

# Explore Weather Trends

COMPARISON BETWEEN GLOBAL WEATHER TRENDS WITH  
RIYADHS WEATHER TRENDS

GHADEER ALKALTHAM

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## SUMMARY

This project contains an overview about the weather trends in the globe and a local city which is Riyadh. Moreover, it depends on a data that contains the yearly average temperature for the years between 1843 and 2013. The contents include steps as calculating the Moving Average (MA) and key considerations of how to analyze and visualize the data to seek of having accurate observations. In addition, to support the observations another city's data has been extracted which is for New York, and calculated the correlation coefficient between Riyadh and the globe Temperatures' Moving Average.

## Steps Taken to Complete the Project

### Tools used

1. Used *SQL* codes to extract the data from the database, below are the queries used.
  - Nearest City Riyadh:  

```
SELECT * FROM city_data  
WHERE city='Riyadh';
```
  - Global data:  

```
SELECT * FROM global_data;
```
  - New York data:  

```
SELECT * FROM city_data  
WHERE city='New York';
```
2. The data has been extracted to *Excel* as separated sheets, after that the sheets has been added to one file to figure out how to visualize the local and global weather trends in appropriate way that make it understandable and easy to read.
3. Used *Excel* to calculate the Correlation coefficient, for the details of calculating see *Appendix-2*.

### Key Considerations

1. Understanding the data well, and try to figure out the differences and similarities of entities and the related ones.
2. Having a unique entity names to be unique and to be able to distinguish between them. Such as, both the local and global data includes avg\_temp standing for temperatures'

average. So, changed the name for the local entity to avg\_temp\_Riyadh, and the global as avg\_temp\_Global as shown in appendix-1.

3. Combining the data in one sheet and adding only the years, average temperature for Riyadh and average temperature for the global weather, and turn it into a table.
4. having one-line chart that includes the lines that interpret the trends of global and local weather trends.
5. The years in global data are starting from 1750 to 2015, while the local data starts from 1843 to 2013. So, the dates other than what is between 1843 and 2013 has been omitted to have the same length and clearer chart.
6. Deciding what to be the amount of moving average.

### Calculating Moving Average

After inserting the average temperatures in one sheet, I've added a new column and called it (10-Year MA Global) referring on the moving average for the global weather as shown in *Figure-1*.

	A	B	C	D	E	F
1	year	avg_temp_Global	avg_temp_Riyadh	10-Year MA Global		
2	1843	8.17	24.74			
3	1844	7.65	15.45			
4	1845	7.85	20.82			
5	1846	8.55				

Figure 1 - Calculating Moving Average (1)

The moving average chosen to be 10-Year. To have the result in a proper cell, D11 has been chosen and used =AVERAGE function to start calculating the moving average, then selected the cells from B2 until B11 total of 10 cells.




D11		   =AVERAGE(B2:B11)				
	A	B	C	D	E	F
1	year	avg_temp_Global	avg_temp_Riyadh	10-Year MA Global		
2	1843	8.17	24.74			
3	1844	7.65	15.45			
4	1845	7.85	20.82			
5	1846	8.55				
6	1847	8.09				
7	1848	7.98	24.56			
8	1849	7.98	24.8			
9	1850	7.9	24.34			
10	1851	8.18	25.03			
11	1852	8.1	24.85	8.045		
12	1853	8.04	24.93			
13	1854	8.21	24.72			

