Daniel_Jackson_module08_Python_Project

August 23, 2023

Python Project

Daniel Jackson

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Project Instructions: You are a data scientist and would like to know where the top 5 places in the world (country or city) where your salary will go the farthest with respect to each individual index within the cost_of_living.csv file. Provide a simple statistical analysis in a Jupyter Notebook file and provide visualizations to support your analysis (I am looking for data wrangling more than anything).

Import libraries and CSV/Excel files we will be using:

[389]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from matplotlib.ticker import StrMethodFormatter
import pycountry

cost_of_living_df = pd.read_csv('cost_of_living.csv')
ds_salaries_df = pd.read_csv('ds_salaries.csv')
levels_salary_df = pd.read_csv('Levels_Fyi_Salary_Data.csv')

# Used pip install pip install openpyxl to read in excel files into Python
country_codes_df = pd.read_excel('country_codes.xlsx')
```

[390]:
```
# Run a code to find where our reference point cities will be. Need to figure out
coli_city_ref = cost_of_living_df[cost_of_living_df['Cost of Living Index'] ==␣
 ↪100]
print(coli_city_ref['City'])
```

```
13    New York, NY, United States
Name: City, dtype: object
```

Let's say I am a intermediate level Data Scientist making $100,000 living in New York City (our reference point city). For example: If cost of living index is 120 somewhere, then cost of living is 20% higher than in New York. If cost of living index is 80, then cost of living is 20% lower than in New York. Where is my money going the furthest?

[391]:
```
# Let's look at cost_of_living_df
cost_of_living_df = cost_of_living_df.sort_values(by='City')
# Drop Rank column
cost_of_living_df.drop('Rank', axis=1, inplace=True)
cost_of_living_df.head()
```

[391]:
```
                                City  Cost of Living Index  Rent Index  \
295                  Aachen, Germany                 61.81       21.74
44                  Aalborg, Denmark                 82.43       23.26
282         Aberdeen, United Kingdom                 63.40       23.06
367             Abidjan, Ivory Coast                 47.06       19.73
308  Abu Dhabi, United Arab Emirates                 57.89       91.80

     Cost of Living Plus Rent Index  Groceries Index  Restaurant Price Index  \
295                           43.03            49.49                   57.99
44                            54.70            71.24                   93.27
282                           44.49            47.87                   77.47
367                           34.25            40.32                   32.22
308                           73.79            49.79                   58.49

     Local Purchasing Power Index
295                        116.48
44                         100.93
282                        102.02
367                          6.27
308                         75.22
```

[392]:
```
# Create two new data frames for in and out of US (US cost and offshore cost)
substring = 'United States'
filter = cost_of_living_df['City'].str.contains(substring)
us_cost_of_living_df = cost_of_living_df[filter].copy()
off_cost_of_living_df = cost_of_living_df[~filter].copy()
us_cost_of_living_df.head()
```

[392]:
```
                               City  Cost of Living Index  Rent Index  \
293        Akron, OH, United States                 62.20       22.90
167       Albany, NY, United States                 71.49       34.70
281  Albuquerque, NM, United States                 63.44       33.91
23     Anchorage, AK, United States                 91.23       39.29
190    Ann Arbor, MI, United States                 70.28       47.97

     Cost of Living Plus Rent Index  Groceries Index  Restaurant Price Index  \
293                           43.78            63.55                   55.56
167                           54.24            69.53                   78.98
281                           49.60            64.60                   64.07
23                            66.88            97.95                   78.76
190                           59.82            74.16                   63.62
```

```
     Local Purchasing Power Index
293                        102.89
167                        129.75
281                        122.44
23                         118.63
190                        159.99
```

[393]:

```
off_cost_of_living_df.head()
```

[393]:

```
                                City  Cost of Living Index  Rent Index  \
295                  Aachen, Germany                 61.81       21.74
44                  Aalborg, Denmark                 82.43       23.26
282         Aberdeen, United Kingdom                 63.40       23.06
367              Abidjan, Ivory Coast                 47.06       19.73
308  Abu Dhabi, United Arab Emirates                 57.89       91.80

     Cost of Living Plus Rent Index  Groceries Index  Restaurant Price Index  \
295                           43.03            49.49                   57.99
44                            54.70            71.24                   93.27
282                           44.49            47.87                   77.47
367                           34.25            40.32                   32.22
308                           73.79            49.79                   58.49

     Local Purchasing Power Index
295                        116.48
44                         100.93
282                        102.02
367                          6.27
308                         75.22
```

[394]:

```
# Split city column into multiple columns: City, State, Country for US and City,␣
 ↪Country for Offshore
us_cost_of_living_df[['City', 'State', 'Country']] =␣
 ↪us_cost_of_living_df['City'].str.split(',',expand = True)
us_cost_of_living_df = us_cost_of_living_df.reset_index(drop = True)
off_cost_of_living_df[['City','Country']] = off_cost_of_living_df['City'].str.
 ↪split(',', n = 1, expand = True)
us_cost_of_living_df.head()
```

[394]:

```
          City  Cost of Living Index  Rent Index  \
0        Akron                 62.20       22.90
1       Albany                 71.49       34.70
2  Albuquerque                 63.44       33.91
3    Anchorage                 91.23       39.29
4    Ann Arbor                 70.28       47.97
```

```
   Cost of Living Plus Rent Index  Groceries Index  Restaurant Price Index  \
0                           43.78            63.55                   55.56
1                           54.24            69.53                   78.98
2                           49.60            64.60                   64.07
3                           66.88            97.95                   78.76
4                           59.82            74.16                   63.62

   Local Purchasing Power Index State        Country
0                        102.89    OH  United States
1                        129.75    NY  United States
2                        122.44    NM  United States
3                        118.63    AK  United States
4                        159.99    MI  United States
```

[395]:

```
off_cost_of_living_df.head()
```

[395]:

```
          City  Cost of Living Index  Rent Index  \
295     Aachen                 61.81       21.74
44     Aalborg                 82.43       23.26
282   Aberdeen                 63.40       23.06
367    Abidjan                 47.06       19.73
308  Abu Dhabi                 57.89       91.80

     Cost of Living Plus Rent Index  Groceries Index  Restaurant Price Index  \
295                           43.03            49.49                   57.99
44                            54.70            71.24                   93.27
282                           44.49            47.87                   77.47
367                           34.25            40.32                   32.22
308                           73.79            49.79                   58.49

     Local Purchasing Power Index                Country
295                        116.48                Germany
44                         100.93                Denmark
282                        102.02         United Kingdom
367                          6.27            Ivory Coast
308                         75.22   United Arab Emirates
```

[396]:

```
# Find means of each column for each data frame
us_avg = us_cost_of_living_df.mean(numeric_only = True)
print(us_avg)
```

```
Cost of Living Index               73.252000
Rent Index                         46.378105
Cost of Living Plus Rent Index     60.654421
Groceries Index                    74.003684
Restaurant Price Index             72.332842
Local Purchasing Power Index      117.364000
dtype: float64
```

[397]:
```
off_avg = off_cost_of_living_df.mean(numeric_only = True)
print(off_avg)
```

```
Cost of Living Index              54.451263
Rent Index                        22.770518
Cost of Living Plus Rent Index    39.600870
Groceries Index                   49.547101
Restaurant Price Index            50.818219
Local Purchasing Power Index      62.484493
dtype: float64
```

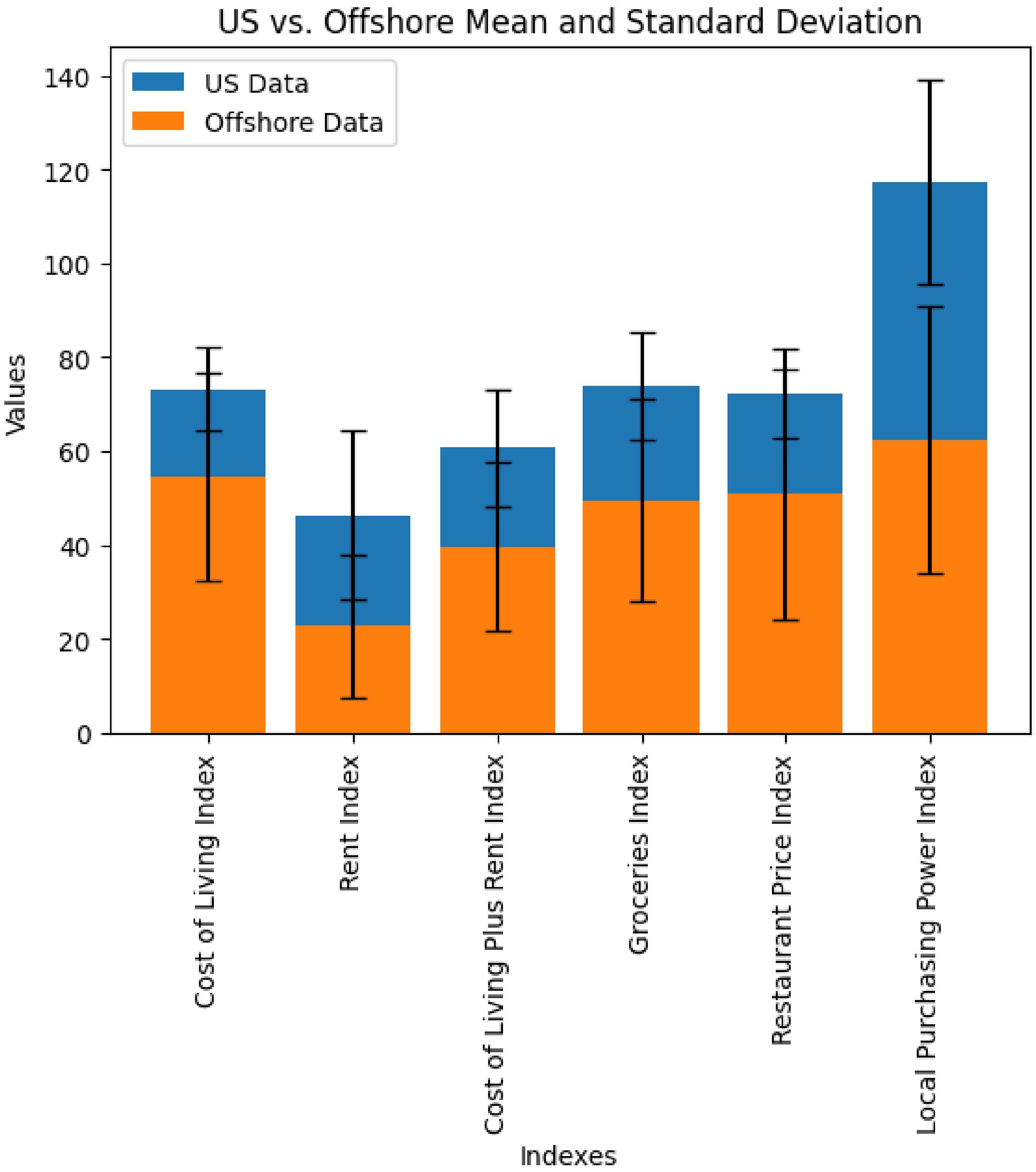
[398]:
```
# Find standard deviation of each column for each data frame
us_stand_dev = us_cost_of_living_df.std(numeric_only = True)
print(us_stand_dev)
```

