GDP_PER_CAPITA

September 9, 2021

1 GDP PER CAPITA - A SHORT ANALYSIS

[2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

1.1 Import the excel file

[3]:
```
xls = pd.ExcelFile('E:\PythonRes\Datasets\gdp_per_capita_20.xlsx')
df1=pd.read_excel(xls,'Sheet1')
df2=pd.read_excel(xls,'Sheet2')
df3=pd.read_excel(xls,'Romania')
```

[88]:
```
print(df1[0:3])
print('---------Transpose---------')
print(df1[0:3].T)
```

```
   TIME  2020
30   RS  5410
1    BG  6600
22   RO  8780
---------Transpose---------
        30    1     22
TIME    RS    BG    RO
2020  5410  6600  8780
```

[90]:
```
df1.describe()
```

[90]:

	2020
count	32.000000
mean	28044.375000
std	19277.556219
min	5410.000000
25%	13587.500000
50%	21365.000000
75%	36040.000000
max	81290.000000

[30]:
```
print(df3[0:1])
```

```
      TIME  2014  2015  2016  2017  2018  2019  2020
0  Romania  7040  7290  7670  8280  8700  9110  8780
```

[92]:
```
#sorting df1 ASC
df1.sort_values(by=['2020'], inplace=True)
print(df1)
```

```
   TIME   2020
30   RS   5410
1    BG   6600
22   RO   8780
10   HR  11500
31   TR  11600
13   LV  12130
16   HU  12640
20   PL  12680
14   LT  13890
5    EE  15010
24   SK  15090
7    EL  16300
21   PT  17200
2    CZ  17340
23   SI  19720
17   MT  20380
8    ES  22350
12   CY  23050
11   IT  24890
9    FR  30610
0    BE  33560
4    DE  34310
19   AT  35610
27   IS  36030
25   FI  36070
18   NL  40160
26   SW  42640
3    DK  48150
29   NO  60820
6    IE  62980
28   LI  68630
15   LU  81290
```

[32]:
```
time1 = df1['TIME']
time2 = df2['TIME']
```

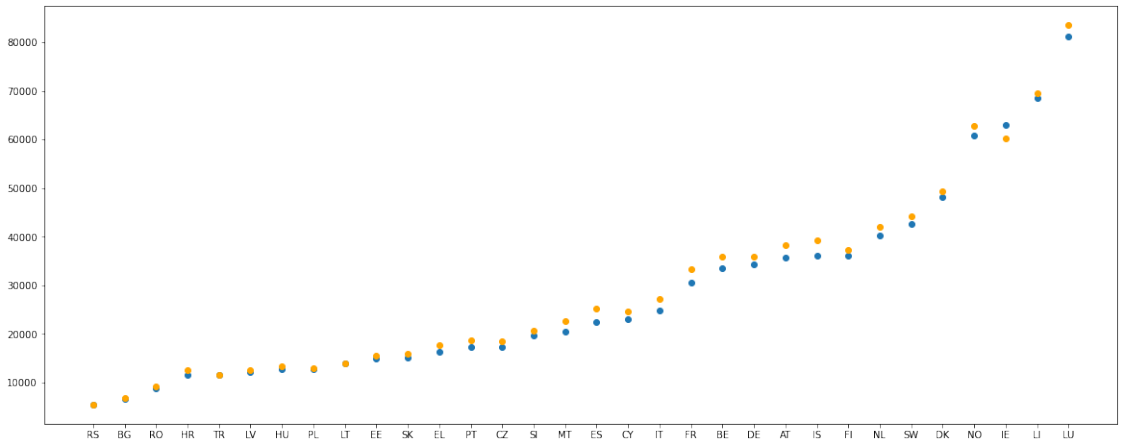
[33]:
```
year1 = df1['2020']
year2 = df2['2019']
```

1.1.1 Calculating the mean and median for df1 and df2

[105]:
```
y_mean1 = [np.mean(year1) for i in time1]
y_mean2 = [np.mean(year2) for i in time2]
y_median2020 = [np.median(year1) for i in time1]
```

1.1.2 Scatter plot -> GDP per capita 2019 and 2020

[158]:
```
plt.figure(figsize=(20,8))
plt.scatter(time1,year1)
plt.scatter(time2,year2,color='orange')
plt.show()
print('orange=GDP per capita 2019')
print('blue=GDP per capita 2020')
```

