Modeling Global CO_2 Emissions

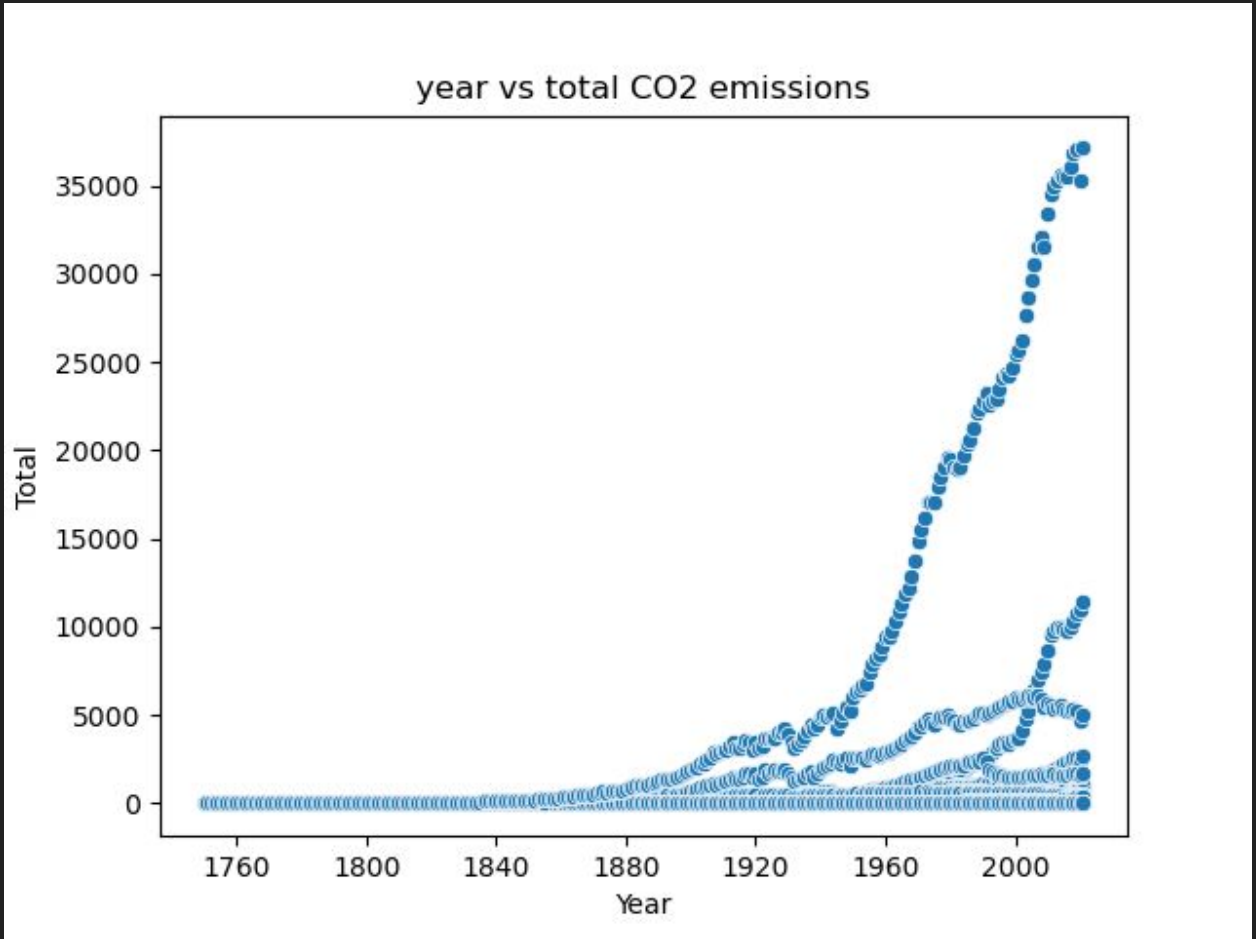
Akhil Midha

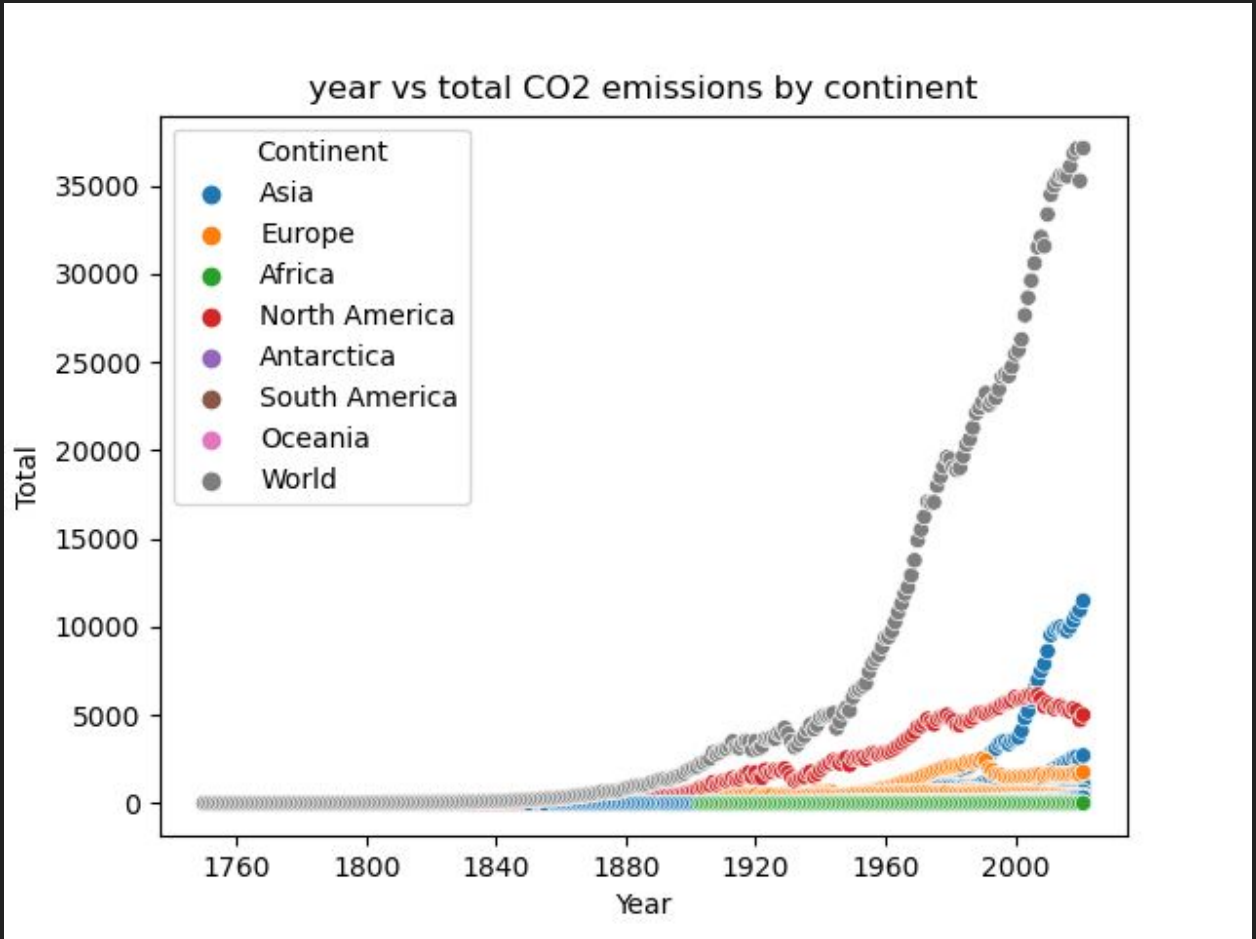
Problem Statement

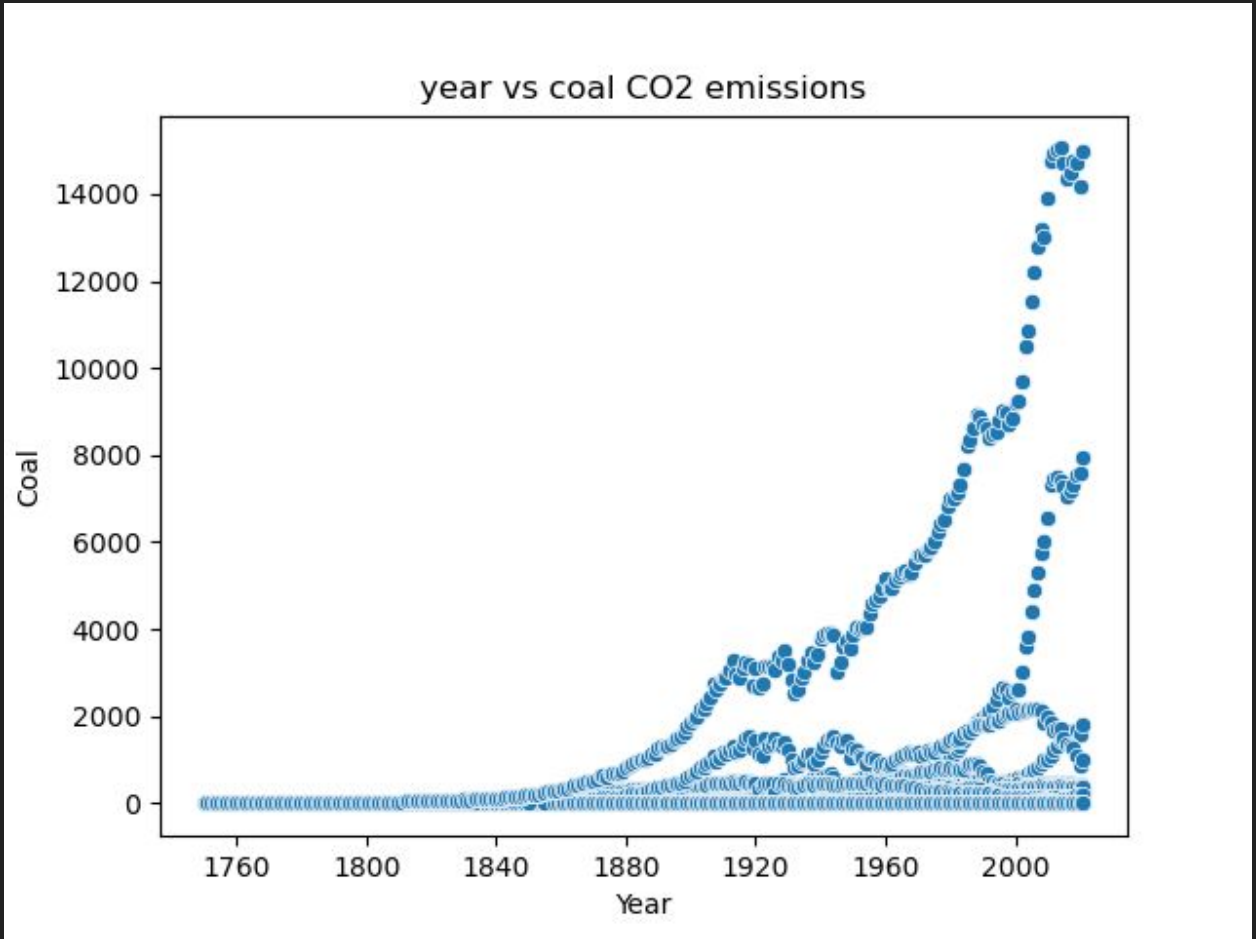
- Examining global Carbon Dioxide (CO_2) emissions
- Modeling to predict future CO_2 emissions
- Can allow corporations, countries and organizations to monitor and control their CO_2 emissions

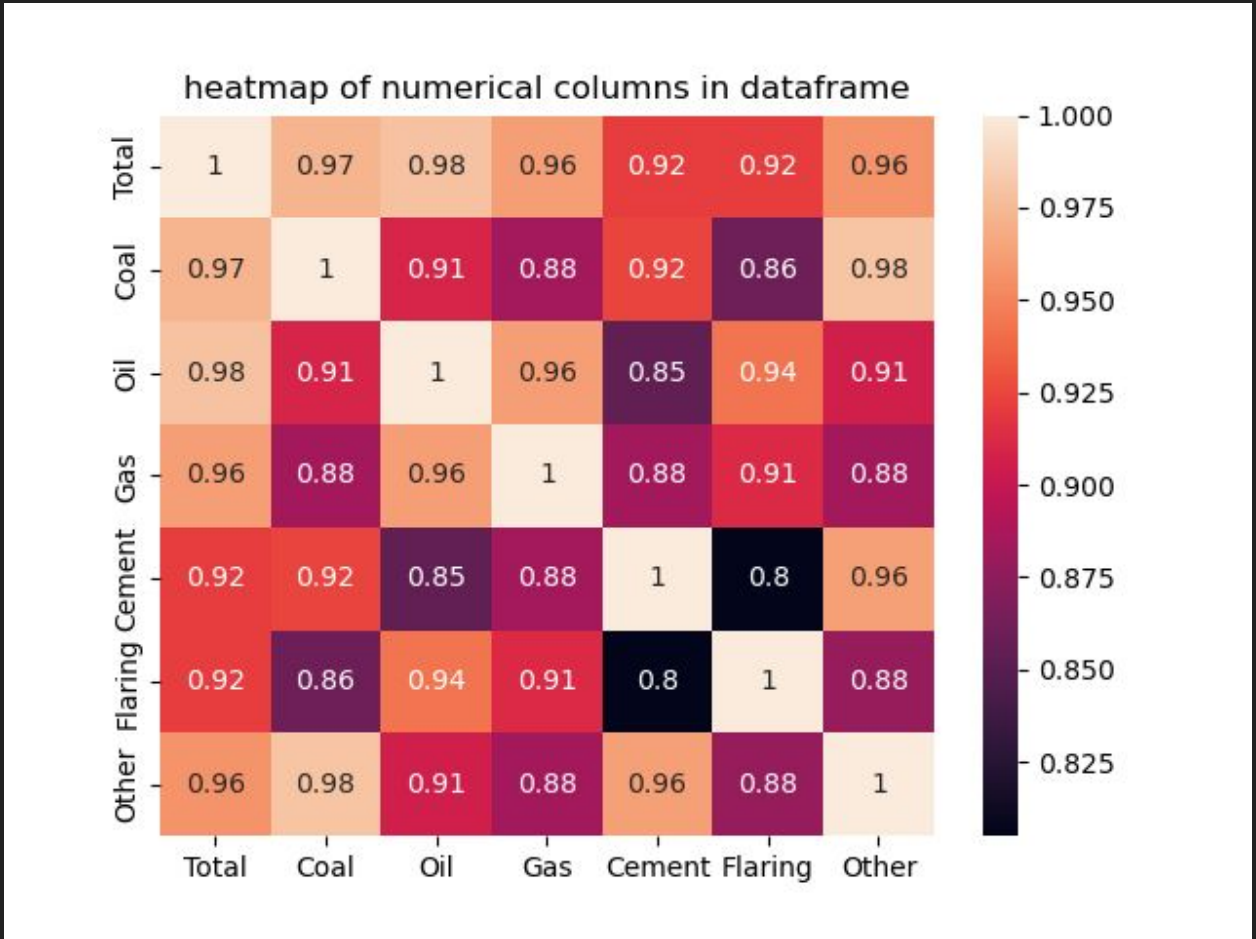
Data Cleaning

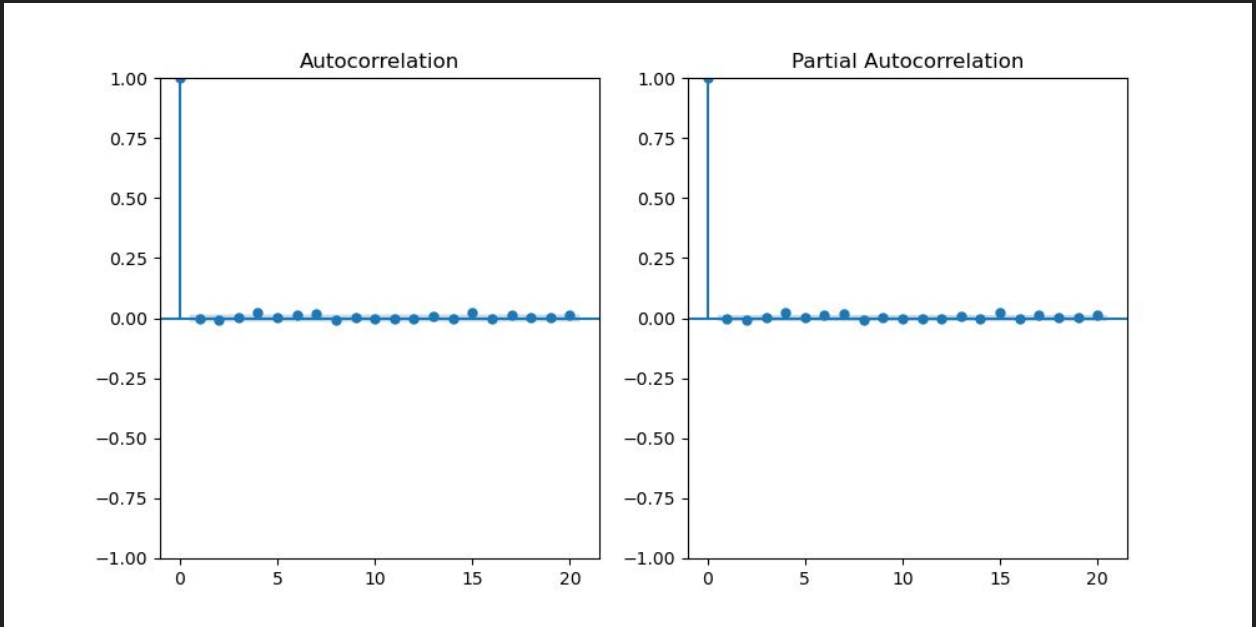
- Merged with Wikipedia country list to obtain continents
- Dropped missing values
- Reduced dimensionality by eliminating irrelevant or unusable columns

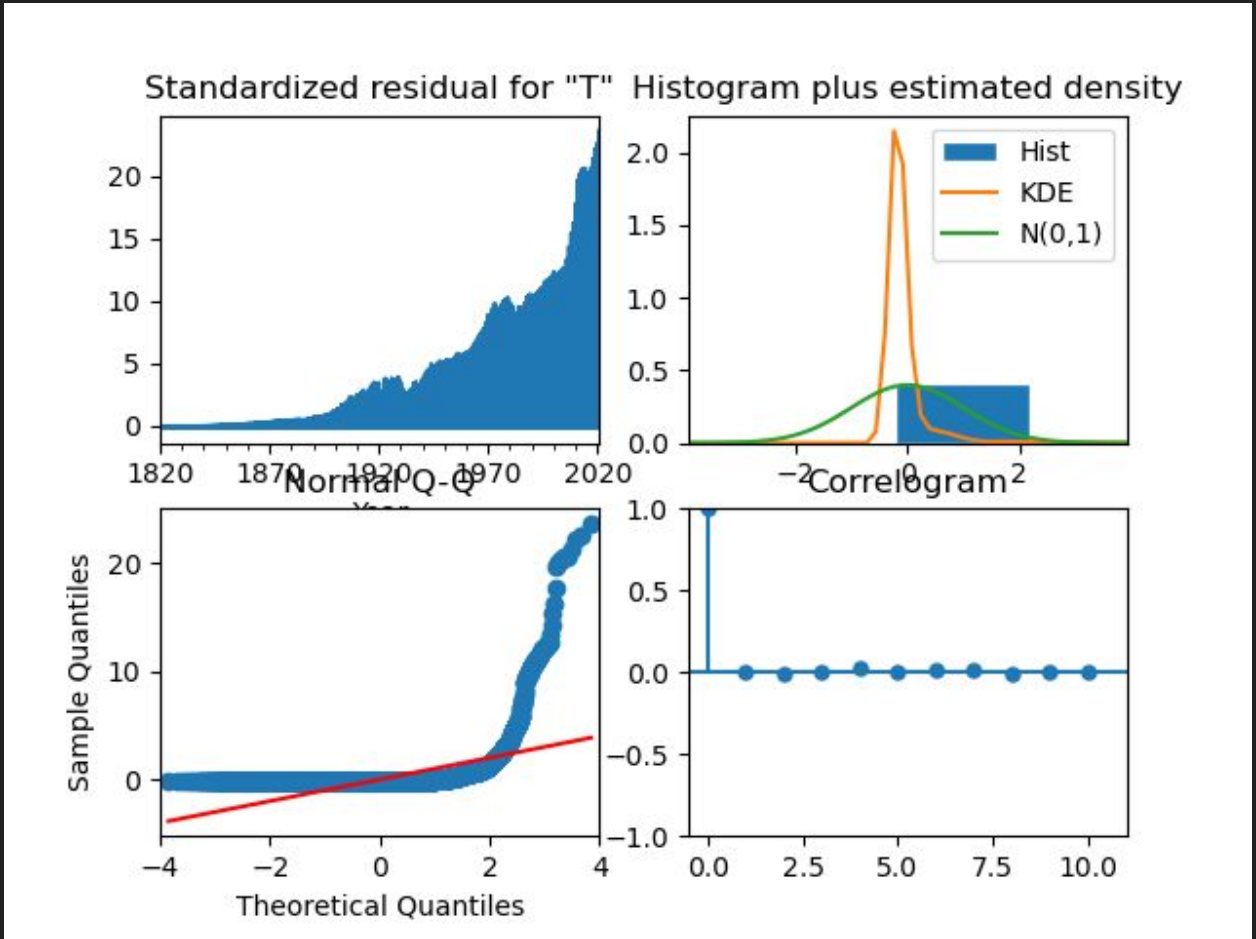

year vs total CO2 emissions
Total
35000
30000
25000
20000
15000
10000
5000
0
1760
1800
1840
1880
1920
1960
2000
Year


year vs total CO2 emissions by continent
Continent
Asia
Europe
Africa
North America
Antarctica
South America
Oceania
World
Total
35000
30000
25000
20000
15000
10000
5000
0
1760
1800
1840
1880
1920
1960
2000
Year

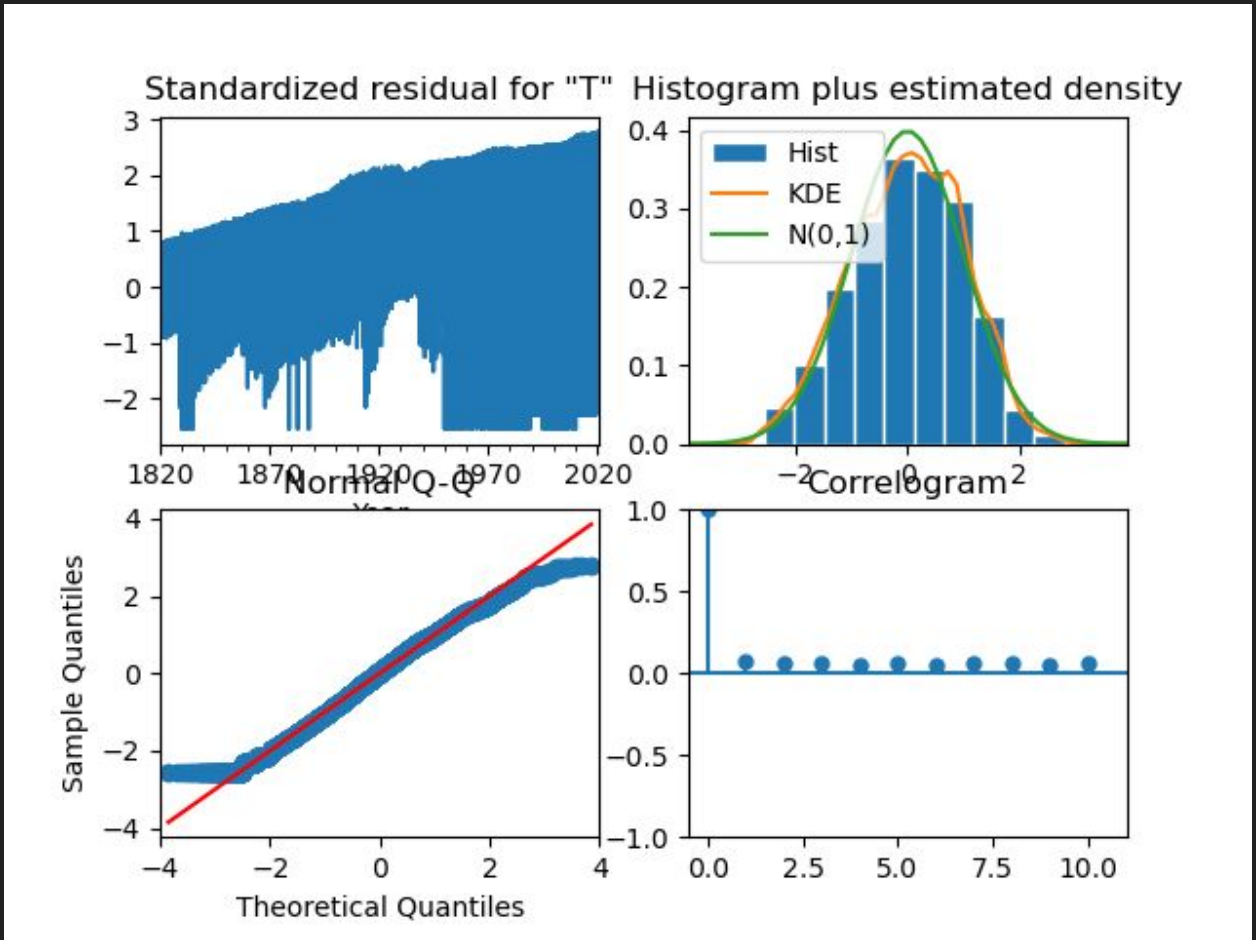

year vs coal CO2 emissions
Coal
Year
0
2000
4000
6000
8000
10000
12000
14000
1760
1800
1840
1880
1920
1960
2000


heatmap of numerical columns in dataframe
Total
Coal
Oil
Gas
Cement
Flaring
Other
1 0.97 0.98 0.96 0.92 0.92 0.96
0.97 1 0.91 0.88 0.92 0.86 0.98
0.98 0.91 1 0.96 0.85 0.94 0.91
0.96 0.88 0.96 1 0.88 0.91 0.88
0.92 0.92 0.85 0.88 1 0.8 0.96
0.92 0.86 0.94 0.91 0.8 1 0.88
0.96 0.98 0.91 0.88 0.96 0.88 1
Total
Coal
Oil
Gas
Cement
Flaring
Other
1.000
0.975
0.950
0.925
0.900
0.875
0.850
0.825

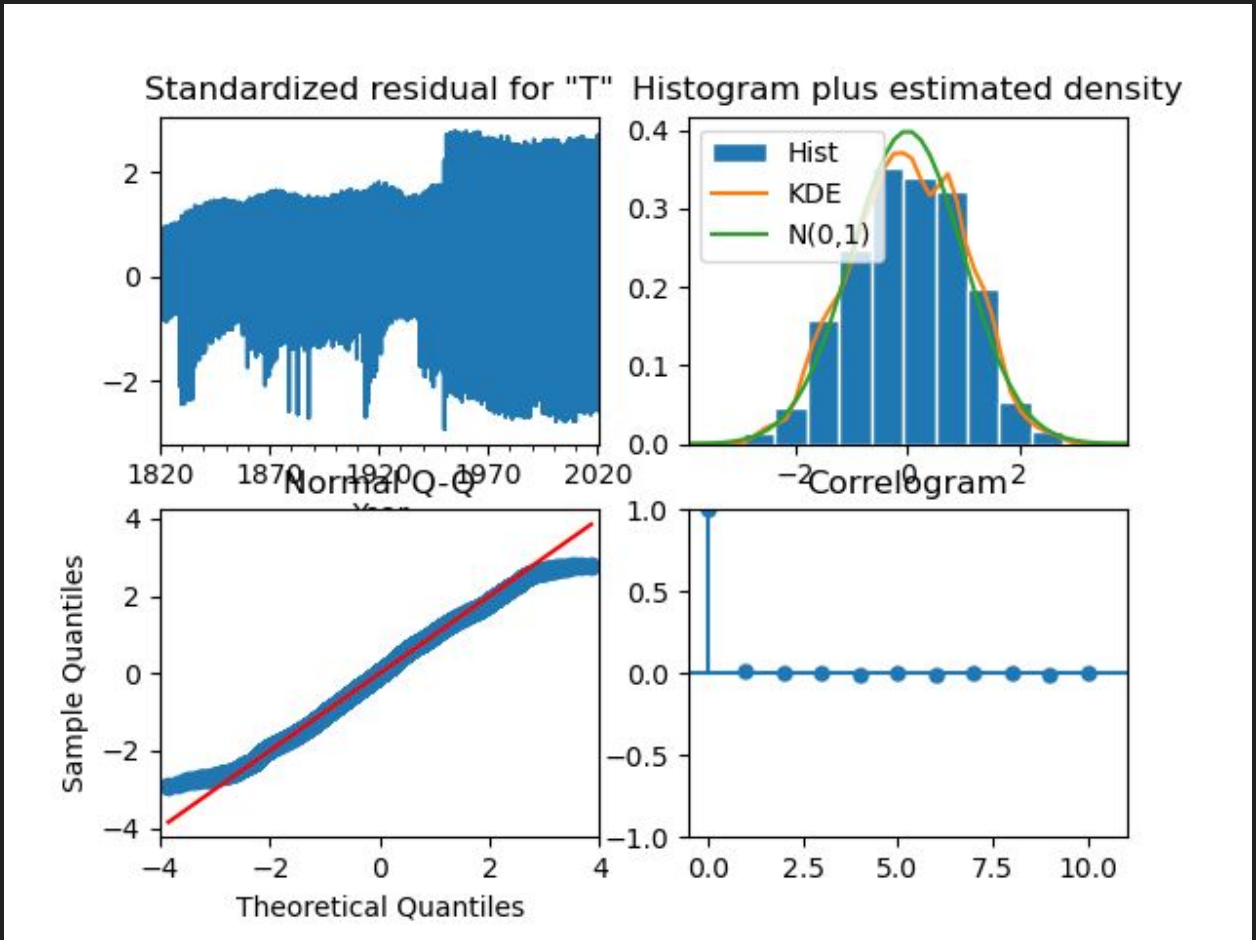

Autocorrelation
Partial Autocorrelation
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20



ARIMA (0,0,0), scaled



ARIMA (0,0,0), log transformation



ARIMA (2,0,2), log transformation

Recommendations on Further Use

- Compare to other greenhouse gas (GHG) emission data
- Prepare for future (Paris Climate Accords, National Goals, etc.)
- Pair with other weather data to predict weather patterns

Sources:

The Global Carbon Project's fossil CO2 emissions dataset

- Andrew, Robbie M
- Peters, Glen P

https://zenodo.org/records/7215364