Project 1: Exploring Weather Trends

In this project, I will be comparing global temperature trends with local temperature trends of London, UK. The goal is to extract relevant data from a temperature database then analyse and present my findings.

Firstly, SQL was used to extract data from the database then downloaded as csv files.

The global temperature trends were obtained by using the following query then downloaded as a .csv:

```
SELECT *
FROM global_data
```

To locate local trend data, I first needed to lookup what cities were listed within the database. I used the follow query to view which cities in the UK had temperature data:

```
SELECT *
FROM city_list
WHERE country = 'United Kingdom'
```

This gave an output of 5 cities, London would be used for local temperature trends.

London's temperature trends were obtained by using the following query then downloaded as a csv:

```
SELECT *
FROM city_data
WHERE country = 'United Kingdom' AND city = 'London'
```

After downloading both csv files, I combined the data into an Excel workbook by copying the local temperature sheet onto the same workbook as the global temperature trends csv.

In order to visualise the differences in temperature trends, a 10-year moving average was calculated for both datasets. A 10-year moving average (10yr MA) is much more informative than a line chart simply plotting the average temperature for every year as it helps to smooth out outliers and gives a better overview of the overall trend. This was done by calculating the average temperature over 10 years, for example with the function =AVERAGE(B2:B11). Once this had been calculated for the local and global dataset, the temperature trends could be compared.

I plotted the temperature against the year. As the average temperature never dropped below 7°C, the y axis was adjusted to start from 7°C. This allowed me to view the graph in greater detail and visualise trends more easily. The graph is present on the next page.

To better interpret the trends, I have decided to include the correlation coefficient. This will give me a better indication of whether there is a positive correlation between an increase in temperature and an increase in years, and also how strong the correlation is.

To calculate the correlation coefficient, I have used the following formula:
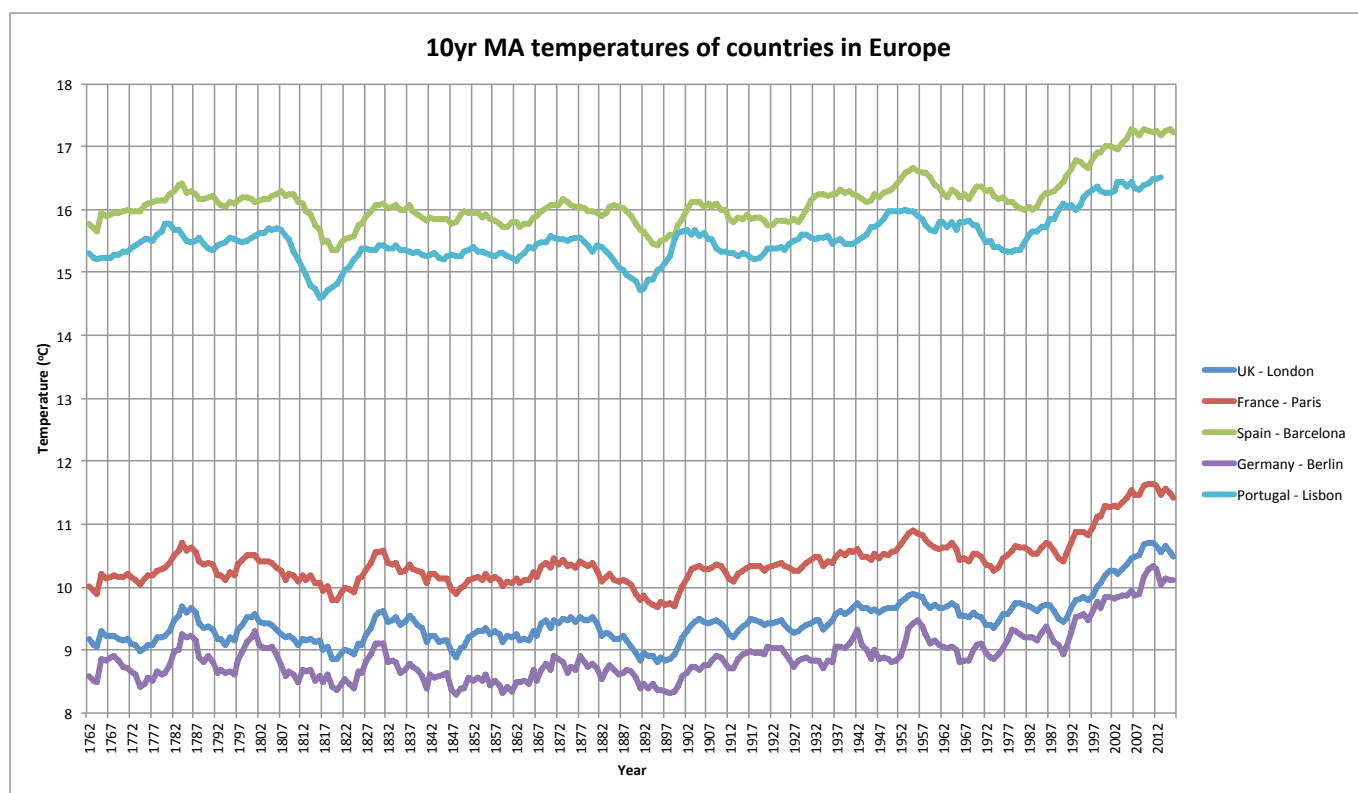
```
=CORREL(A11:A267,C11:C267)
```

This formula is comparing the year found in column A with the 10yr MA found in column C.