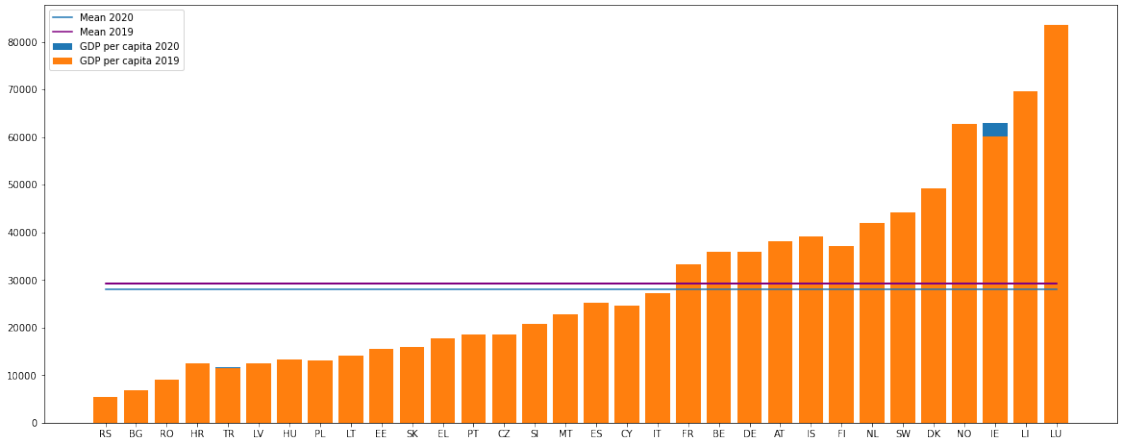



```
orange=GDP per capita 2019
blue=GDP per capita 2020
```

1.1.3 GDP per capita for 32 countries in Europe

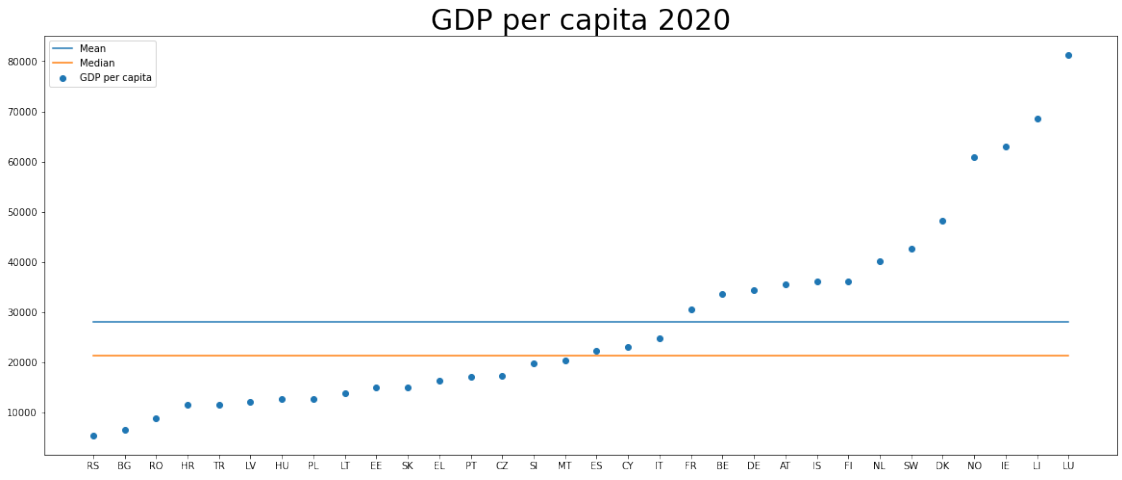
The data is ordered from lowest to highest value

[107]:
```
fig,ax = plt.subplots(figsize=(20,8))
scattered_data1 = ax.bar(time1,year1,label='GDP per capita 2020')
scattered_data2 = ax.bar(time2,year2,label='GDP per capita 2019')
mean_line1 = ax.plot(time1,y_mean1, label='Mean 2020')
mean_line2 = ax.plot(time2,y_mean2, label='Mean 2019', color='purple')
legend = ax.legend(loc='upper left')
```



The average value of GDP per capita was lower in 2020 compared to 2019. The only two countri
GDP per capita in 2020 compared to 2019 were Turkey and Ireland.

