Global Warming

July 21, 2020

0.1 Is Global Warming a Thing?

This is an attempt to find comparisons between the assumptions that global warming is real or not.

To decide, you'll conduct a study on a 200-year trend from 1813-2013. These samples should be sufficient enough to determine the validity of global warming.

Note: To complete this data report, you will need to calculate the moving average of weather over a period of 200 years. Click here to learn how to calculate moving averages.

Moving Averages are also known as rolling averages

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt


from IPython.display import Image
```

0.2 Retrieve Data

[2]:
```
df_global = pd.read_csv('weather_global.csv')
df_chicago = pd.read_csv('weather_chicago.csv')
```

0.3 Clean Data

Drop 'city' and 'country' columns

[3]:
```
# This WILL change the DataFrame object
df_chicago.drop(['city', 'country'], axis=1, inplace=True)
```

Check for null values

[4]:
```
df_global.isnull().sum()
```

[4]:
```
year        0
avg_temp    0
dtype: int64
```

[5]:
```
df_chicago.isna().sum()
```

[5]:
```
year        0
avg_temp    4
dtype: int64
```

Remove all records with null values

[6]:
```
df_chicago.dropna(inplace=True)
```

[7]:
```
df_chicago.isna().sum()
```

[7]:
```
year        0
avg_temp    0
dtype: int64
```

[8]:
```
df_global.isna().sum()
```

[8]:
```
year        0
avg_temp    0
dtype: int64
```

Convert all Celcius temperatures to Fahrenheit

[9]:
```
df_chicago.avg_temp = df_chicago.avg_temp.apply(lambda temp: round((temp * (9/
↪5)) + 32), 2)
df_global.avg_temp = df_global.avg_temp.apply(lambda temp: round((temp * (9/5))␣
↪+ 32), 2)
```

Trim results to a 200-year time frame

[10]:
```
df_global = df_global.query('year >= 1764 and year <= 2013')
df_chicago = df_chicago.query('year >= 1764 and year <= 2013')
```

Store data inside of new CSV files

[11]:
```
df_chicago.to_csv('clean_chicago.csv', index=False)
df_global.to_csv('clean_global.csv', index=False)
```

Reset the indeces and drop the extra columns that are added by default in both new DataFrames

[12]:
```
df_chicago.reset_index(inplace=True, drop=True)
df_global.reset_index(inplace=True, drop=True)
```

Find the rolling/moving averages of our Chicago temperatures in Spreadsheet

Calculate moving averages using Pandas

[13]:
```
df_chicago.avg_temp.rolling(50).mean()
```

[13]:
```
0        NaN
1        NaN
2        NaN
3        NaN
4        NaN
        ...
245    51.14
246    51.20
247    51.22
248    51.32
249    51.38
Name: avg_temp, Length: 250, dtype: float64
```

[14]:
```
df_chicago['ra_50'] = round(df_chicago.avg_temp.rolling(50).mean(), 2)
df_chicago[df_chicago.ra_50.notnull()].head()
```

[14]:

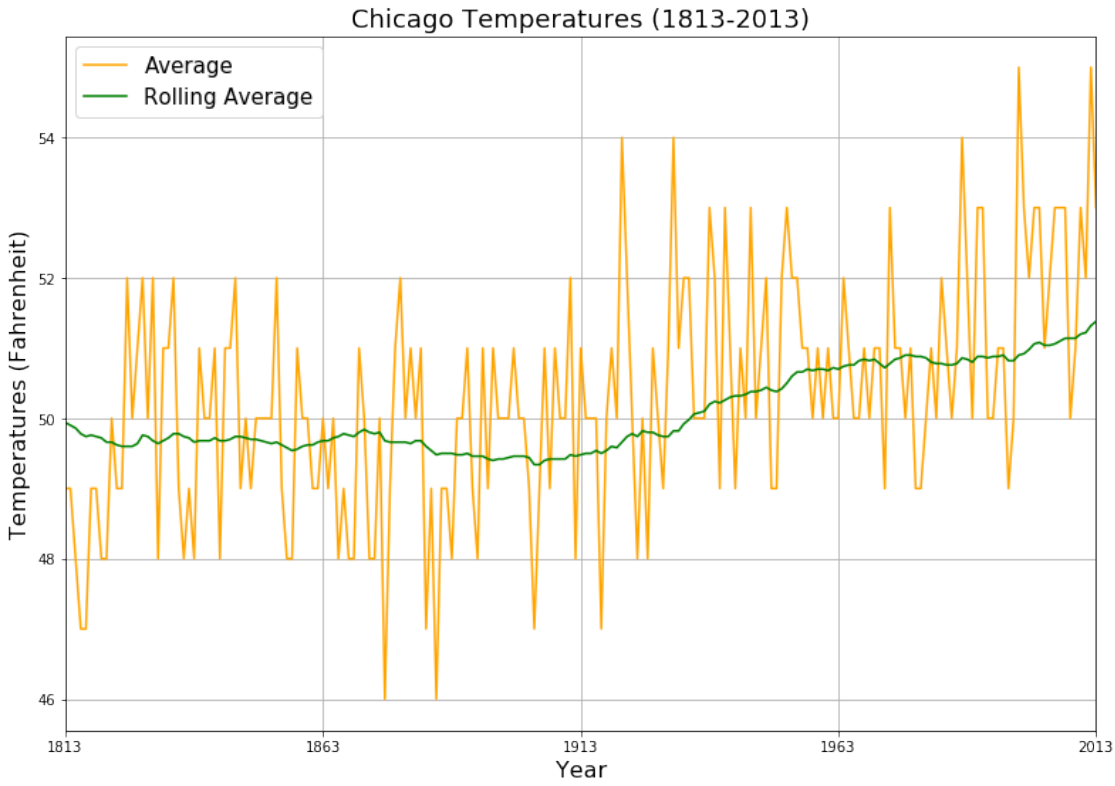
	year	avg_temp	ra_50
49	1813	49	49.94
50	1814	49	49.90
51	1815	48	49.86
52	1816	47	49.78
53	1817	47	49.74

0.4 Visualize my findings

Chicago

[15]:
```
year_range = range(1813, 2014, 50)
year_labels = ['1813', '1863', '1913', '1963', '2013']
```

[16]:
```
plt.subplots(figsize=(13, 9))
plt.grid(True)
plt.plot(df_chicago.year, df_chicago.avg_temp, color='orange')
plt.plot(df_chicago.year, df_chicago.ra_50, color='green')
plt.title('Chicago Temperatures (1813-2013)', fontsize=18)
plt.ylabel('Temperatures (Fahrenheit)', fontsize=16)
plt.xlabel('Year', fontsize=16)
plt.xticks(year_range, year_labels)
plt.xlim(int(year_labels[0]), int(year_labels[-1]))
plt.legend(['Average', 'Rolling Average'], loc='best', prop={'size': 15});
```



Global

[17]:
```
df_global.avg_temp.rolling(50).mean()
```

[17]:
```
0        NaN
1        NaN
2        NaN
3        NaN
4        NaN
       ...
245    48.18
246    48.22
247    48.24
248    48.26
249    48.28
Name: avg_temp, Length: 250, dtype: float64
```

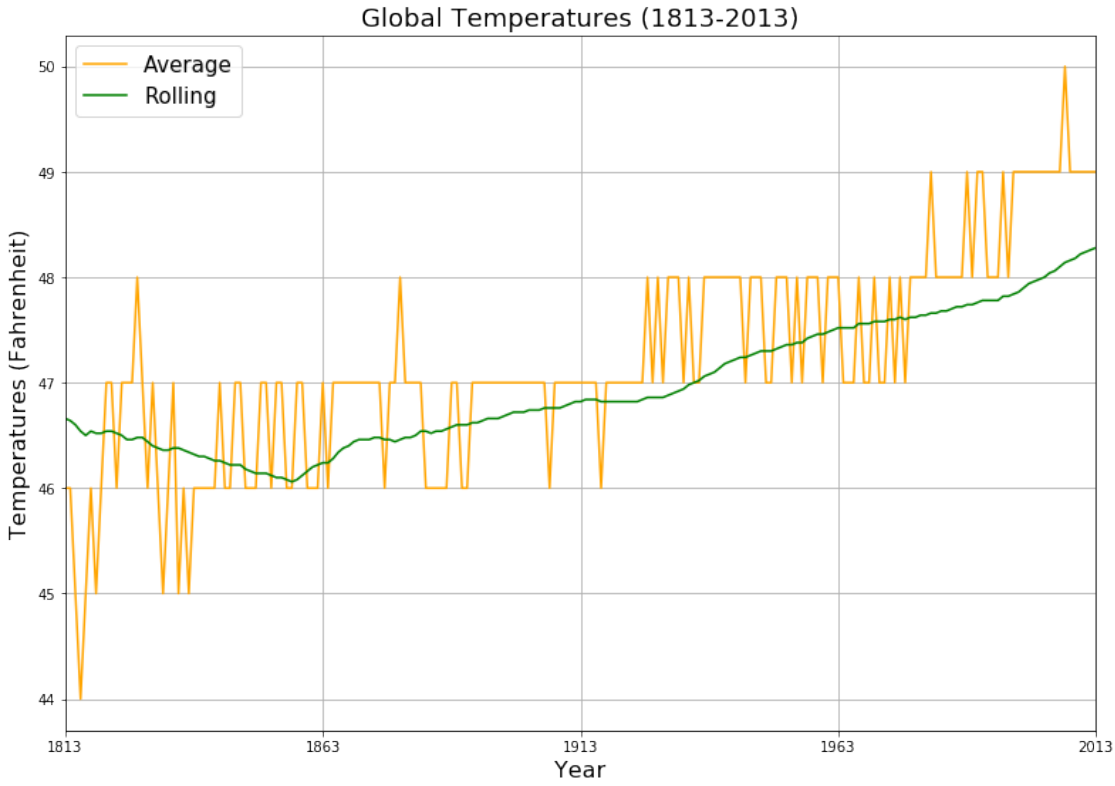
[18]:
```
df_global['ra_50'] = round(df_global.avg_temp.rolling(50).mean(), 2)
df_global[df_global.ra_50.notnull()].head()
```

[18]:

	year	avg_temp	ra_50
49	1813	46	46.66

```
50  1814        46  46.64
51  1815        45  46.60
52  1816        44  46.54
53  1817        45  46.50
```

[19]:
```
plt.subplots(figsize=(13, 9))
plt.grid(True)
plt.plot(df_global.year, df_global.avg_temp, color='orange')
plt.plot(df_global.year, df_global.ra_50, color='green')
plt.title('Global Temperatures (1813-2013)', fontsize=18)
plt.xlabel('Year', fontsize=(16))
plt.ylabel('Temperatures (Fahrenheit)', fontsize=16)
plt.xlim(int(year_labels[0]), int(year_labels[-1]))
plt.xticks(year_range, year_labels)
plt.legend(['Average', 'Rolling'], loc='best', prop={'size': 15});
```



0.5 Conclusions

1) The average global temperate has been slightly colder than that of Chicago's per every 50-year assessment.

2) The average global temperature has had a 'smoother' transition from cooler to warmer temperatures.

3) The temperature fluctuations of that of Chicago seem to show slightly more volatility than global temperatures.

4) Just from looking at the data, one can assume that global warming may be true. Investigations pending...