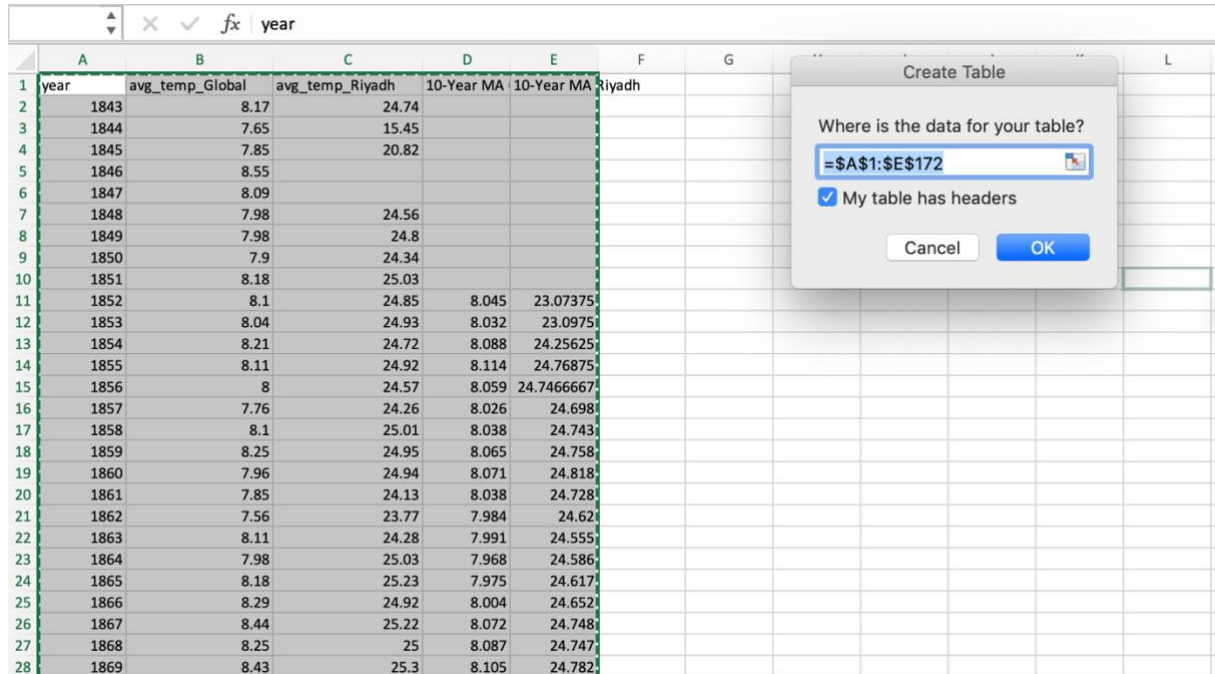
Figure 2 - Calculating Moving Average (2)

Then the same process mentioned previously in *Figure-2* has been repeated the rest of the column as shown in *Figure-3*.

D26		=AVERAGE(B17:B26)				
	A	B	C	D	E	F
1	year	avg_temp_Global	avg_temp_Riyadh	10-Year MA Global		
2	1843	8.17	24.74			
3	1844	7.65	15.45			
4	1845	7.85	20.82			
5	1846	8.55				
6	1847	8.09				
7	1848	7.98	24.56			
8	1849	7.98	24.8			
9	1850	7.9	24.34			
10	1851	8.18	25.03			
11	1852	8.1	24.85	8.045		
12	1853	8.04	24.93	8.032		
13	1854	8.21	24.72	8.088		
14	1855	8.11	24.92	8.114		
15	1856	8	24.57	8.059		
16	1857	7.76	24.26	8.026		
17	1858	8.1	25.01	8.038		
18	1859	8.25	24.95	8.065		
19	1860	7.96	24.94	8.071		
20	1861	7.85	24.13	8.038		
21	1862	7.56	23.77	7.984		
22	1863	8.11	24.28	7.991		
23	1864	7.98	25.03	7.968		
24	1865	8.18	25.23	7.975		
25	1866	8.29	24.92	8.004		
26	1867	8.44	25.22	8.072		
27	1868	8.25	25	8.087		
28	1869	8.43	25.3	8.105		
29	1870	8.2	25.02	8.129		
30	1871	8.12	24.73	8.156		

Figure 3 - Calculating Moving Average (3)

To calculate the local Moving Average for Riyadh city, created a new column and called it 10-Year MA Riyadh. Then, made the same process has been done for the global temperature moving average, but using the temperature that is related to the local temperature which I avg\_temp\_Riyadh. The last step is converting the content into table to make the chart which is shown in *Figure-5*.



The image shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K	L
	year	avg_temp_Global	avg_temp_Riyadh	10-Year MA	10-Year MA	Riyadh						
1	1843	8.17	24.74									
2	1844	7.65	15.45									
3	1845	7.85	20.82									
4	1846	8.55										
5	1847	8.09										
6	1848	7.98	24.56									
7	1849	7.98	24.8									
8	1850	7.9	24.34									
9	1851	8.18	25.03									
10	1852	8.1	24.85	8.045	23.07375							
11	1853	8.04	24.93	8.032	23.0975							
12	1854	8.21	24.72	8.088	24.25625							
13	1855	8.11	24.92	8.114	24.76875							
14	1856	8	24.57	8.059	24.7466667							
15	1857	7.76	24.26	8.026	24.698							
16	1858	8.1	25.01	8.038	24.743							
17	1859	8.25	24.95	8.065	24.758							
18	1860	7.96	24.94	8.071	24.818							
19	1861	7.85	24.13	8.038	24.728							
20	1862	7.56	23.77	7.984	24.62							
21	1863	8.11	24.28	7.991	24.555							
22	1864	7.98	25.03	7.968	24.586							
23	1865	8.18	25.23	7.975	24.617							
24	1866	8.29	24.92	8.004	24.652							
25	1867	8.44	25.22	8.072	24.748							
26	1868	8.25	25	8.087	24.747							
27	1869	8.43	25.3	8.105	24.782							

A 'Create Table' dialog box is open, showing the range '\$A\$1:\$E\$172' and the option 'My table has headers' checked.

Figure 4 - Calculating Moving Average (4)

## OBSERVATIONS

### Observations about weather trends Riyadh and the Globe

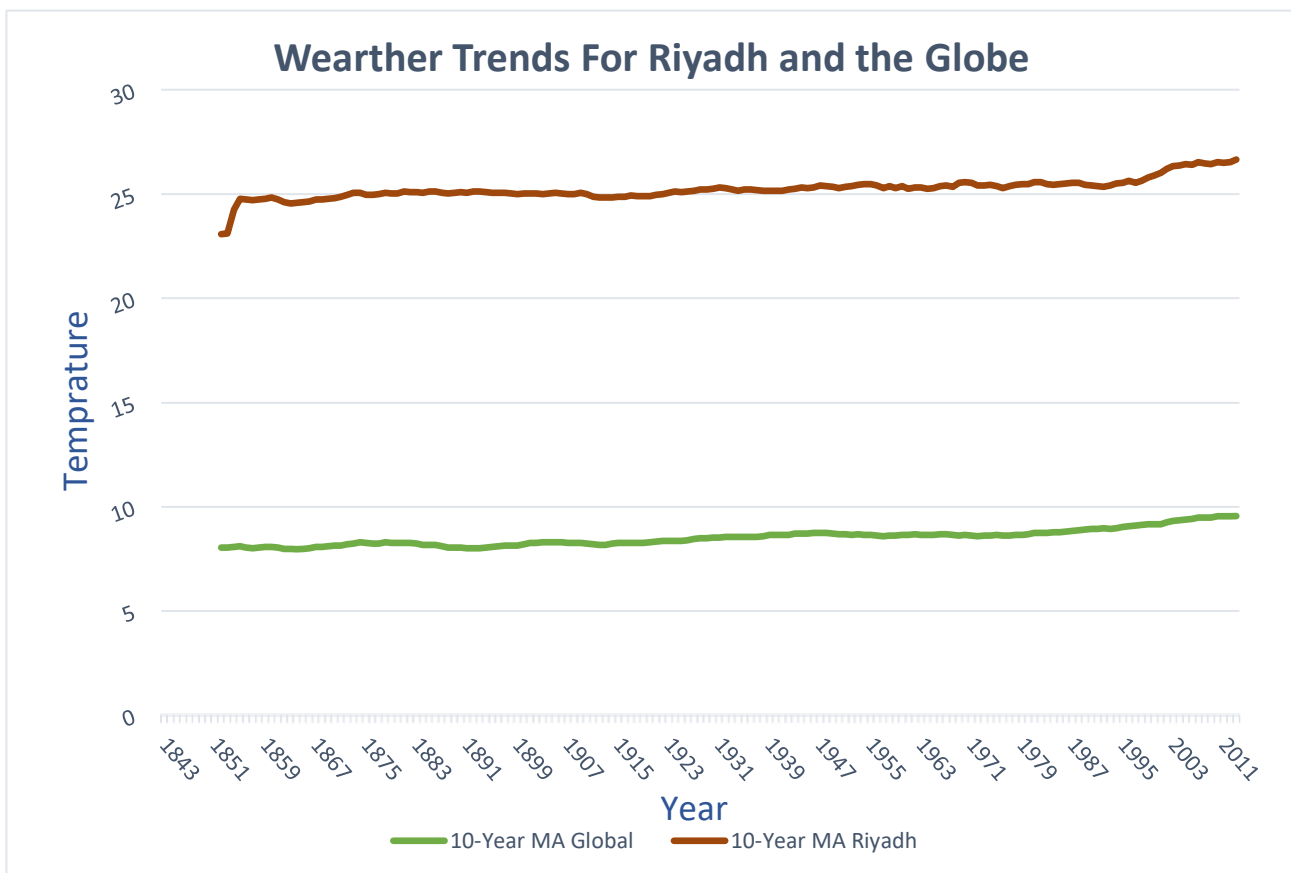


Chart 1 - Weather Trends for Riyadh and the globe

*Chart-1* indicates the difference between the Global weather and the local weather for Riyadh, considering the temperature for the years between 1843 and 2013. Here are four observations that are noticed from Chart-1 after calculating the moving average for the years between 1843 and 2013, and interpret it to the chart:

1. In general, as it can be clearly noticed in the chart that the difference between the local weather in comparison to the global weather is huge. In addition, the local weather is much hotter than the global average for the global weather temperature. Which is the global temperature being between 5 and 10, while the local weather being between 20 and 30.
2. The changes of weather in the globe is affecting the changes in the local weather for Riyadh. In other words, the changes of weather in globe is parallel with the changes of weather in Riyadh, but is not in one degree. Moreover, to know the strength of relationship between Riyadh Moving Average Temperature and the global Moving



Average Temperature, the Correlation Coefficient has been calculated to have 87.84% very strong positive correlation.

3. In the last 80's and beginnings of 90's, the weather was stable in Riyadh as well as the globe, and when the temperature in the globe starts to grow to be hotter that can be noticed after 1995, even the temperature in Riyadh is getting is growing.
4. The overall trend indicates that the weather wear consistent and cooler in the whole world before 1995, while the clearest movement and change of the lines were after that, that could be a sign that the weather changes are related. Furthermore, a study by NASA earth observatory proves that the years from 1885 to 1945 are much cooler than the years after the 1950s (NASA earth observatory, n.d.).

### Observations about Weather Trends in Riyadh, New York and the Globe

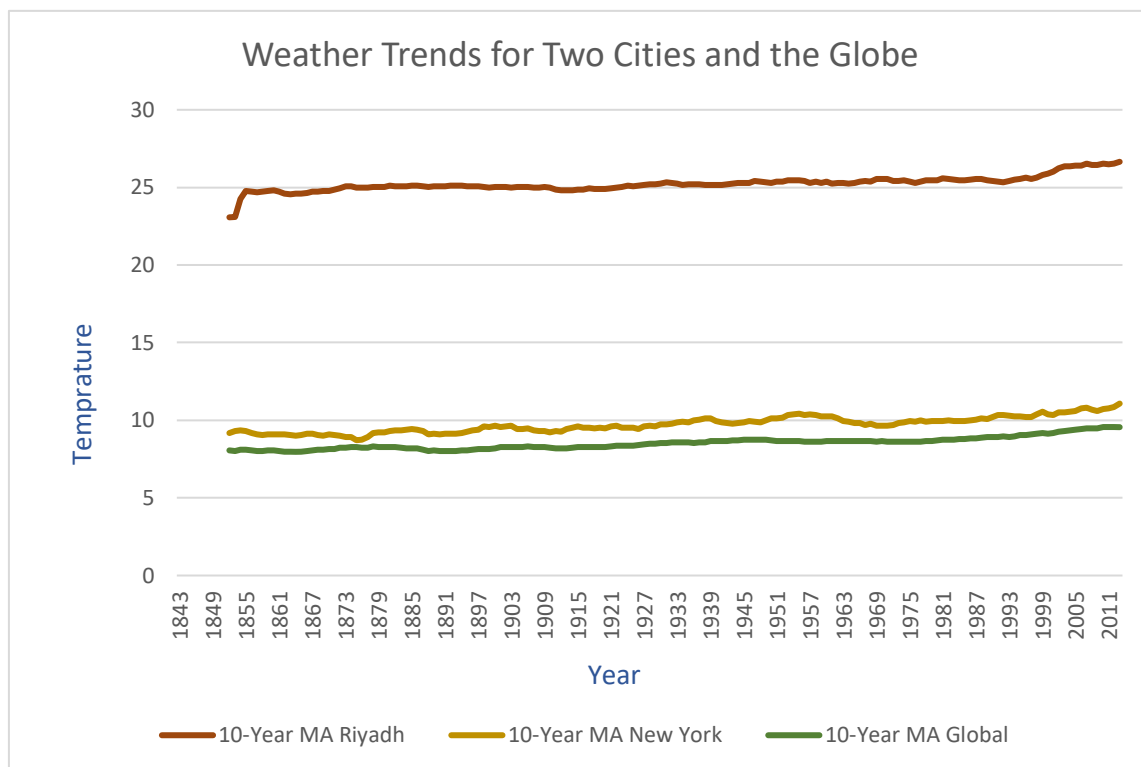


Chart 2 - Weather trends for Riyadh, New York and the Globe

The chart above indicates the weather trends in two cities which are Riyadh and New York to be compared with the globe. For New York, the weather trends are more unstable than Riyadh, while it has more up and downs. But, the temperature for New York and the globe mounts clearly to be much hotter after 1993. In addition, NASA earth observatory study shows that after the 2000's the land of the United States temperature changes is 50% greater than the ocean temperature changes (NASA earth observatory, n.d.).

## APPENDIX

### Appendix-1

Table of data related to Riyadh, New York and the globe.

Year	avg_temp_Riyadh	avg_temp_NewYork	avg_temp_Global	10-Year MA Riyadh	10-Year MA New York	10-Year MA Global
1843	24.74	8.49	8.17			
1844	15.45	9.12	7.65			
1845	20.82	9.49	7.85			
1846		9.66	8.55			
1847		9.3	8.09			
1848	24.56	9.54	7.98			
1849	24.8	8.83	7.98			
1850	24.34	9.1	7.9			
1851	25.03	9.26	8.18			
1852	24.85	8.98	8.1	23.07375	9.177	8.045
1853	24.93	9.68	8.04	23.0975	9.296	8.032
1854	24.72	9.56	8.21	24.25625	9.34	8.088
1855	24.92	9.11	8.11	24.76875	9.302	8.114
1856	24.57	8.2	8	24.7466667	9.156	8.059
1857	24.26	8.52	7.76	24.698	9.078	8.026
1858	25.01	9.13	8.1	24.743	9.037	8.038
1859	24.95	9.17	8.25	24.758	9.071	8.065
1860	24.94	9.18	7.96	24.818	9.079	8.071
1861	24.13	9.47	7.85	24.728	9.1	8.038
1862	23.77	9	7.56	24.62	9.102	7.984
1863	24.28	9.09	8.11	24.555	9.043	7.991
1864	25.03	9.29	7.98	24.586	9.016	7.968
1865	25.23	9.64	8.18	24.617	9.069	7.975
1866	24.92	8.95	8.29	24.652	9.144	8.004
1867	25.22	8.59	8.44	24.748	9.151	8.072
1868	25	7.95	8.25	24.747	9.033	8.087
1869	25.3	8.85	8.43	24.782	9.001	8.105
1870	25.02	10.04	8.2	24.79	9.087	8.129
1871	24.73	8.94	8.12	24.85	9.034	8.156
1872	24.87	8.61	8.19	24.96	8.995	8.219
1873	25.24	8.44	8.35	25.056	8.93	8.243
1874	24.98	9.06	8.43	25.051	8.907	8.288
1875	24.43	7.74	7.86	24.971	8.717	8.256
1876	24.89	9.35	8.08	24.968	8.757	8.235
1877	25.47	10.15	8.54	24.993	8.913	8.245

<b>1878</b>	25.51	10.38	8.83	25.044	9.156	8.303
<b>1879</b>	25.24	9.37	8.17	25.038	9.208	8.277
<b>1880</b>	24.8	9.99	8.12	25.016	9.203	8.269
<b>1881</b>	25.63	9.77	8.27	25.106	9.286	8.284
<b>1882</b>	24.66	9.22	8.13	25.085	9.347	8.278
<b>1883</b>	25.19	8.59	7.98	25.08	9.362	8.241
<b>1884</b>	24.8	9.36	7.77	25.062	9.392	8.175
<b>1885</b>	24.98	8.37	7.92	25.117	9.455	8.181
<b>1886</b>	24.98	8.9	7.95	25.126	9.41	8.168
<b>1887</b>	24.81	9.1	7.91	25.06	9.305	8.105
<b>1888</b>	25.13	8.31	8.09	25.022	9.098	8.031
<b>1889</b>	25.52	9.86	8.32	25.05	9.147	8.046
<b>1890</b>	25.07	9.62	7.97	25.077	9.11	8.031
<b>1891</b>	25.39	10	8.02	25.053	9.133	8.006
<b>1892</b>	25.22	9.15	8.07	25.109	9.126	8
<b>1893</b>	25.19	8.68	8.06	25.109	9.135	8.008
<b>1894</b>	24.66	9.95	8.16	25.095	9.194	8.047
<b>1895</b>	24.69	9.22	8.15	25.066	9.279	8.07
<b>1896</b>	24.88	9.51	8.21	25.056	9.34	8.096
<b>1897</b>	24.86	9.63	8.29	25.061	9.393	8.134
<b>1898</b>	24.88	10.24	8.18	25.036	9.586	8.143
<b>1899</b>	25.12	9.51	8.4	24.996	9.551	8.151
<b>1900</b>	25.29	10.4	8.5	25.018	9.629	8.204
<b>1901</b>	25.55	9.29	8.54	25.034	9.558	8.256
<b>1902</b>	25.25	9.43	8.3	25.037	9.586	8.279
<b>1903</b>	24.64	9.32	8.22	24.982	9.65	8.295
<b>1904</b>	25.07	7.87	8.09	25.023	9.442	8.288
<b>1905</b>	24.87	9.1	8.23	25.041	9.43	8.296
<b>1906</b>	24.85	9.9	8.38	25.038	9.469	8.313
<b>1907</b>	24.44	8.49	7.95	24.996	9.355	8.279
<b>1908</b>	24.95	9.87	8.19	25.003	9.318	8.28
<b>1909</b>	25.57	9.51	8.18	25.048	9.318	8.258
<b>1910</b>	24.75	9.55	8.22	24.994	9.233	8.23
<b>1911</b>	24.24	9.91	8.18	24.863	9.295	8.194
<b>1912</b>	24.96	9.24	8.17	24.834	9.276	8.181
<b>1913</b>	24.63	10.76	8.3	24.833	9.42	8.189
<b>1914</b>	24.94	9.02	8.59	24.82	9.535	8.239
<b>1915</b>	25.38	9.85	8.59	24.871	9.61	8.275
<b>1916</b>	24.85	9.1	8.23	24.871	9.53	8.26
<b>1917</b>	25.03	8.24	8.02	24.93	9.505	8.267
<b>1918</b>	24.66	9.51	8.13	24.901	9.469	8.261
<b>1919</b>	25.39	10.05	8.38	24.883	9.523	8.281