```
Cost of Living Index               9.013655
Rent Index                        17.834354
Cost of Living Plus Rent Index    12.409951
Groceries Index                   11.454642
Restaurant Price Index             9.351185
Local Purchasing Power Index      21.621612
dtype: float64
```

[399]:
```
off_stand_dev = off_cost_of_living_df.std(numeric_only = True)
print(off_stand_dev)
```

```
Cost of Living Index              22.076649
Rent Index                        15.074494
Cost of Living Plus Rent Index    18.020702
Groceries Index                   21.491912
Restaurant Price Index            26.598407
Local Purchasing Power Index      28.521335
dtype: float64
```

[400]:
```
# Plot mean and standard deviation of both US and Offshore data sets
plt.bar(us_avg.index, us_avg.values, yerr = us_stand_dev, capsize = 5, label =␣
 ↪'US Data')
plt.bar(off_avg.index, off_avg.values, yerr = off_stand_dev, capsize = 5, label␣
 ↪= 'Offshore Data')
plt.xlabel('Indexes')
plt.xticks(rotation = 90)
plt.ylabel('Values')
plt.title('US vs. Offshore Mean and Standard Deviation')
plt.legend()
plt.show()
```



The averages of each US index is higher than the averages of each Offshore index. The long bar in Local Purchasing power Index represents high variability compared to the shorter bars in the other indexes. The error bar only overlaps in Local Purchasing Power index, which indicates a very large difference between the means of the US and Offshore data.

Let's merge the cost_of_living_df and the country_codes_df

[401]:
```
def split_city(city):
    parts = city.split(',')
    if len(parts) == 3:
        return pd.Series(parts, index=['city', 'State', 'Country'])
    elif len(parts) == 2:
        return pd.Series(parts, index=['city', 'Country'])

# Apply the function to each row of the 'City' column
split_columns = cost_of_living_df['City'].apply(split_city)

# Concatenate the split columns with the original DataFrame
cost_of_living_df = pd.concat([cost_of_living_df, split_columns], axis=1)

# Drop the original 'City' column
cost_of_living_df.drop('City', axis=1, inplace=True)
cost_of_living_df.head()
```

[401]:
```
     Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
295                 61.81       21.74                           43.03
44                  82.43       23.26                           54.70
282                 63.40       23.06                           44.49
367                 47.06       19.73                           34.25
308                 57.89       91.80                           73.79

     Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
295            49.49                   57.99                        116.48
44             71.24                   93.27                        100.93
282            47.87                   77.47                        102.02
367            40.32                   32.22                          6.27
308            49.79                   58.49                         75.22

          city                Country State
295     Aachen                Germany   NaN
44     Aalborg                Denmark   NaN
282   Aberdeen         United Kingdom   NaN
367    Abidjan            Ivory Coast   NaN
308  Abu Dhabi   United Arab Emirates   NaN
```

[402]:
```
# Change Country name to Country codes to make merge easier
def map_to_country_code(country_name):
    try:
        country = pycountry.countries.search_fuzzy(country_name)[0]
        return country.alpha_2
    except LookupError:
        return country_name  # Return original name if country code not found
```

```
# Make full country names to country codes using pycountry method we created
cost_of_living_df['Country'] = cost_of_living_df['Country'].
 ↪apply(map_to_country_code)
cost_of_living_df.head()
```

[402]:

```
     Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
295                 61.81       21.74                           43.03
44                  82.43       23.26                           54.70
282                 63.40       23.06                           44.49
367                 47.06       19.73                           34.25
308                 57.89       91.80                           73.79

     Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
295            49.49                   57.99                        116.48
44             71.24                   93.27                        100.93
282            47.87                   77.47                        102.02
367            40.32                   32.22                          6.27
308            49.79                   58.49                         75.22

          city       Country State
295     Aachen            DE   NaN
44     Aalborg            DK   NaN
282   Aberdeen            GB   NaN
367    Abidjan   Ivory Coast   NaN
308  Abu Dhabi            AE   NaN
```

[403]:

```
# Rename 'Country' to 'country_code' to merge after
new_col_name_1 = 'Alpha-2 code'
cost_of_living_df.rename(columns = {'Country': new_col_name_1}, inplace = True)
cost_of_living_df.head()
```

[403]:

```
     Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
295                 61.81       21.74                           43.03
44                  82.43       23.26                           54.70
282                 63.40       23.06                           44.49
367                 47.06       19.73                           34.25
308                 57.89       91.80                           73.79

     Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
295            49.49                   57.99                        116.48
44             71.24                   93.27                        100.93
282            47.87                   77.47                        102.02
367            40.32                   32.22                          6.27
308            49.79                   58.49                         75.22

          city  Alpha-2 code State
295     Aachen            DE   NaN
```

```
44     Aalborg            DK   NaN
282   Aberdeen            GB   NaN
367    Abidjan   Ivory Coast   NaN
308  Abu Dhabi            AE   NaN
```

```
[404]: country_codes_df.head()
```

```
[404]:           Country Alpha-2 code Alpha-3 code  Numeric
       0     Afghanistan           AF          AFG        4
       1         Albania           AL          ALB        8
       2         Algeria           DZ          DZA       12
       3  American Samoa           AS          ASM       16
       4         Andorra           AD          AND       20
```

```
[405]: coli_codes_df = pd.merge(cost_of_living_df, country_codes_df, on = 'Alpha-2␣
        ↪code')
       coli_codes_df.head()
```

```
[405]:    Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
       0                 61.81       21.74                           43.03
       1                 68.51       25.89                           48.53
       2                 68.94       38.59                           54.71
       3                 71.08       30.96                           52.27
       4                 62.24       23.82                           44.23

          Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
       0            49.49                   57.99                        116.48
       1            55.01                   66.96                         79.93
       2            56.41                   61.05                        105.86
       3            53.92                   73.85                         95.72
       4            48.69                   61.63                         77.06

              city Alpha-2 code State  Country Alpha-3 code  Numeric
       0    Aachen           DE   NaN  Germany          DEU      276
       1  Augsburg           DE   NaN  Germany          DEU      276
       2    Berlin           DE   NaN  Germany          DEU      276
       3      Bonn           DE   NaN  Germany          DEU      276
       4    Bremen           DE   NaN  Germany          DEU      276
```

```
[406]: # Merge coli_codes_pdf with ds_salaries_df
       # First, need to filter out ds_salaries_df to only show data scientists, since␣
        ↪that is what we are looking for in our analysis
       ds_salaries_df = ds_salaries_df[ds_salaries_df['job_title'] == 'Data Scientist']
       # 143 Observations
       ds_salaries_df = ds_salaries_df.drop('Unnamed: 0', axis = 1)
       ds_salaries_df = ds_salaries_df.reset_index(drop = True)
       ds_salaries_df.head()
```

[406]:
```
   work_year experience_level employment_type       job_title    salary  \
0       2020               MI              FT  Data Scientist     70000
1       2020               MI              FT  Data Scientist  11000000
2       2020               EN              FT  Data Scientist     45000
3       2020               MI              FT  Data Scientist   3000000
4       2020               EN              FT  Data Scientist     35000

  salary_currency  salary_in_usd employee_residence  remote_ratio  \
0             EUR          79833                 DE             0
1             HUF          35735                 HU            50
2             EUR          51321                 FR             0
3             INR          40481                 IN             0
4             EUR          39916                 FR             0

  company_location company_size
0               DE            L
1               HU            L
2               FR            S
3               IN            L
4               FR            M
```

[407]:
```
# Change 'employee_residence' to 'country_code' so we can merge
new_col_name = 'Alpha-2 code'
ds_salaries_df.rename(columns = {'employee_residence': new_col_name}, inplace =␣
 ↪True)
ds_salaries_df.head()
```

[407]:
```
   work_year experience_level employment_type       job_title    salary  \
0       2020               MI              FT  Data Scientist     70000
1       2020               MI              FT  Data Scientist  11000000
2       2020               EN              FT  Data Scientist     45000
3       2020               MI              FT  Data Scientist   3000000
4       2020               EN              FT  Data Scientist     35000

  salary_currency  salary_in_usd Alpha-2 code  remote_ratio company_location  \
0             EUR          79833           DE             0               DE
1             HUF          35735           HU            50               HU
2             EUR          51321           FR             0               FR
3             INR          40481           IN             0               IN
4             EUR          39916           FR             0               FR

  company_size
0            L
1            L
2            S
3            L
4            M
```

[408]:

