Project: Explore Weather Patterns

Prepared by Ian McComiskie

OUTLINE:

- Tools Utilized:
    - MySql was used to extract the data. Source of the dataset is currently unconfirmed and further investigation is required to ensure the veracity. (See appendix for MySql request formulas).
    - Microsoft excel was used to calculate metrics and create visualizations of the data.
- Basis for Analysis:
    - My hometown is Brisbane, Australia denoted as “BNE” in the analysis.
    - Time period used was between 1841 and 2013. This data range was used to maximize the amount of data available for both areas. Note that not all cities have complete data sets and so the GLOBAL temperatures may have some hidden volatility as additional city temperature inputs are included over time.
    - A 20 year moving average (‘MA’) was used in Microsoft Excel to remove any outliers in the data and to view the trend in temperatures over the time period.
    - The 20 year MA temperature data was baselined at 1860 in order to view the comparative changes in the data overtime.
    - 20 year moving volatility and correlation calculated based on raw data (not MA).
    - Additional data extracted for various cities to test a thesis that temperature changes are similar along similar latitudes. I selected only 2 data sources for each latitude due to time restraints.
        - 47 N - Rome & Chicago
        - 35 S - Canberra & Buenos Aires

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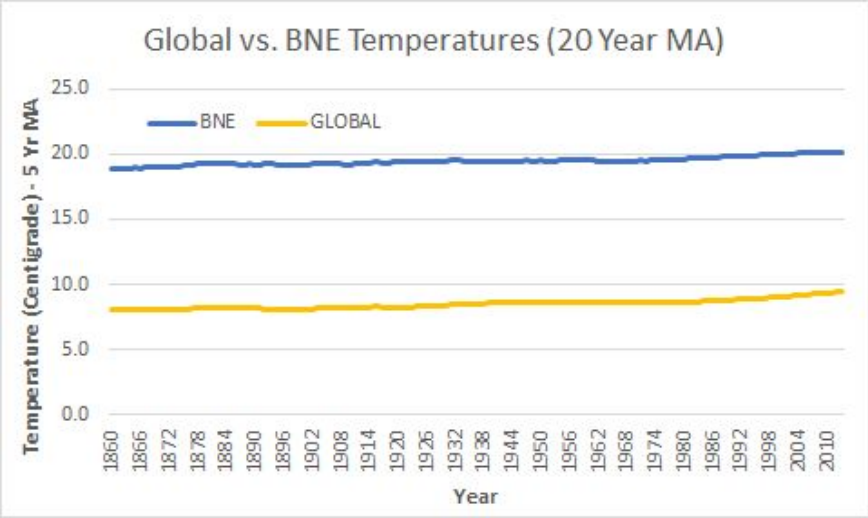
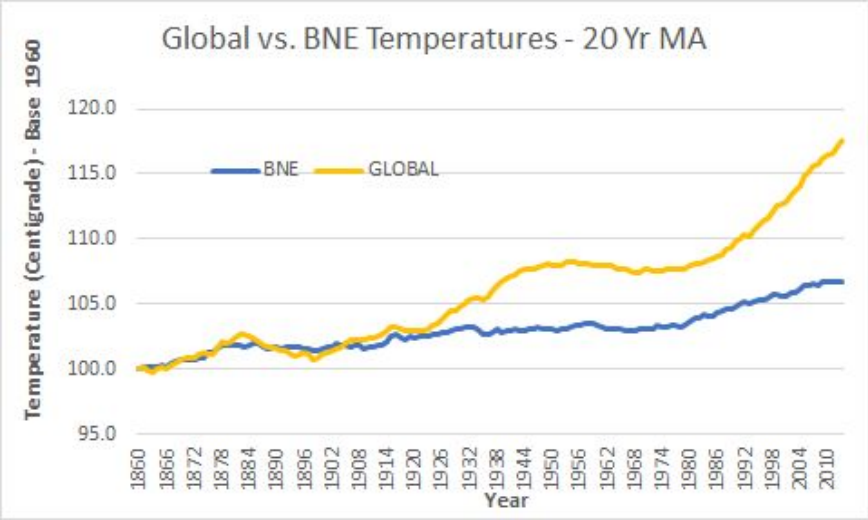
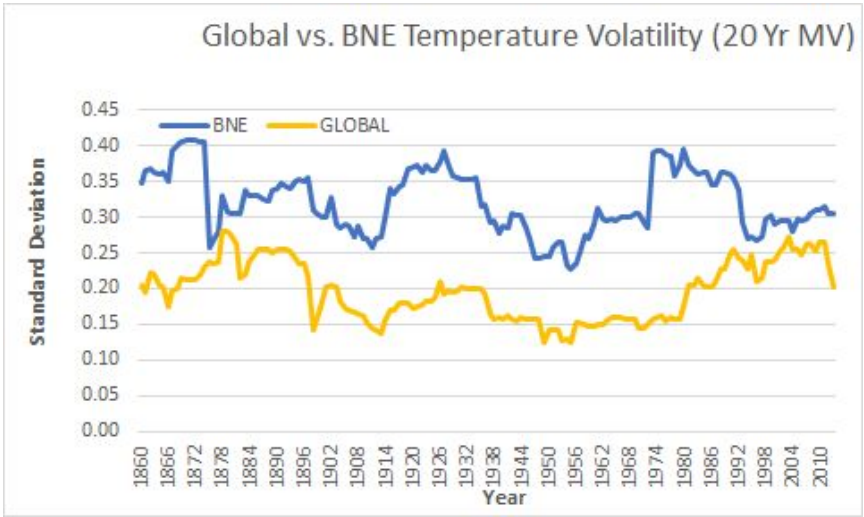
RESULTS:







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OBSERVATIONS:

- **Average Temperature:** BNE is considerably warmer than the GLOBAL average temperature with the average temperature across the total time period of 19.5 degrees centigrade (BNE) vs. 8.5 degrees centigrade (GLOBAL).
- **Temperature Change:**
    - Both GLOBAL and BNE temperature have increased over the time period with GLOBAL reaching a base of 117.5 in 2013 vs. 106.7 for BNE. GLOBAL temperatures have gotten warmer at a faster rate in comparison to BNE.
    - Temperature change of the two data sets were in line up until the early 1920s when GLOBAL temperatures started increasing faster than BNE.
- **Rate of Temperature Change over Time:**
    - GLOBAL temperatures change rate is increasing over time indicated by the steepening slope of the line chart. It is changing at a faster rate than BNE temperatures.
- **Correlation:** BNE and GLOBAL have a moderate to strong correlation of 0.78 over the time period.
- **Volatility:** BNE temperature volatility is higher than the GLOBAL temperature volatility. No apparent trends in volatility over the time period for both BNE and GLOBAL temperatures.

ADDITIONAL INSIGHTS:

- Is it possible to estimate BNE temperature based on historical data using global temperature as an input, however the relationship is not static over the whole time period. I would provide regression analysis over these different periods in order to determine a formula. None of these would be useful in predicting future temperatures.
    - 1860-1920s
    - 1920-1980s
    - 1980-2010s
- The higher temperature volatility in BNE may be driven by the cyclical El Nino effect. Additional analysis would be needed to control for the El Nino effect and determine thesis.
- I made a thesis that temperature changes may be consistent across latitudes due to consistency of sunlight across the year.
    - 47N latitude - Chicago & Rome (indicated by the blue lines)
    - 35S latitude - Canberra & Santiago de Chile. (indicated by the green lines)
- The correlation table below and the below chart disproved my thesis showing that there didn't seem to be any significant relationship in temperature change over time according to latitude.

CORRELATIONS BETWEEN CITIES (1856-2013)

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	ROME	CHICAGO	SANTIAGO	CANBERRA
ROME		0.38	0.52	0.43
CHICAGO			0.41	0.45
SANTIAGO				0.45
CANBERRA				

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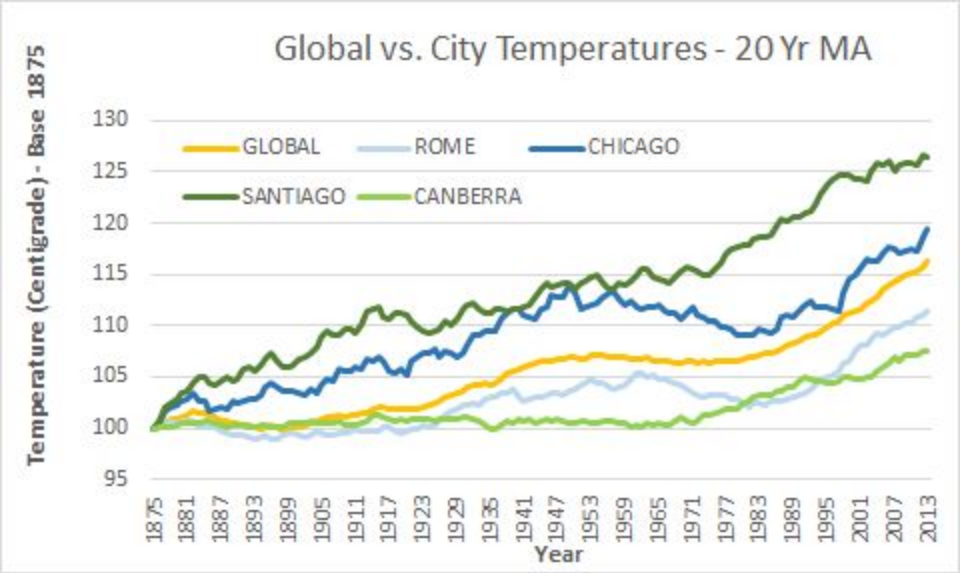

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APPENDIX 1: Extracting data from MySql.

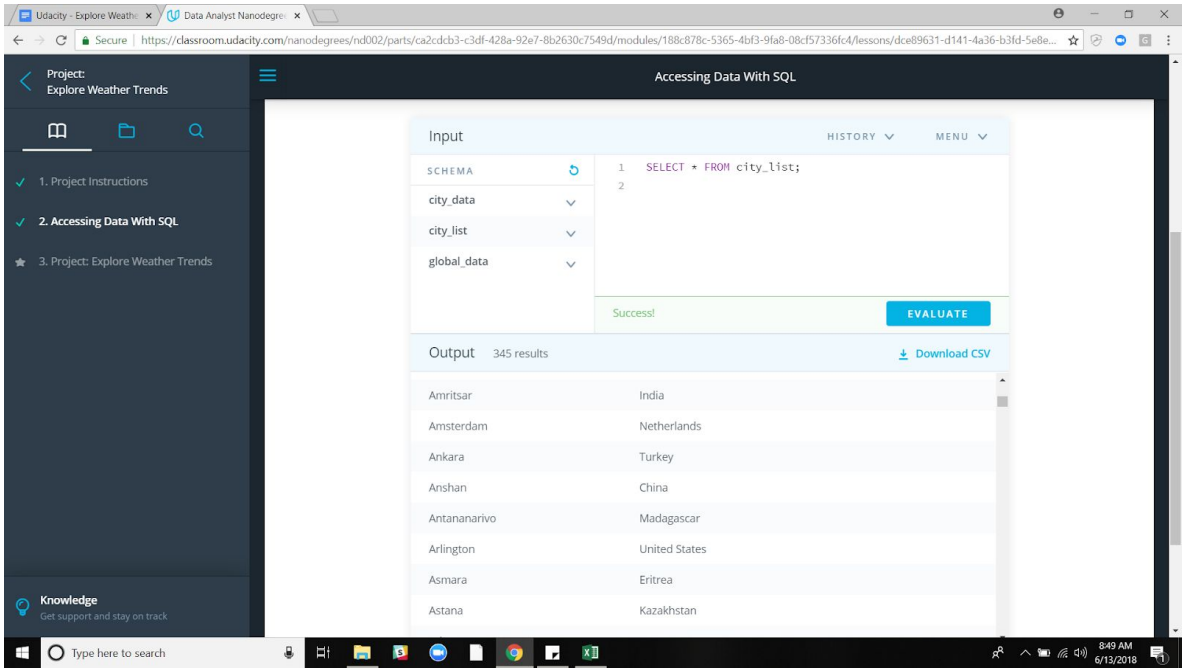
Using the MySql query “SELECT * FROM [data table name] I extracted the data from the 3 tables and compiled them into one microsoft excel spreadsheet.

Step 1: Understand how data was expressed.
MySql query:
SELECT * FROM city_list

I wanted to understand how the data was expressed so that I could filter in my next command with the WHERE function for my country. I did not download this database as I only needed to check how my country was written ensuring there was no shorthand ie “AUS” and also capitals “australia.”

Step 2: Extract city data.
MySql query:
SELECT * FROM city_data WHERE country ='Australia' ORDER BY city, year

I selected data from all the cities in Australia for the database so that I could provide additional analysis over not only how my city compares globally, but also how it compares within Australia as well. I ordered by city first and then by year so that once it is in excel I could manipulate the data to compare across years.



Step 3: Extract global data.
MySql query:
SELECT * FROM global_data WHERE (year >= '1841' AND year <= '2013')

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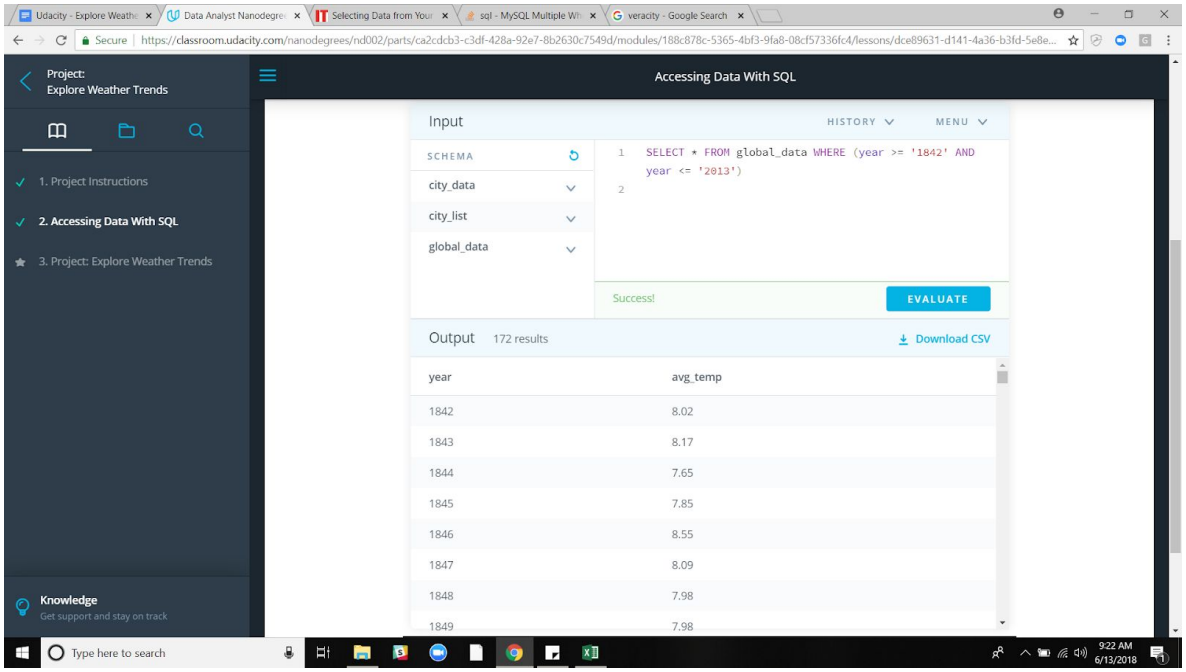
I noted that the dataset for my country was between 1841 and 2013. The global temperature data was between 1750 and 2015. I adjusted my query in MySql so that I only extracted the necessary data.



CONCERN: The fact that the data for Australia wasn't available makes me question the veracity of the global temperatures. If the Australian temperatures were not included in the base dataset how can we be sure the the global temperatures post 2013 (and possibly before) provides a true and accurate average. I would have to download the complete dataset and calculate the global average across all countries to verify.