<b>1920</b>	24.94	9.19	8.36	24.902	9.487	8.295
<b>1921</b>	24.84	10.91	8.57	24.962	9.587	8.334
<b>1922</b>	25.35	10.04	8.41	25.001	9.667	8.358
<b>1923</b>	25.1	9.51	8.42	25.048	9.542	8.37
<b>1924</b>	25.69	8.85	8.51	25.123	9.525	8.362
<b>1925</b>	25	9.72	8.53	25.085	9.512	8.356
<b>1926</b>	25.19	8.54	8.73	25.119	9.456	8.406
<b>1927</b>	25.29	9.7	8.52	25.145	9.602	8.456
<b>1928</b>	25.39	9.82	8.63	25.218	9.633	8.506
<b>1929</b>	25.36	9.97	8.24	25.215	9.625	8.492
<b>1930</b>	25.39	10.22	8.63	25.26	9.728	8.519
<b>1931</b>	25.38	11.03	8.72	25.314	9.74	8.534
<b>1932</b>	24.96	10.44	8.71	25.275	9.78	8.564
<b>1933</b>	24.67	10.18	8.34	25.232	9.847	8.556
<b>1934</b>	24.97	9.48	8.63	25.16	9.91	8.568
<b>1935</b>	25.61	9.48	8.52	25.221	9.886	8.567
<b>1936</b>	25.15	9.73	8.55	25.217	10.005	8.549
<b>1937</b>	25.08	10.16	8.7	25.196	10.051	8.567
<b>1938</b>	25.11	10.42	8.86	25.168	10.111	8.59
<b>1939</b>	25.16	10.07	8.76	25.148	10.121	8.642
<b>1940</b>	25.51	8.53	8.76	25.16	9.952	8.655
<b>1941</b>	25.37	10.19	8.77	25.159	9.868	8.66
<b>1942</b>	25.49	9.96	8.73	25.212	9.82	8.662
<b>1943</b>	24.96	9.58	8.76	25.241	9.76	8.704
<b>1944</b>	25.6	10.01	8.85	25.304	9.813	8.726
<b>1945</b>	25.3	9.94	8.58	25.273	9.859	8.732
<b>1946</b>	25.49	10.63	8.68	25.307	9.949	8.745
<b>1947</b>	26	9.91	8.8	25.399	9.924	8.755
<b>1948</b>	24.85	9.83	8.75	25.373	9.865	8.744
<b>1949</b>	24.82	11.39	8.59	25.339	9.997	8.727
<b>1950</b>	24.98	9.72	8.37	25.286	10.116	8.688
<b>1951</b>	26.1	10.27	8.63	25.359	10.124	8.674
<b>1952</b>	25.72	10.52	8.64	25.382	10.18	8.665
<b>1953</b>	25.51	11.17	8.87	25.437	10.339	8.676
<b>1954</b>	25.8	10.31	8.56	25.457	10.369	8.647
<b>1955</b>	25.33	10.39	8.63	25.46	10.414	8.652
<b>1956</b>	25.02	9.75	8.28	25.413	10.326	8.612
<b>1957</b>	24.69	10.5	8.73	25.282	10.385	8.605
<b>1958</b>	25.64	9.16	8.77	25.361	10.318	8.607
<b>1959</b>	24.14	10.77	8.73	25.293	10.256	8.621
<b>1960</b>	25.67	9.76	8.58	25.362	10.26	8.642
<b>1961</b>	25.12	10.03	8.8	25.264	10.236	8.659

<b>1962</b>	26.1	9.32	8.75	25.302	10.116	8.67
<b>1963</b>	25.54	9.32	8.86	25.305	9.931	8.669
<b>1964</b>	25.14	9.96	8.41	25.239	9.896	8.654
<b>1965</b>	25.59	9.63	8.53	25.265	9.82	8.644
<b>1966</b>	26.16	9.75	8.6	25.379	9.82	8.676
<b>1967</b>	24.87	9.3	8.7	25.397	9.7	8.673
<b>1968</b>	25.21	9.75	8.52	25.354	9.759	8.648
<b>1969</b>	26.05	9.76	8.6	25.545	9.658	8.635
<b>1970</b>	25.84	9.77	8.7	25.562	9.659	8.647
<b>1971</b>	24.93	10.01	8.6	25.543	9.657	8.627
<b>1972</b>	24.74	9.49	8.5	25.407	9.674	8.602
<b>1973</b>	25.6	10.96	8.95	25.413	9.838	8.611
<b>1974</b>	25.4	10.08	8.47	25.439	9.85	8.617
<b>1975</b>	25.04	10.56	8.74	25.384	9.943	8.638
<b>1976</b>	24.97	9.53	8.35	25.265	9.921	8.613
<b>1977</b>	25.99	9.96	8.85	25.377	9.987	8.628
<b>1978</b>	25.95	9.17	8.69	25.451	9.929	8.645
<b>1979</b>	26.2	10.02	8.73	25.466	9.955	8.658
<b>1980</b>	25.83	9.86	8.98	25.465	9.964	8.686
<b>1981</b>	25.95	9.95	9.17	25.567	9.958	8.743
<b>1982</b>	24.62	9.78	8.64	25.555	9.987	8.757
<b>1983</b>	24.85	10.51	9.03	25.48	9.942	8.765
<b>1984</b>	25.05	10.26	8.69	25.445	9.96	8.787
<b>1985</b>	25.3	10.26	8.66	25.471	9.93	8.779
<b>1986</b>	25.36	10.15	8.83	25.51	9.992	8.827
<b>1987</b>	26.37	10.32	8.99	25.548	10.028	8.841
<b>1988</b>	25.99	9.93	9.2	25.552	10.104	8.892
<b>1989</b>	25.05	9.66	8.92	25.437	10.068	8.911
<b>1990</b>	25.7	11.32	9.23	25.424	10.214	8.936
<b>1991</b>	25.43	11.36	9.18	25.372	10.355	8.937
<b>1992</b>	24.37	9.57	8.84	25.347	10.334	8.957
<b>1993</b>	25.42	10.04	8.87	25.404	10.287	8.941
<b>1994</b>	26.08	10	9.04	25.507	10.261	8.976
<b>1995</b>	25.64	10.24	9.35	25.541	10.259	9.045
<b>1996</b>	26.28	9.81	9.04	25.633	10.225	9.066
<b>1997</b>	25.49	10	9.2	25.545	10.193	9.087
<b>1998</b>	26.73	11.82	9.52	25.619	10.382	9.119
<b>1999</b>	26.92	11.16	9.29	25.806	10.532	9.156
<b>2000</b>	26.55	9.97	9.2	25.891	10.397	9.153
<b>2001</b>	26.67	10.93	9.41	26.015	10.354	9.176
<b>2002</b>	26.44	11.25	9.57	26.222	10.522	9.249
<b>2003</b>	26.62	9.84	9.53	26.342	10.502	9.315

<b>2004</b>	26.2	10.39	9.32	26.354	10.541	9.343
<b>2005</b>	26.27	10.68	9.7	26.417	10.585	9.378
<b>2006</b>	26.24	11.52	9.53	26.413	10.756	9.427
<b>2007</b>	26.49	10.63	9.73	26.513	10.819	9.48
<b>2008</b>	26.21	10.64	9.43	26.461	10.701	9.471
<b>2009</b>	26.71	10.14	9.51	26.44	10.599	9.493
<b>2010</b>	27.37	11.36	9.7	26.522	10.738	9.543
<b>2011</b>	26.4	11.27	9.52	26.495	10.772	9.554
<b>2012</b>	26.83	11.97	9.51	26.534	10.844	9.548
<b>2013</b>	27.78	12.16	9.61	26.65	11.076	9.556

## Appendix 2

Calculating the Correlation Coefficient Using Excel:

1. Choosing a cell to have the result of the function in it.
2. Choose (=CORREL) function that stands for the correlation coefficient.
3. Array1 = 10- Year Moving Average for Riyadh, and Array2: 10- Year Moving Average for the global.

Formula Builder

×

Show All Functions

**CORREL**

**Array1** = {0;0;0;0;0;0;0;0;23.07375;23.0975;24.2562...  
Table4[10-Year MA Riyadh]

**Array2** = {0;0;0;0;0;0;0;0;8.045;8.032;8.088;8.114;8...  
Table4[10-Year MA Global]

Result: 0.87341029

Done

## REFERENCES

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