[108]:
```
fig,ax = plt.subplots(figsize=(20,8))
scattered_data = ax.scatter(time1,year1,label='GDP per capita')
mean_line = ax.plot(time1,y_mean1, label='Mean')
median_line = ax.plot(time1,y_median2020, label='Median')
legend = ax.legend(loc='upper left')

plt.title(label='GDP per capita 2020', loc='center', fontdict={'fontsize':30})

plt.show()
```



[162]:
```
#df1['zscore'] = (df1['2020']-df1.mean())/df1.std()
#print(df1)
```

```
new_df1 = df1.rename(columns = {'TIME':'CountryID','2020':'Value'}, inplace =␣
 ↪False)
#print(new_df1.Value)
new_df1['zscore'] = (new_df1.Value - new_df1.Value.mean())/new_df1.Value.std()
```

[110]:
```
new_df1.head()
```

[110]:

	CountryID	Value	zscore
30	RS	5410	-1.174131
1	BG	6600	-1.112401
22	RO	8780	-0.999316
10	HR	11500	-0.858220
31	TR	11600	-0.853032

[111]:
```
print('-------------Upper Outliers-------------------')
print(new_df1[new_df1['zscore']>2])
print('----------------------------------------------')
#print(new_df1[new_df1['zscore']<-1])
print('Lichtenstein and Luxembourg are the otliers of this analysis. ')
```

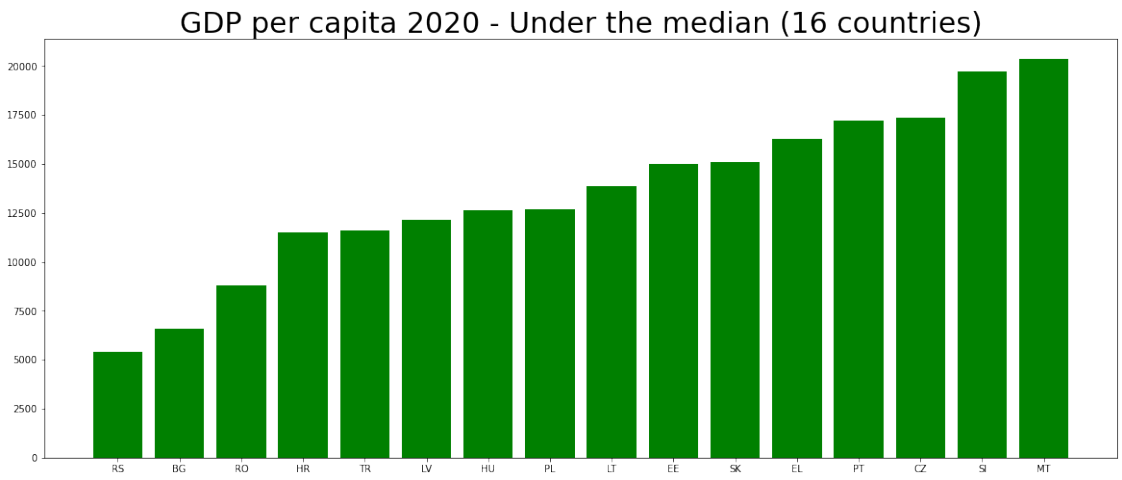
```
-------------Upper Outliers-------------------
   CountryID  Value    zscore
28        LI  68630  2.105330
15        LU  81290  2.762053
----------------------------------------------
Lichtenstein and Luxembourg are the otliers of this analysis.
```

[112]:
```
df1_without_outliers=new_df1[(new_df1.zscore<2)]
```

[113]:
```
#print table with certain columns and without index
df1_without_outliers[['CountryID','Value']].style.hide_index()
```

[113]:
```
<pandas.io.formats.style.Styler at 0x22cb7c83040>
```

[160]:
```
below_mean_df1 = new_df1.iloc[:16,:]
contry_id_df1 = below_mean_df1['CountryID']
value_df1 = below_mean_df1['Value']

plt.figure(figsize=(20,8))
plt.bar(contry_id_df1,value_df1, color='g')
#plt.plot(contry_id_df1,value_df1, color='r')

plt.title(label='GDP per capita 2020 - Under the median (16 countries)',␣
 ↪loc='center', fontdict={'fontsize':30})

plt.show()
```



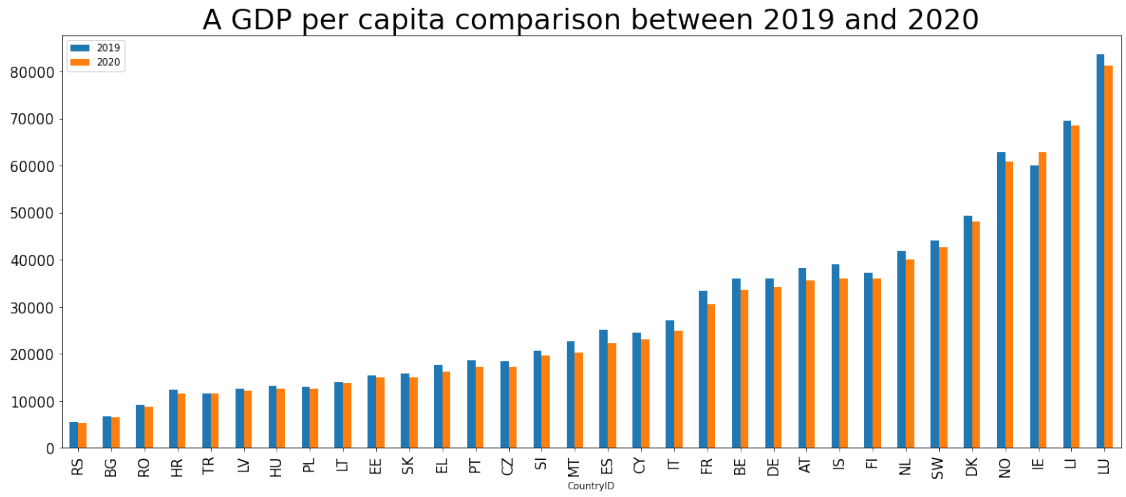
[115]:
```
frames = [df1,df2]
concat = pd.concat(frames, axis=1, join='inner')
concat = concat.loc[:,~concat.columns.duplicated()]
df1df2 = concat.rename(columns = {'TIME':'CountryID'}, inplace = False)
value2020 = df1df2['2020']
value2019 = df1df2['2019']
column = df1df2["CountryID"]
df1df2
```

[115]:

	CountryID	2020	2019
30	RS	5410	5450
1	BG	6600	6840
22	RO	8780	9110
10	HR	11500	12450
31	TR	11600	11500
13	LV	12130	12510
16	HU	12640	13270
20	PL	12680	13020
14	LT	13890	14010
5	EE	15010	15510
24	SK	15090	15860
7	EL	16300	17750
21	PT	17200	18630
2	CZ	17340	18460
23	SI	19720	20720
17	MT	20380	22720
8	ES	22350	25200
12	CY	23050	24530
11	IT	24890	27180
9	FR	30610	33320
0	BE	33560	35950

```
4          DE  34310  35980
19         AT  35610  38170
27         IS  36030  39160
25         FI  36070  37200
18         NL  40160  41980
26         SW  42640  44180
3          DK  48150  49270
29         NO  60820  62800
6          IE  62980  60130
28         LI  68630  69560
15         LU  81290  83640
```

[155]:
```
df1df2.plot(x="CountryID", y=['2019','2020'], kind='bar',figsize=(20,8),␣
↪fontsize=15)
plt.title(label='A GDP per capita comparison between 2019 and 2020',␣
↪loc='center', fontsize=30)
plt.show()
```



[117]:
```
df1df2.describe()
```

[117]:

	2020	2019
count	32.000000	32.000000
mean	28044.375000	29251.875000
std	19277.556219	19499.017748
min	5410.000000	5450.000000
25%	13587.500000	13825.000000
50%	21365.000000	23625.000000
75%	36040.000000	38417.500000
max	81290.000000	83640.000000

