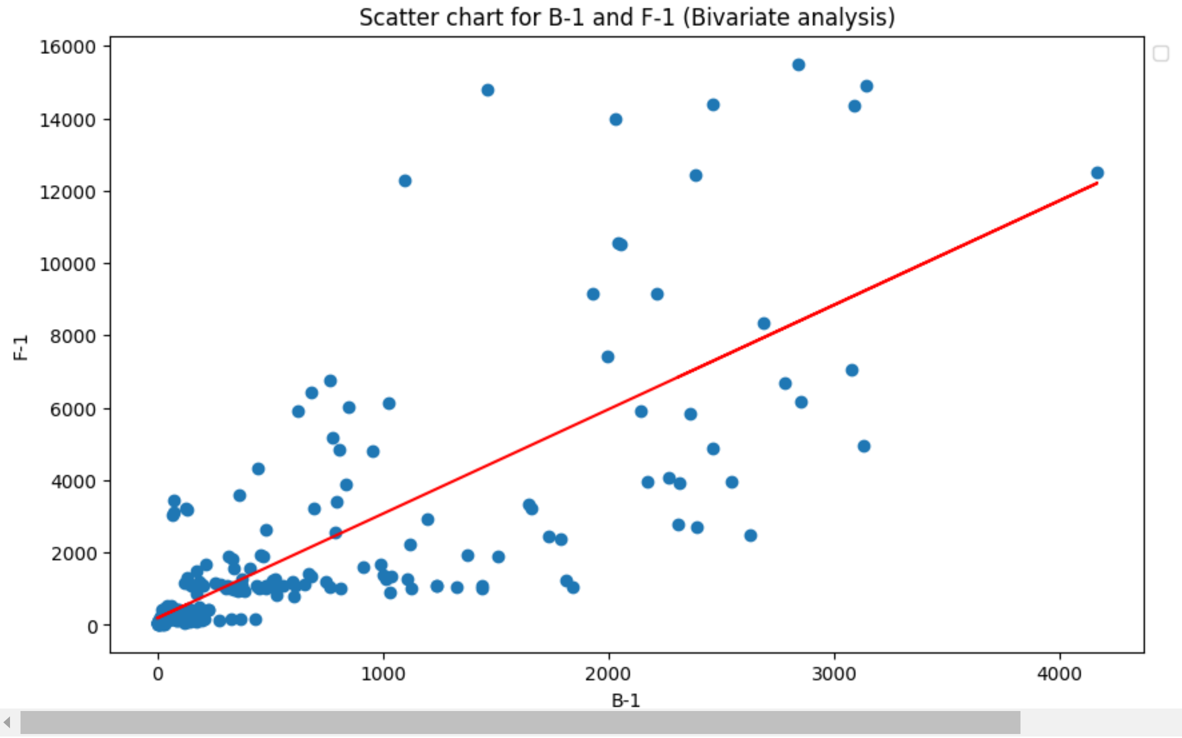
```
comparisonVisas('Asia',['F-1','H-1B'])
```

```
WARNING:matplotlib.legend:No artists with labels found to put in legend.  Note that artists whose label start with an underscore are igr
The slope of the line is 0.18249425551765144 and the intercept is 1294.2597233168995.
```