```
coli_codes_sal_df = pd.merge(coli_codes_df, ds_salaries_df, on = 'Alpha-2 code')
coli_codes_sal_df.head()
```

[408]:

```
   Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
0                 61.81       21.74                           43.03
1                 61.81       21.74                           43.03
2                 61.81       21.74                           43.03
3                 61.81       21.74                           43.03
4                 61.81       21.74                           43.03

   Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
0            49.49                   57.99                        116.48
1            49.49                   57.99                        116.48
2            49.49                   57.99                        116.48
3            49.49                   57.99                        116.48
4            49.49                   57.99                        116.48

     city Alpha-2 code State  Country  ... work_year  experience_level  \
0  Aachen           DE   NaN  Germany  ...      2020                MI
1  Aachen           DE   NaN  Germany  ...      2020                EN
2  Aachen           DE   NaN  Germany  ...      2020                EN
3  Aachen           DE   NaN  Germany  ...      2021                MI
4  Aachen           DE   NaN  Germany  ...      2021                MI

   employment_type       job_title salary salary_currency  salary_in_usd  \
0               FT  Data Scientist  70000             EUR          79833
1               FT  Data Scientist  55000             EUR          62726
2               FT  Data Scientist  43200             EUR          49268
3               FT  Data Scientist  76760             EUR          90734
4               FT  Data Scientist  52000             EUR          61467

  remote_ratio  company_location  company_size
0            0                DE             L
1           50                DE             S
2            0                DE             S
3           50                DE             L
4           50                AT             M

[5 rows x 22 columns]
```

[409]:

```
# Add new column, 'weighted_sal_usd' which is the weighted salary in USD dollars␣
↪based on the cost of living index
coli_codes_sal_df['weighted_sal_usd'] = ((coli_codes_sal_df['Cost of Living␣
↪Index']*coli_codes_sal_df['salary_in_usd'])/100).round()
coli_codes_sal_df.head()
```

[409]:

```
   Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
0                 61.81       21.74                           43.03   
1                 61.81       21.74                           43.03   
2                 61.81       21.74                           43.03   
3                 61.81       21.74                           43.03   
4                 61.81       21.74                           43.03   

   Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
0            49.49                   57.99                        116.48   
1            49.49                   57.99                        116.48   
2            49.49                   57.99                        116.48   
3            49.49                   57.99                        116.48   
4            49.49                   57.99                        116.48   

     city Alpha-2 code State  Country  ... experience_level  employment_type  \
0  Aachen           DE   NaN  Germany  ...               MI               FT   
1  Aachen           DE   NaN  Germany  ...               EN               FT   
2  Aachen           DE   NaN  Germany  ...               EN               FT   
3  Aachen           DE   NaN  Germany  ...               MI               FT   
4  Aachen           DE   NaN  Germany  ...               MI               FT   

        job_title salary salary_currency salary_in_usd  remote_ratio  \
0  Data Scientist  70000             EUR         79833             0   
1  Data Scientist  55000             EUR         62726            50   
2  Data Scientist  43200             EUR         49268             0   
3  Data Scientist  76760             EUR         90734            50   
4  Data Scientist  52000             EUR         61467            50   

  company_location  company_size  weighted_sal_usd  
0               DE             L           49345.0  
1               DE             S           38771.0  
2               DE             S           30453.0  
3               DE             L           56083.0  
4               AT             M           37993.0  

[5 rows x 23 columns]
```

[410]:

```python
# Plot the weighted income by each country
us_count = coli_codes_sal_df['Alpha-2 code'].value_counts()['US']
print('US count:', us_count)
off_count = len(coli_codes_sal_df['Alpha-2 code']) - us_count
print('Offshore count:', off_count)
# More US data than any other country
```

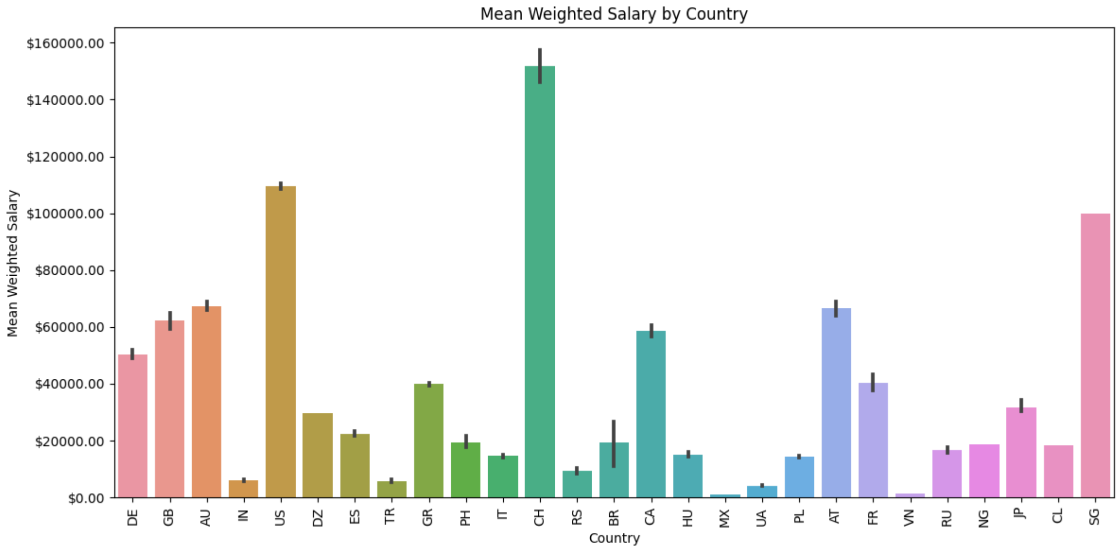
```
US count: 7410
Offshore count: 1340
```

[411]:

```
# Create barplot of Mean Weighted Salaries by country
country_mean_salary = coli_codes_sal_df.groupby('Alpha-2␣
 ↪code')['weighted_sal_usd'].mean()

plt.figure(figsize=(12, 6))
sns.barplot(x = 'Alpha-2 code', y = 'weighted_sal_usd', data = coli_codes_sal_df)
plt.xlabel('Country')
plt.ylabel('Mean Weighted Salary')
plt.title('Mean Weighted Salary by Country')
y_formatter = StrMethodFormatter("${x:.2f}")
plt.gca().yaxis.set_major_formatter(y_formatter)
plt.xticks(rotation = 90)  # Rotate x-axis labels for better readability
plt.tight_layout()

# Display the plot
plt.show()
```



China has the highest mean weighted salary in USD, the US is second, and Singapore is third. These countries have relatively high salaries.

Based on this bar plot, I will look at China, US and Singapore data to see what the top 5 places to live where my income will go the farthest.

[412]:

```
# Filter the data so it only has China, US and Singapore Intermediate level data␣
 ↪science jobs for Medium sized companies
condition1 = coli_codes_sal_df['Alpha-2 code'].isin(['CH', 'US', 'SG'])
condition2 = coli_codes_sal_df['experience_level'] == 'MI'
condition3 = coli_codes_sal_df['company_size'] == 'M'
subset_df = coli_codes_sal_df[condition1 & condition2 & condition3]
```

```
subset_df.head()
```

```
[412]:       Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
       981                   62.2        22.9                           43.78
       983                   62.2        22.9                           43.78
       990                   62.2        22.9                           43.78
       1001                  62.2        22.9                           43.78
       1002                  62.2        22.9                           43.78

             Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
       981             63.55                   55.56                        102.89
       983             63.55                   55.56                        102.89
       990             63.55                   55.56                        102.89
       1001            63.55                   55.56                        102.89
       1002            63.55                   55.56                        102.89

              city Alpha-2 code State                         Country  ...  \
       981   Akron           US    OH  United States of America (the)  ...
       983   Akron           US    OH  United States of America (the)  ...
       990   Akron           US    OH  United States of America (the)  ...
       1001  Akron           US    OH  United States of America (the)  ...
       1002  Akron           US    OH  United States of America (the)  ...

            experience_level  employment_type       job_title  salary  \
       981                MI               FT  Data Scientist  118000
       983                MI               FT  Data Scientist  138350
       990                MI               FT  Data Scientist  150000
       1001               MI               FT  Data Scientist  130000
       1002               MI               FT  Data Scientist   90000

            salary_currency salary_in_usd  remote_ratio company_location  \
       981              USD        118000           100               US
       983              USD        138350           100               US
       990              USD        150000           100               US
       1001             USD        130000             0               US
       1002             USD         90000             0               US

             company_size  weighted_sal_usd
       981              M           73396.0
       983              M           86054.0
       990              M           93300.0
       1001             M           80860.0
       1002             M           55980.0

       [5 rows x 23 columns]
```

```
[413]: print('There are',len(subset_df), 'observations in subset dataframe.')
```

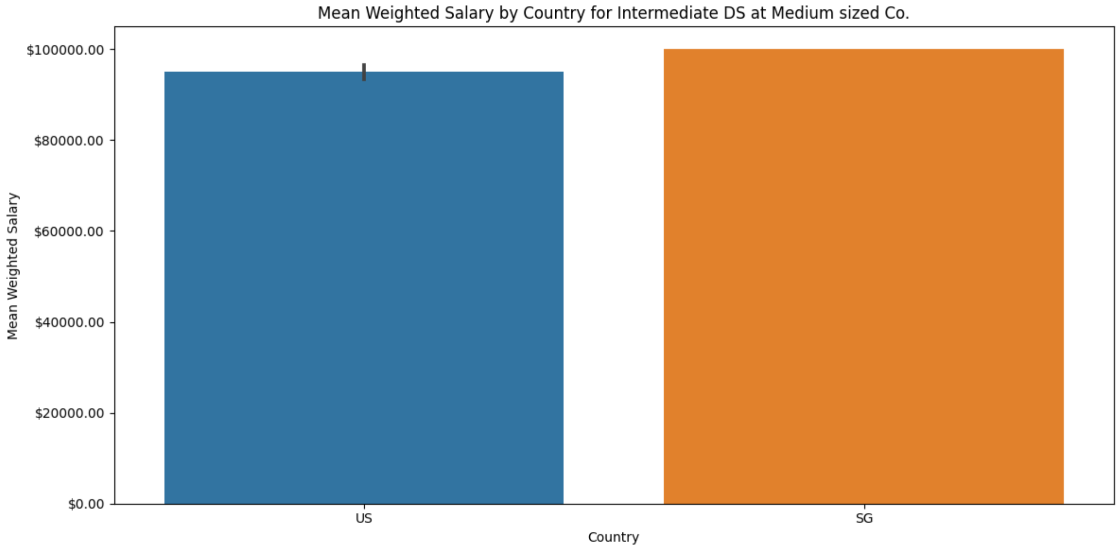
```
There are 1141 observations in subset dataframe.
```

[415]:

```
# Create barplot of Mean Weighted Salaries by country for Intermediate DS at␣
 ↪Medium sized companies
country_mean_salary_subset = subset_df.groupby('Alpha-2␣
 ↪code')['weighted_sal_usd'].mean()

plt.figure(figsize=(12, 6))
sns.barplot(x='Alpha-2 code', y='weighted_sal_usd', data = subset_df)
plt.xlabel('Country')
plt.ylabel('Mean Weighted Salary')
plt.title('Mean Weighted Salary by Country for Intermediate DS at Medium sized␣
 ↪Co.')
y_formatter = StrMethodFormatter("${x:.2f}")
plt.gca().yaxis.set_major_formatter(y_formatter)
plt.tight_layout()

# Display the plot
plt.show()
```



Only US and Singapore is in this data frame. Average weighted salaries are almost identical.

[416]:

```
# Since New York COLI is 100, I do not want to be at or over 100. However, we do␣
 ↪not want to be too low on the COLI, becuase quality of life could be affected.␣
 ↪Let's subset data again to where COLI is lower than 100 but purchasing power␣
 ↪is still over 100. And is not in New York
```

```
condition_1 = (subset_df['Cost of Living Index'] >= 70) & (subset_df['Cost of␣
 ↪Living Index'] <= 80)
condition_2 = subset_df['Local Purchasing Power Index'] > 100
condition_3 = subset_df['State'].str.strip() != 'NY'

subset_df = subset_df[condition_1 & condition_2 & condition_3]
subset_df.head()
```

[416]:

```
      Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
1293                 70.28       47.97                           59.82
1295                 70.28       47.97                           59.82
1302                 70.28       47.97                           59.82
1313                 70.28       47.97                           59.82
1314                 70.28       47.97                           59.82

      Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
1293            74.16                   63.62                        159.99
1295            74.16                   63.62                        159.99
1302            74.16                   63.62                        159.99
1313            74.16                   63.62                        159.99
1314            74.16                   63.62                        159.99

           city Alpha-2 code State                         Country  ...  \
1293  Ann Arbor           US    MI  United States of America (the)  ...
1295  Ann Arbor           US    MI  United States of America (the)  ...
1302  Ann Arbor           US    MI  United States of America (the)  ...
1313  Ann Arbor           US    MI  United States of America (the)  ...
1314  Ann Arbor           US    MI  United States of America (the)  ...

     experience_level  employment_type       job_title  salary  \
1293               MI               FT  Data Scientist  118000
1295               MI               FT  Data Scientist  138350
1302               MI               FT  Data Scientist  150000
1313               MI               FT  Data Scientist  130000
1314               MI               FT  Data Scientist   90000

     salary_currency salary_in_usd  remote_ratio company_location  \
1293             USD        118000           100               US
1295             USD        138350           100               US
1302             USD        150000           100               US
1313             USD        130000             0               US
1314             USD         90000             0               US

      company_size  weighted_sal_usd
1293             M           82930.0
1295             M           97232.0
1302             M          105420.0
```

```
1313             M           91364.0
1314             M           63252.0

[5 rows x 23 columns]
```

[417]:

```
print('There are',len(subset_df), 'observations in subset dataframe.')
```

```
There are 348 observations in subset dataframe.
```

[418]:

```
# Filter out duplicate cities to see what we have left then we can rank those␣
 ↪based COLI
filtered_df = subset_df.drop_duplicates(subset='city', keep='first')

filtered_df.head()
```

[418]:

```
      Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
1293                 70.28       47.97                           59.82
1449                 76.60       48.58                           63.47
1605                 73.56       41.68                           58.61
2073                 77.26       48.61                           63.83
2151                 70.06       51.42                           61.32

      Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
1293            74.16                   63.62                        159.99
1449            78.00                   70.94                        130.67
1605            74.65                   73.38                        136.13
2073            77.13                   78.68                        121.26
2151            69.24                   67.63                        144.88

            city Alpha-2 code State                        Country  ...  \
1293   Ann Arbor           US    MI  United States of America (the)  ...
1449     Atlanta           US    GA  United States of America (the)  ...
1605   Baltimore           US    MD  United States of America (the)  ...
2073  Charleston           US    SC  United States of America (the)  ...
2151   Charlotte           US    NC  United States of America (the)  ...

     experience_level  employment_type       job_title  salary  \
1293               MI               FT  Data Scientist  118000
1449               MI               FT  Data Scientist  118000
1605               MI               FT  Data Scientist  118000
2073               MI               FT  Data Scientist  118000
2151               MI               FT  Data Scientist  118000

     salary_currency salary_in_usd  remote_ratio company_location  \
1293             USD        118000           100               US
1449             USD        118000           100               US
1605             USD        118000           100               US
2073             USD        118000           100               US
```

```
2151             USD        118000           100               US

      company_size  weighted_sal_usd
1293             M           82930.0
1449             M           90388.0
1605             M           86801.0
2073             M           91167.0
2151             M           82671.0

[5 rows x 23 columns]
```

[421]:

```
# Reset the index first
filtered_df = filtered_df.reset_index(drop = True)
filtered_df.head()
```

[421]:

```
   Cost of Living Index  Rent Index  Cost of Living Plus Rent Index  \
0                 70.28       47.97                           59.82
1                 76.60       48.58                           63.47
2                 73.56       41.68                           58.61
3                 77.26       48.61                           63.83
4                 70.06       51.42                           61.32

   Groceries Index  Restaurant Price Index  Local Purchasing Power Index  \
0            74.16                   63.62                        159.99
1            78.00                   70.94                        130.67
2            74.65                   73.38                        136.13
3            77.13                   78.68                        121.26
4            69.24                   67.63                        144.88

         city Alpha-2 code State                         Country  ...  \
0   Ann Arbor           US    MI  United States of America (the)  ...
1     Atlanta           US    GA  United States of America (the)  ...
2   Baltimore           US    MD  United States of America (the)  ...
3  Charleston           US    SC  United States of America (the)  ...
4   Charlotte           US    NC  United States of America (the)  ...

  experience_level  employment_type       job_title  salary salary_currency  \
0               MI               FT  Data Scientist  118000             USD
1               MI               FT  Data Scientist  118000             USD
2               MI               FT  Data Scientist  118000             USD
3               MI               FT  Data Scientist  118000             USD
4               MI               FT  Data Scientist  118000             USD

  salary_in_usd  remote_ratio company_location  company_size  weighted_sal_usd
0        118000           100               US             M           82930.0
1        118000           100               US             M           90388.0
2        118000           100               US             M           86801.0
```

```
3        118000            100               US            M          91167.0
4        118000            100               US            M          82671.0

[5 rows x 23 columns]
```

[422]:
```
# Find top 5 cities with higest COLI. We already set parameters on COLI and␣
 ↪purchasing power index in this data frame and filitred properly based on our␣
 ↪data scientist parameters
top_cities = filtered_df.nlargest(5, 'Cost of Living␣
 ↪Index')[['city','State','Cost of Living Index', 'Local Purchasing Power␣
 ↪Index']]
top_cities.head()
```

[422]:
```
            city State  Cost of Living Index  Local Purchasing Power Index
16   Los Angeles    CA                 79.19                        126.12
22  Philadelphia    PA                 79.19                        115.61
18   Minneapolis    MN                 79.08                        114.68
25    Sacramento    CA                 77.88                        101.43
3     Charleston    SC                 77.26                        121.26
```

The top 5 cities where my money as a Mid-level Data Scientist at a Medium sized company making $100,000 will go the farthest:

1. Los Angeles, CA
2. Philadelphia, PA
3. Minneapolis MN
4. Sacramento,CA
5. Charleston, SC

Summary:

We ran a standard deviation test on both US and Offshore data from a macro-view and it looked like that the cost of living in the US was way higher than out of the US. But the local purchasing power index showed that people in the US are buying more goods compared to out of the US, meaning that those markets are more abundant in the US and quality of life is probably better. After setting the paramenters for what sort of Data Scientist that we are (in this case I was a Mid-level Data Scientist at a Medium-sized company making $100,000). The cost of living index was about 21% less than New York in the top city of Los Angeles but the purchasing power was 26% more than New York. Using those two indexes as my main points of emphasis, this is how I came to my conclusion of the top 5 cities where my money will go the farthest.