Exploring Weather Trends – Project

Data Preparation

Using SQL to pull data from the provided global temperatures DB to achieve the below objectives

1- Finding the largest city nearby

```
SELECT
        *
FROM city_list
WHERE LOWER(country) = 'egypt';
```

2- Extracting local average temperatures for Cairo, Egypt

```
SELECT
        *
FROM city_data
WHERE LOWER(city) = 'cairo';
```

3- Extracting global average temperature

```
SELECT
        *
FROM global_data;
```

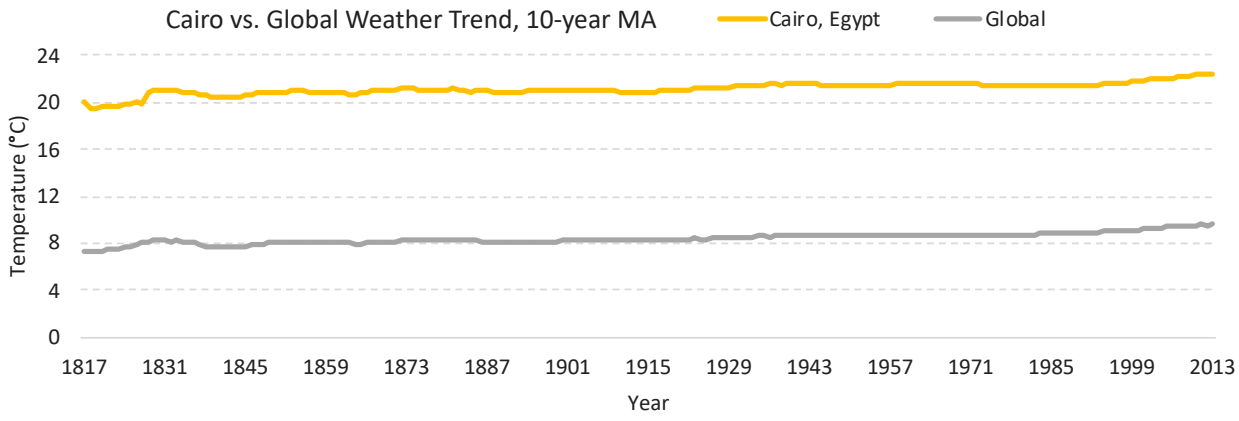
4- An alternative approach is to add points 2 and 3 into one table to reduce later workarounds

```
SELECT
        c.year,
        c.city,
        c.country,
        c.avg_temp AS city_avg_temp,
        g.avg_temp AS global_avg_temp
FROM city_data AS c
JOIN global_data AS g
ON c.year = g.year
AND LOWER(c.city) = 'cairo';
```

Using MS Excel to calculate two extra derivative columns for Cairo and global moving averages to smooth out yearly fluctuations and enhance the overall trend view. A 10-year MA is selected as it better emphasizes the trend while still showing extreme fluctuations/outliers. Accordingly, for every 10 years, the (AVERAGE) function is used to find out the MA for the 10^{th} year. Additional indicators, such as mean difference, standard deviation, and coefficient of correlation, are calculated to help with the observations write-up part.

Visualization

MS Excel is again used to draw a line chart from the data which is shown below. Because this is a trend analysis for quantitative variables, the best way to visualize it is by having a separate line for each variable. Attention is paid to ensure there is no extra clutter and to help maximize Data-Ink ratio.



Observations

- In 1818, Cairo has an outlier of + 11.6 °C whose effect is showing in the chart up to 1828's moving average. This might be attributed to the Tambora eruption. However, the effect on the global average is rather showing in 1816 and is definitely not with the same intensity. Further research should be carried out to decide on how to deal with the outlier.
- As shown in the chart, the average weather conditions in Cairo are always hotter than the global average. This is true with a + 12.77 °C mean difference and a standard deviation of ± 0.77 °C.
- Relatively similar behaviors are apparent between local and global data. The correlation coefficient between Cairo and global yearly averages is 0.58. This suggests that a change in one will moderately predict the change in the other in the same direction.
- Starting from 1830, the overall trend, for both local and global, is almost stable with a hint of positive slope. However, this subtle increase in temperatures has become much more noticeable starting around the 1990s. If this increasing slope persists in the future as in the last couple of decades, it means that there will be more and more increasing average temperatures by then.