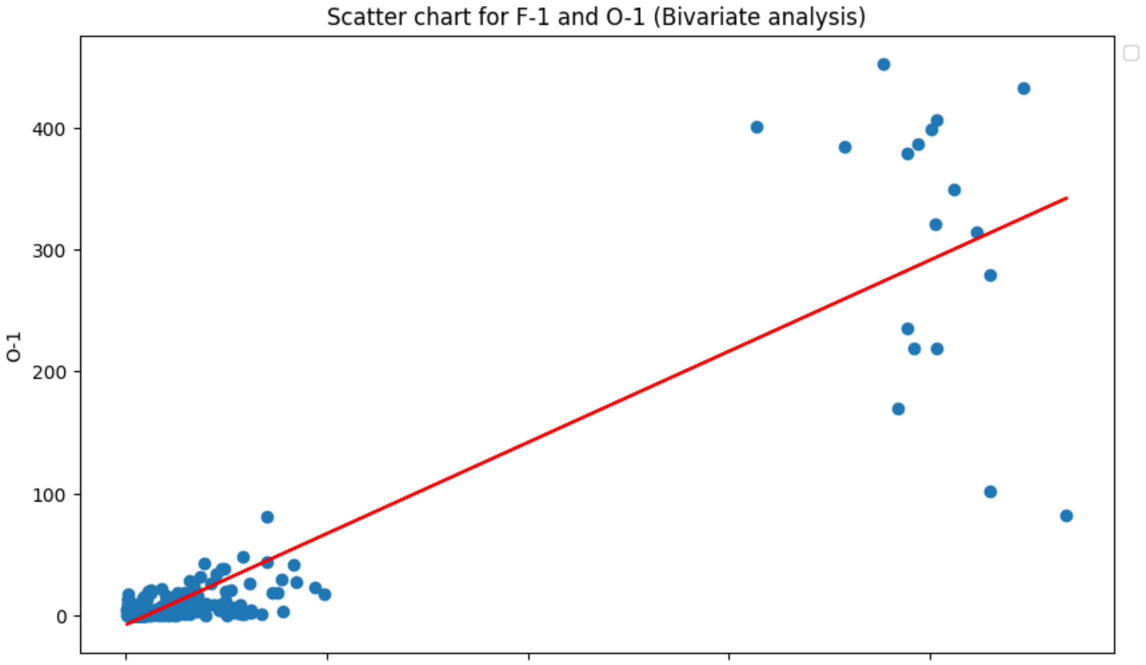
```
comparisonVisas('South America',['B-1','F-1'])
```

```
WARNING:matplotlib.legend:No artists with labels found to put in legend.  Note that artists whose label start with an underscore are igr
The slope of the line is 2.8868766488608313 and the intercept is 183.92324708228998.
```



```
comparisonVisas('North America',['F-1','O-1'])
```

```
WARNING:matplotlib.legend:No artists with labels found to put in legend.  Note that artists whose label start with an underscore are igr
The slope of the line is 0.0374160180944593 and the intercept is -7.926882487987955.
```



Data Extraction of H-1B Petition Filing

```
# Fetch the PDF data
url = 'https://www.uscis.gov/sites/default/files/document/data/h-1b-2007-2017-trend-tables.pdf'
response = requests.get(url)

# Open the PDF data with pdfplumber
with pdfplumber.open(BytesIO(response.content)) as pdf:
    table=pdf.pages[0].extract_table()
    df_country=pd.DataFrame(table[0::],columns=table[0])
    table2=pdf.pages[2].extract_table()
    df_Industry=pd.DataFrame(table2[0::],columns=table2[0])


#Country Dataframe
df_country = df_country.iloc[:, :-4]
new_columns = df_country.iloc[2, :].tolist()
new_columns[0]='Country'
df_country.columns = new_columns
df_country = df_country.iloc[3:, :]
df_country = df_country.drop(df_country.index[-2])
df_country.reset_index(inplace=True)
df_country.drop(columns = ['index'],inplace=True)
df_country
```

	Country	2007	2008	2009	2010	2011	2012	2013	2014
0	India	166,575	157,608	122,475	135,931	155,791	197,940	201,114	227,172
1	China, People's Republic of	26,370	24,434	22,411	21,119	23,227	22,528	23,924	27,733
2	Philippines	12,230	10,713	10,407	8,887	9,098	9,400	7,399	6,772
3	South Korea	10,730	10,277	10,704	8,721	7,480	7,204	5,576	4,897
4	Canada	8,562	7,111	7,871	7,342	6,761	6,688	5,478	5,267
5	Taiwan	5,394	4,088	4,308	4,325	4,511	4,172	3,520	3,267
6	Mexico	4,259	3,680	3,599	3,260	3,439	3,602	2,985	2,769
7	United Kingdom	5,105	4,241	4,270	3,651	3,241	3,130	2,330	1,988

Converting continenets to the int64 in order to avoid any data releated issue while training model. While generating model there was an error because all data was not of same type.

```
df = pd.read_csv('Data_All_Years.csv', index_col='Fiscal_Year')
df['Continent_new']=df['Continent']
df['Continent_new'] = df['Continent_new'].replace('Europe',1)
df['Continent_new'] = df['Continent_new'].replace('Africa',2)
df['Continent_new'] = df['Continent_new'].replace('Asia',3)
df['Continent_new'] = df['Continent_new'].replace('North America',4)
df['Continent_new'] = df['Continent_new'].replace('Oceania',5)
df['Continent_new'] = df['Continent_new'].replace('South America',6)
df.drop('Continent',axis=1,inplace = True)
df['Continent'] = df['Continent_new']
df.drop('Continent_new',axis=1,inplace = True)
```

Removing Unwanted data and adding all the required visa type of which we want to make a predictions.

19 Spain 1,079 974 933 1,018 1,233 1,140 1,230 1,201

```
df["Approval_Count"] =  df["F-1"] + df["H-1B"] + df["B-1,2"] + df["O-1"] + df["B-1"] + df["B-2"]
relevant_cols = ["Fiscal_Year", "Approval_Count","Continent"]

for columns in df.columns:
  if columns not in relevant_cols:
    df.drop(columns,axis=1,inplace=True)


df.tail()
```

	Continent	Approval_Count
Fiscal_Year		
1997	6	6664.0
1997	6	50510.0
1997	6	2817.0
1997	6	21870.0
1997	6	78807.0

Combining all the unique continent data

```
grouped_df = df.groupby([df.index,df['Continent']]).agg({'Approval_Count': 'sum', 'Continent': 'max'})


df = grouped_df.droplevel(1)
df.head()
```

```
                 Approval_Count  Continent

      Fiscal Year
```

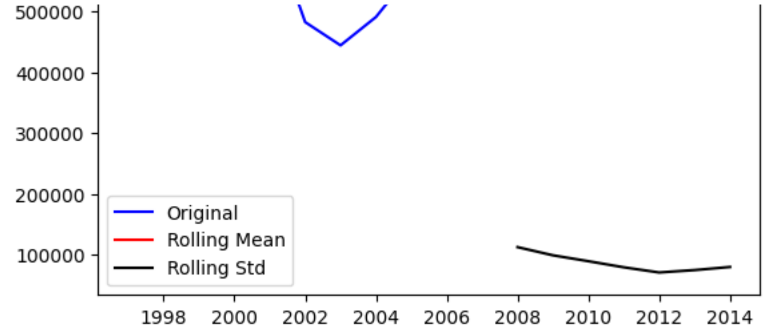
```
df.index
```

```
Int64Index([1997, 1997, 1997, 1997, 1997, 1997, 1998, 1998, 1998, 1998,
            ...
            2013, 2013, 2013, 2013, 2014, 2014, 2014, 2014, 2014, 2014],
           dtype='int64', name='Fiscal_Year', length=108)
```