OTHER MYSQL REQUESTS:
Latitude 47N

```
SELECT *
FROM city_data
WHERE city ='Rome' AND year >= '1841' AND year <= '2013'
ORDER BY year
```

```
SELECT *
FROM city_data
WHERE city ='Chicago' AND year >= '1841' AND year <= '2013'
ORDER BY  year
```

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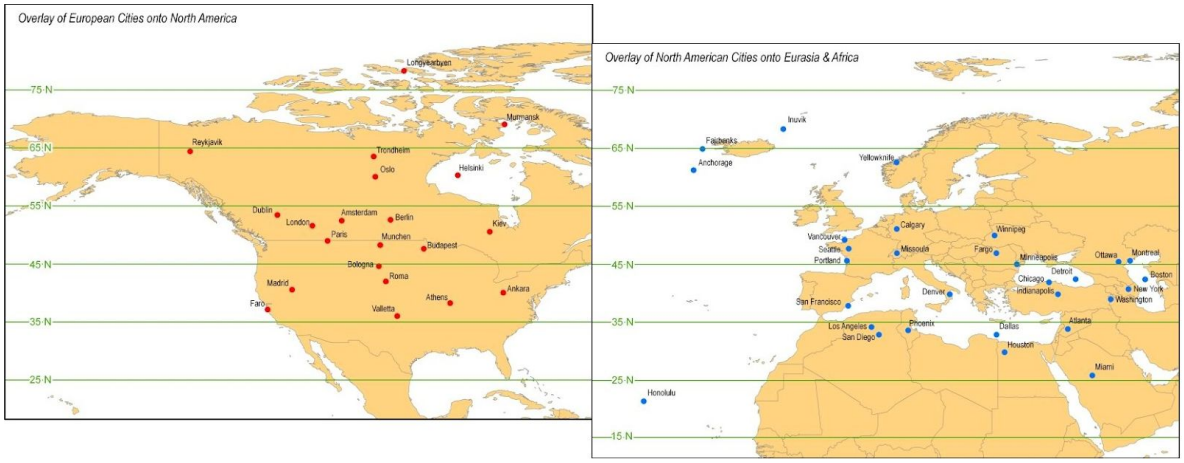
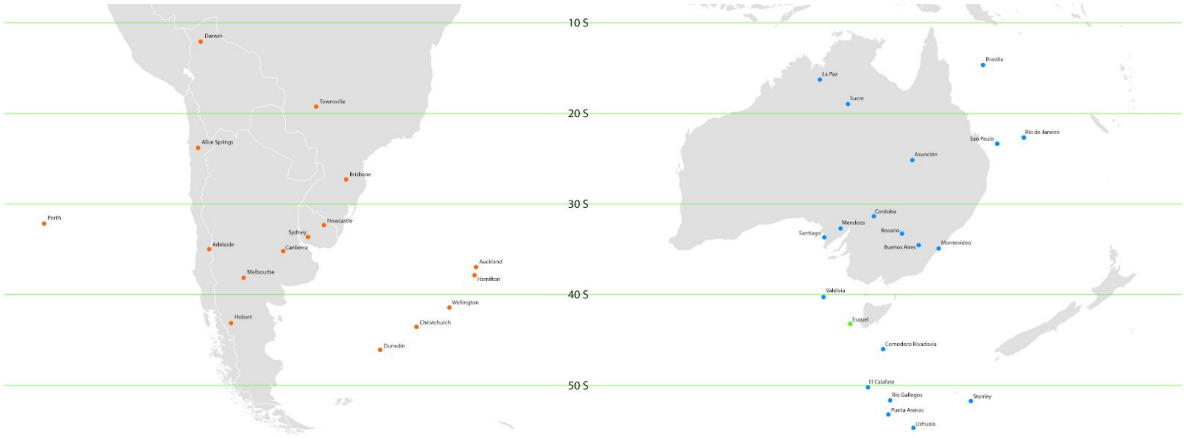


Latitude 35S

```
SELECT *
FROM city_data
WHERE city ='Canberra' AND year >= '1841' AND year <= '2013'
ORDER BY  year
```

```
SELECT *
FROM city_data
WHERE city ='Santiago' AND country = 'Chile' AND year >= '1841' AND year <= '2013'
ORDER BY  year
```



Overlay of Australian and New Zealand cities onto South America

Overlay of South American cities onto Australia and New Zealand