The correlation coefficient for global 10yr MA temperature is 0.751 (3 s.f.) whilst for London, this was 0.677 (3 s.f.).
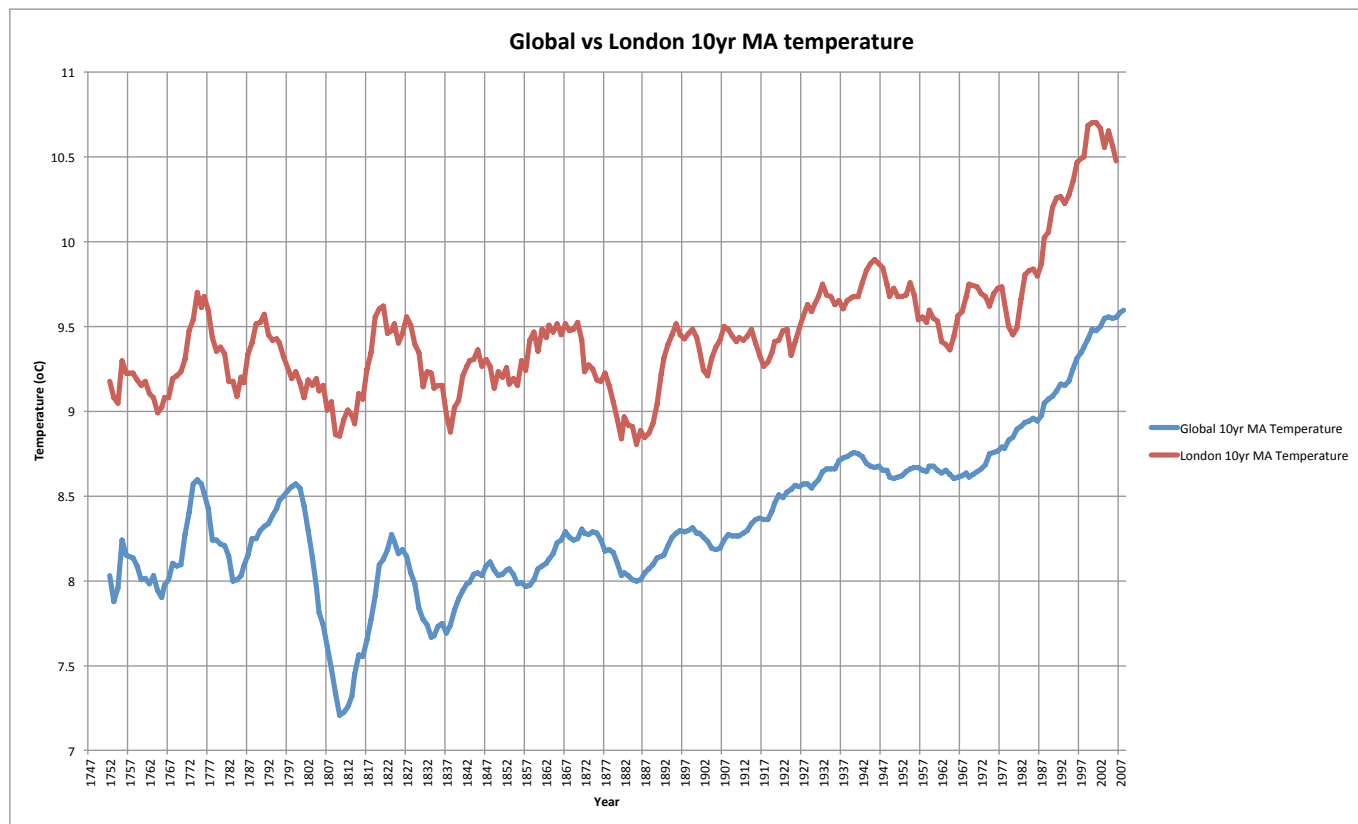
I have also compared the 10yr MA temperatures of 5 countries in Europe.

Their correlation coefficients are as follows:

- UK - London = 0.677 (3 s.f.)
- France - Paris = 0.627 (3 s.f.)
- Spain - Barcelona = 0.563 (3 s.f.)
- Germany - Berlin = 0.633 (3 s.f.)
- Portugal - Lisbon = 0.580 (3 s.f.)

Observations based on 10 year moving averages for temperature:

1. London's 10yr MA temperature is always higher than the global 10yr MA temperature.

2. London's 10yr MA temperature is approximately 1°C higher than the global 10yr MA temperature for the same time period. Therefore, an estimation of London's 10yr MA temperature can be made by adding 1°C to the global average.

3. The global 10yr MA temperature from 1750-1920 has fluctuated by around 1°C from 7.5^{o}C to 8.5^{o}C whilst London's 10yr MA temperature fluctuated around 9°C-10°C from 1750-1990.

4. The lowest global 10yr MA temperature was around 1810. This is much lower than it has even been between 1750-2007.

5. Global 10yr MA temperatures began rising at a rapid pace from 1970-2007, the 10yr MA temperature in 2007 is about 1°C higher than in 1970.

6. London's 10yr MA temperature has also increased rapidly from 1980 to the early 2000s; the London's 10yr MA temperature has also risen by 1°C during this time period.

7. The global 10yr MA temperature is increasing at a faster rate than London. This is because the global correlation coefficient is 0.751 whilst for London it was 0.677. A number closer to 1 indicates a stronger positive correlation.

8. When comparing the 10yr MA temperature for 5 European countries, I found that all 5 countries exhibited the same upward trend around 1990. The average for all of these is now much higher than before, approximately 1°C higher.

9. When comparing the correlation coefficients of UK, France, Spain, Germany and Portugal, every one of these countries exhibited a positive correlation indicating average temperatures are rising. Barcelona and Lisbon however, had the smallest increase as their correlation coefficients were 0.563 and 0.580 respectively. London had the highest rate of increase with a correlation coefficient of 0.677.