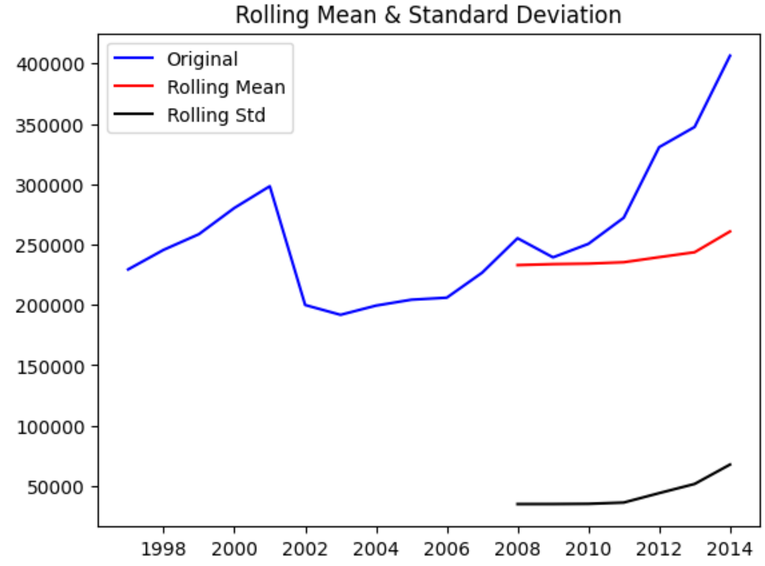
Using time series analysis, trying to predict the following years visa approval count. ARIMA is a popular model for predicting time series, especially when the time series properties change over time

```
# Convert the year column to a datetime object
df.index = pd.to_datetime(df.index, format='%Y')
```

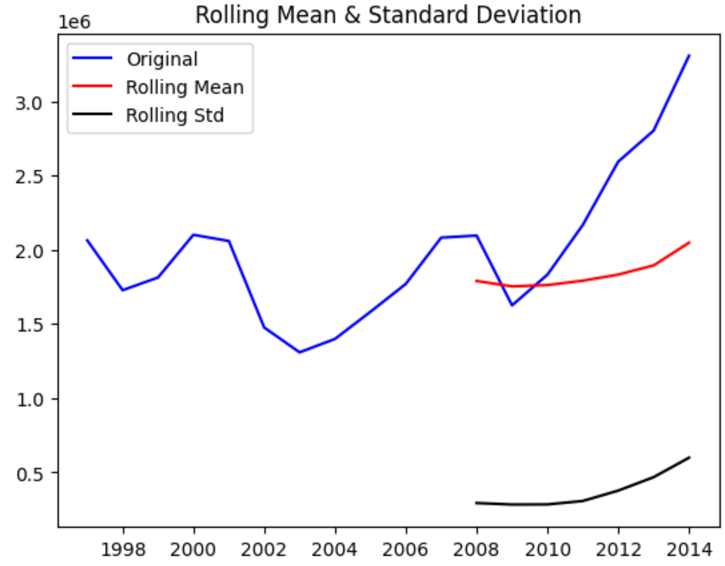
```
def check_Stationarity(timeseries):
    # Calculate rolling statistics
    mean = timeseries.rolling(window=12).mean()
    std = timeseries.rolling(window=12).std()

    # Plot rolling statistics
    plt.plot(timeseries, color='blue', label='Original')
    plt.plot(mean, color='red', label='Rolling Mean')
    plt.plot(std, color='black', label='Rolling Std')
    plt.legend(loc='best')
    plt.title('Rolling Mean & Standard Deviation')
    plt.show(block=False)

# Check for stationarity for each continent
for continent in df['Continent'].unique():
    print('Continent:', continent)
    check_Stationarity(df[df['Continent'] == continent]['Approval_Count'])

continents_names=['Europe','Africa','Asia','North America','Oceania','South America']

for continent in df['Continent'].unique():
    print('Continent:', continent)
    data = df[df['Continent'] == continent]['Approval_Count']
    train = data[:]
    warnings.filterwarnings("ignore")

    # Train the ARIMA model
    model = ARIMA(train, order=(2, 1, 2))
    fitted_model = model.fit()

    # Predicting model for 2 years
    predictions = fitted_model.predict(start=len(train), end=len(train) + 1, typ='levels')
    print(f'{continents_names[element]}\nPredictions for 2014 and 2015\n{predictions}')
    element+=1
```



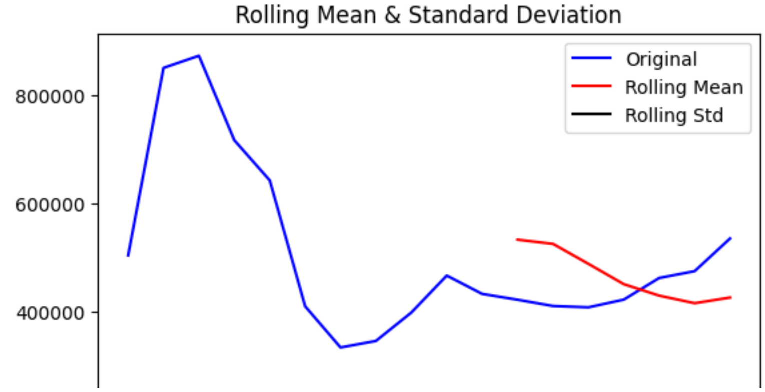
```
Continent: 2
```


Rolling Mean & Standard Deviation

```
Continent: 3
```


Rolling Mean & Standard Deviation

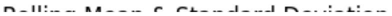
```
Continent: 4
```


Rolling Mean & Standard Deviation

Output : The preceding graph depicts the trend of rolling mean and standard deviation for all continents over the specified time period.

Each continent's predictions for the forthcoming years [2014-2015] are listed above.

Research Question 2



```
# Fetch the PDF data
url = 'https://www.uscis.gov/sites/default/files/document/data/h-1b-2007-2017-trend-tables.pdf'
response = requests.get(url)

# Open the PDF data with pdfplumber
with pdfplumber.open(BytesIO(response.content)) as pdf:
    table=pdf.pages[0].extract_table()
    df_country=pd.DataFrame(table[0::],columns=table[0])
#Country Dataframe
df_country = df_country.iloc[:, :-4]
new_columns = df_country.iloc[2, :].tolist()
new_columns[0]='Country'
df_country.columns = new_columns
df_country = df_country.iloc[3:, :]
df_country = df_country.drop(df_country.index[-2])
df_country.reset_index(inplace=True)
df_country.drop(columns = ['index'],inplace=True)
df_country = df_country.replace(',', '', regex=True)
country = ['2007',  '2008', '2009', '2010', '2011', '2012', '2013', '2014']
for i in country:
  df_country[i] = df_country[i].astype(int)
df_petition = df_country.sum(numeric_only=True, axis=0)
df_petition['Country'] = 'All Countries'
df_petition = df_country.append(df_petition, ignore_index=True)
df_petition = df_petition.iloc[-1:]
df_petition = df_petition.reset_index(drop=True)
df_petition=df_petition.transpose()
df_petition.columns = ["Count"]
df_petition.insert(0, "Fiscal_Year", df_petition.index)
df_petition=df_petition.reset_index(drop=True)
df_petition = df_petition.iloc[1:]
df_petition.reset_index(inplace=True)
df_petition.drop(columns = ['index'],inplace=True)
df_petition['gdp'] = gdp
df_petition['Count'] = pd.to_numeric(df_petition['Count'], errors='coerce')
```

```
df = pd.concat([df_14,df_13,df_12,df_11,df_10,df_09,df_08,df_07], axis=0)
df.reset_index(inplace=True)
df.fillna(0,inplace=True)
df.to_csv('Data_All_Years_modified1.csv')
df_Approval = pd.read_csv('Data_All_Years_modified1.csv', index_col='Fiscal_Year')
df_Approval['Continent_new']=df_Approval['Continent']
df_Approval['Continent_new'] = df_Approval['Continent_new'].replace('Europe',1)
df_Approval['Continent_new'] = df_Approval['Continent_new'].replace('Africa',2)
df_Approval['Continent_new'] = df_Approval['Continent_new'].replace('Asia',3)
df_Approval['Continent_new'] = df_Approval['Continent_new'].replace('North America',4)
df_Approval['Continent_new'] = df_Approval['Continent_new'].replace('Oceania',5)
df_Approval['Continent_new'] = df_Approval['Continent_new'].replace('South America',6)
df_Approval.drop('Continent',axis=1,inplace = True)
df_Approval['Continent'] = df_Approval['Continent_new']
df_Approval.drop('Continent_new',axis=1,inplace = True)
df_Approval.reset_index(inplace=True)
df_Approval= df_Approval[['Fiscal_Year', 'H-1B']]
df_Approval = df_Approval[df_Approval['Fiscal_Year'].between(2007, 2014)].groupby('Fiscal_Year')['H-1B'].sum().reset_index()
df_Approval.columns = ['Fiscal_Year', 'Count']
df_Approval['Count'] = df_Approval['Count'].astype(int).map('{:d}'.format)
df_Approval['gdp'] = gdp
df_Approval['Count'] = pd.to_numeric(df_Approval['Count'], errors='coerce')
```

```
    2015-01-01    3.284636e+06
```

```
X = df_Approval[['Fiscal_Year', 'gdp']]
y = df_Approval['Count']

# Splitting data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)

# Creating linear regression object
ln = LinearRegression()
```

```
lr = LinearRegression()

# Training the model
lr.fit(X_train, y_train)

# Making predictions on the test set
y_pred_test = lr.predict(X_test)

# Predicting for 2015
y_pred_2015_approval = lr.predict([[2015, 18206.02]])
y_pred_2015_approval = int(y_pred_2015_approval[0])
new_row = {'Fiscal_Year': 2015, 'Count': y_pred_2015_approval, 'gdp': 18206.02}
# add the new row to df_approval
df_Approval = df_Approval.append(new_row, ignore_index=True)
df_Approval['Fiscal_Year'] = df_Approval['Fiscal_Year'].astype(int).map('{:d}'.format)
df_Approval['Count'] = df_Approval['Count'].astype(int).map('{:d}'.format)
# Printing the predicted value for 2015
print("Predicted Approval count for 2015:", y_pred_2015_approval)

X = df_petition[['Fiscal_Year', 'gdp']]
y = df_petition['Count']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=0)
lr = LinearRegression()
lr.fit(X_train, y_train)
y_pred_test = lr.predict(X_test)
y_pred_2015_petition = lr.predict([[2015, 18206.02]])
y_pred_2015_petition = int(y_pred_2015_petition[0])
print("Predicted petition count for 2015:", y_pred_2015_petition)
new_row = {'Fiscal_Year': 2015, 'Count': y_pred_2015_petition, 'gdp': 18206.02}
# add the new row to df_approval
df_petition = df_petition.append(new_row, ignore_index=True)
df_petition['Fiscal_Year'] = df_petition['Fiscal_Year'].astype(int).map('{:d}'.format)
df_petition['Count'] = df_petition['Count'].astype(int).map('{:d}'.format)
```

```
    Predicted Approval count for 2015: 172879
    Predicted petition count for 2015: 355474
```

```
df_Approval
```

	Fiscal_Year	Count	gdp
0	2007	154044	14474.23
1	2008	129456	14769.86
2	2009	110357	14478.06
3	2010	117389	15048.96
4	2011	129126	15599.73
5	2012	135515	16253.97
6	2013	153206	16843.19
7	2014	161358	17550.68
8	2015	172879	18206.02

```
df_petition
```

	Fiscal_Year	Count	gdp
0	2007	314621	14474.23
1	2008	285475	14769.86
2	2009	246126	14478.06
3	2010	248272	15048.96
4	2011	268412	15599.73
5	2012	308242	16253.97
6	2013	299690	16843.19
7	2014	325971	17550.68
8	2015	355474	18206.02

✓ 0s completed at 10:07 PM ● ×