1.1.4 The next line delets the 'TIME' cell from the table

[120]:
```
#df3.drop('TIME', axis='columns',inplace=True)
```

[119]:
```
df3.index=['Romania']
print(df3)
```

```
         2014  2015  2016  2017  2018  2019  2020
Romania  7040  7290  7670  8280  8700  9110  8780
```

[40]:
```
df3.loc['Romania']   #echivalent cu df3.iloc[0], ptr ca e primul rand
print(df3.loc['Romania'])
df3
```

```
2014    7040
2015    7290
2016    7670
2017    8280
2018    8700
2019    9110
2020    8780
Name: Romania, dtype: int64
```

[40]:

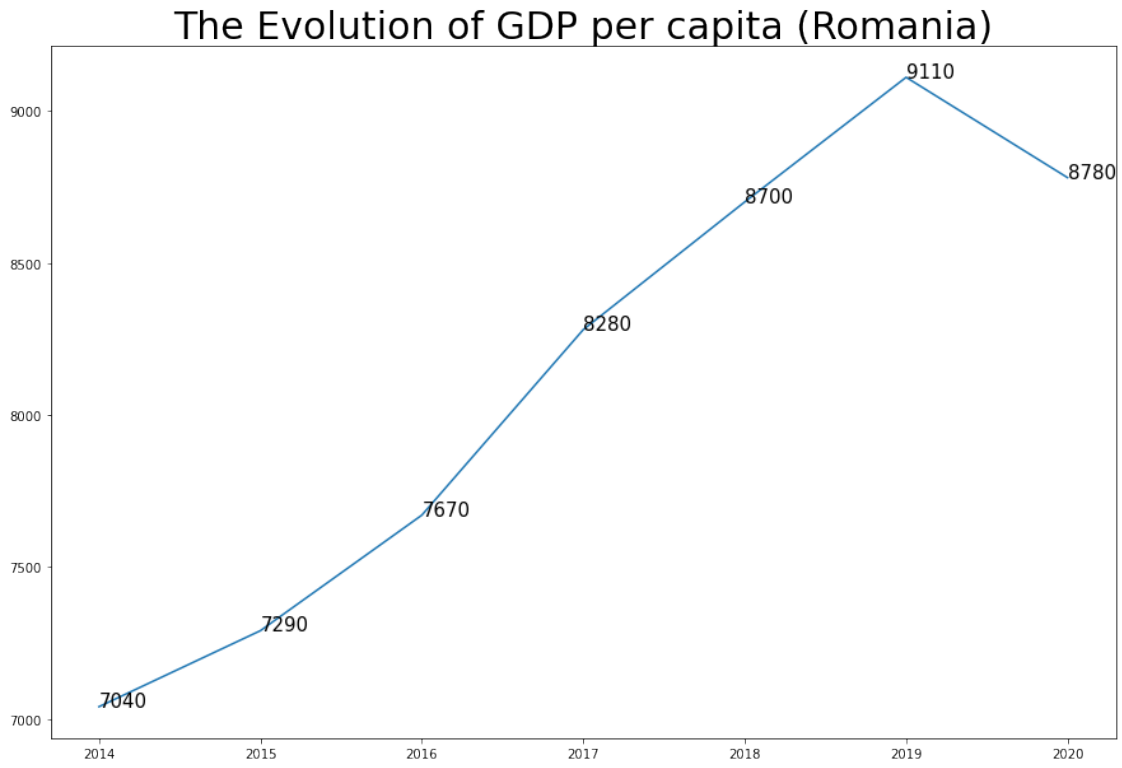
	2014	2015	2016	2017	2018	2019	2020
Romania	7040	7290	7670	8280	8700	9110	8780

[121]:
```
x = np.arange(2014,2021,1).tolist()
print(x)
list_values_y=pd.Index.tolist(df3.loc['Romania'])
print(list_values_y)

#reference year 2014
y = [ x for x in df3.loc['Romania']-df3.at['Romania','2014']]
print(y)
```

```
[2014, 2015, 2016, 2017, 2018, 2019, 2020]
[7040, 7290, 7670, 8280, 8700, 9110, 8780]
[0, 250, 630, 1240, 1660, 2070, 1740]
```

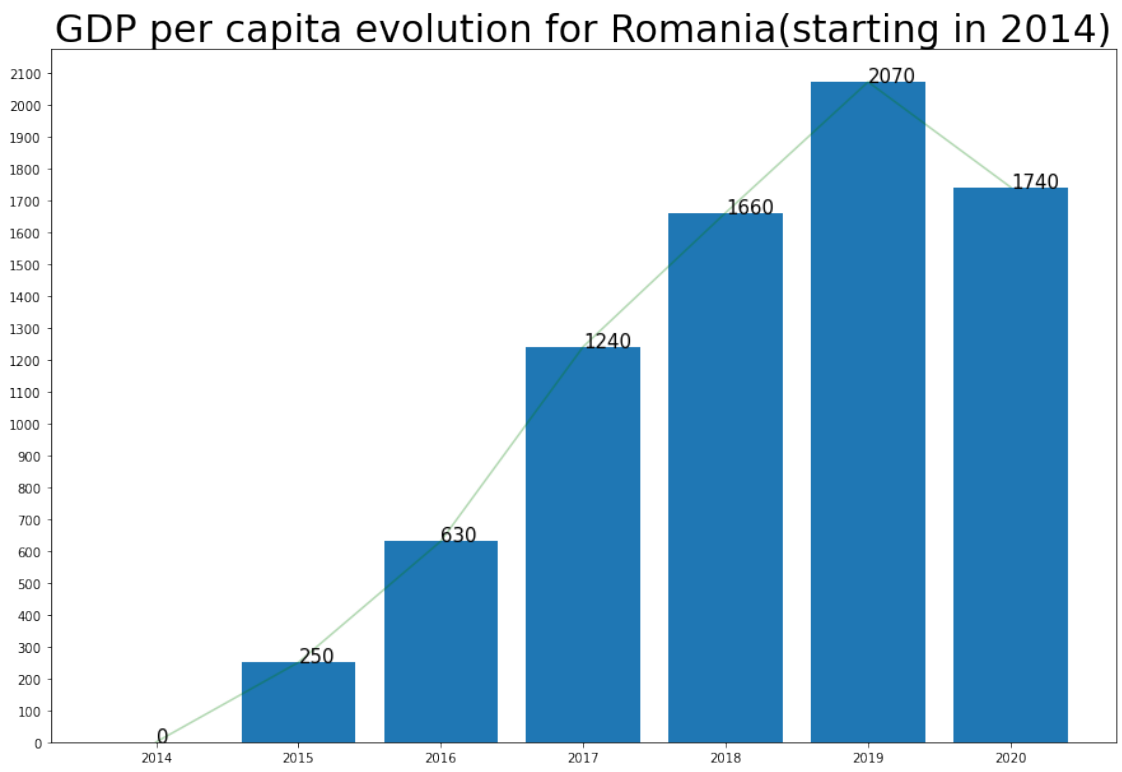
[149]:
```
fig = plt.subplots(figsize=(15,10))
#plt.yticks(np.arange(y.min(), y.max()+100, 100))

# for line_value in df3.loc['Romania']:
#     plt.axhline(y=line_value,alpha=0.5, ls='--')
# for line_value in x:
#     plt.axvline(x=line_value,alpha=0.5, ls='--')

for i,j in zip(x,list_values_y):
    inplot = plt.annotate(str(j),xy=(i,j),fontsize=15,color='black')
```

```
plt.title(label='The Evolution of GDP per capita (Romania)', loc='center',␣
 ↪fontdict={'fontsize':30})
plt.plot(x,list_values_y)
plt.show()
```



As can be seen in the chart above, Romania's GDP per capita increased steadily between 2014 and

[122]:
```
fig = plt.subplots(figsize=(15,10))
plt.yticks(np.arange(0, max(y)+100, 100))
plt.bar(x,y,bottom=0)
plt.plot(x,y,color='g',alpha=0.3)
#plt.axhline(y=250,alpha=0.5, ls='--')
plt.title(label='GDP per capita evolution for Romania(starting in 2014)',␣
 ↪loc='center', fontdict={'fontsize':30})
for i,j in zip(x,y):
    inplot = plt.annotate(str(j),xy=(i,j),fontsize=15,color='black')
plt.show()
```



The highest increase in Romania's GDP per capita compared to 2014 was in 2019 (2070 euros)

[ ]: