Project 1: Explore Weather Trends

Outline

Step 1: Use SQL to extract temperature data for NYC and world from the database

```
select cd.year, cd.avg_temp as nyc_temp, gd.avg_temp as global_temp
from city_data cd
join global_data gd on cd.year = gd.year
where cd.city = 'New York' and cd.country = 'United States'
```

Step 2: Use Python for data wrangling

In [1]:
```
# load packages and data
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
temp_df = pd.read_csv('../Downloads/results.csv')
temp_df.head()
```

Out[1]:

	year	nyc_temp	global_temp
0	1750	10.07	8.72
1	1751	10.79	7.98
2	1752	2.81	5.78
3	1753	9.52	8.39
4	1754	9.88	8.47

In [2]:
```
# checking missing data
temp_df.loc[temp_df.isnull().any(axis = 1),:]
```

Out[2]:

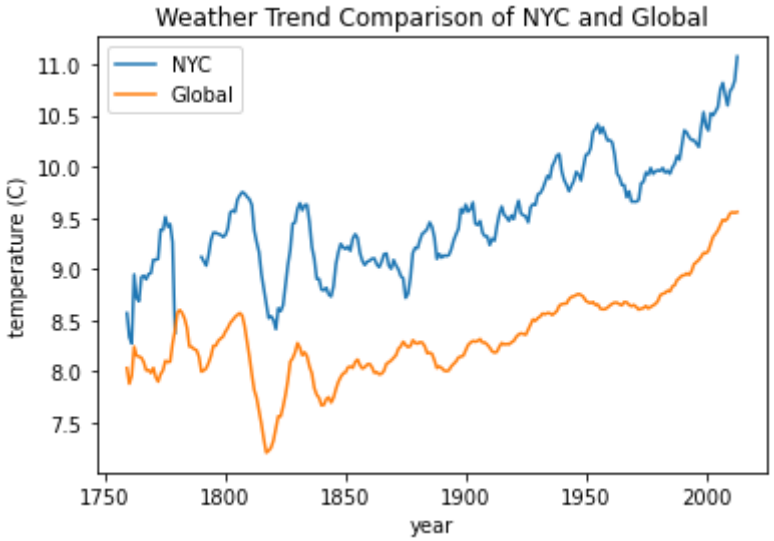
	year	nyc_temp	global_temp
30	1780	NaN	9.43

Step 3: Calculate 10-year simple moving average to smooth out the lines

In [4]:
```
# calculate 10-year moving average
temp_df['nyc_temp_sma'] = temp_df.loc[:,'nyc_temp'].rolling(window = 10)
.mean()
temp_df['global_temp_sma'] = temp_df.loc[:,'global_temp'].rolling(window
= 10).mean()
```

Step 4: Plot the data and make observations

In [10]:
```
# plot out
%matplotlib inline
temp_df.plot(x = 'year', y= ['nyc_temp_sma', 'global_temp_sma'], label =
['NYC','Global']);
plt.ylabel('temperature (C)');
plt.title('Weather Trend Comparison of NYC and Global');
```



In [11]:
```
# calculate the raw correlation from the time series
print(temp_df.nyc_temp.corr(temp_df.global_temp))
```

```
0.5634132512382904
```

In [27]:
```
# difference between NYC and global average
temp_df['diff'] = temp_df.nyc_temp - temp_df.global_temp
print('The mean of difference is', temp_df['diff'].mean(),
      '\nThe variance of difference is',temp_df['diff'].var())
```

```
The mean of difference is 1.1315589353612165
The variance of difference is 0.8270246596813051
```

Observations

- NYC is consistently hotter than the global average
- The temperature change in NYC is following the temperature change in global average closely, the two time series have a correlation of 0.56
- The temperature differences between NYC and global average look stable during this historical time period
- The overall temperature trend for global average is increasing -- meaning the world is getting hotter over time. The trend is not consistent over the last few hundred years, as we can see there is a huge dip at the beginning of 19th century

In [ ]: