

Introduction

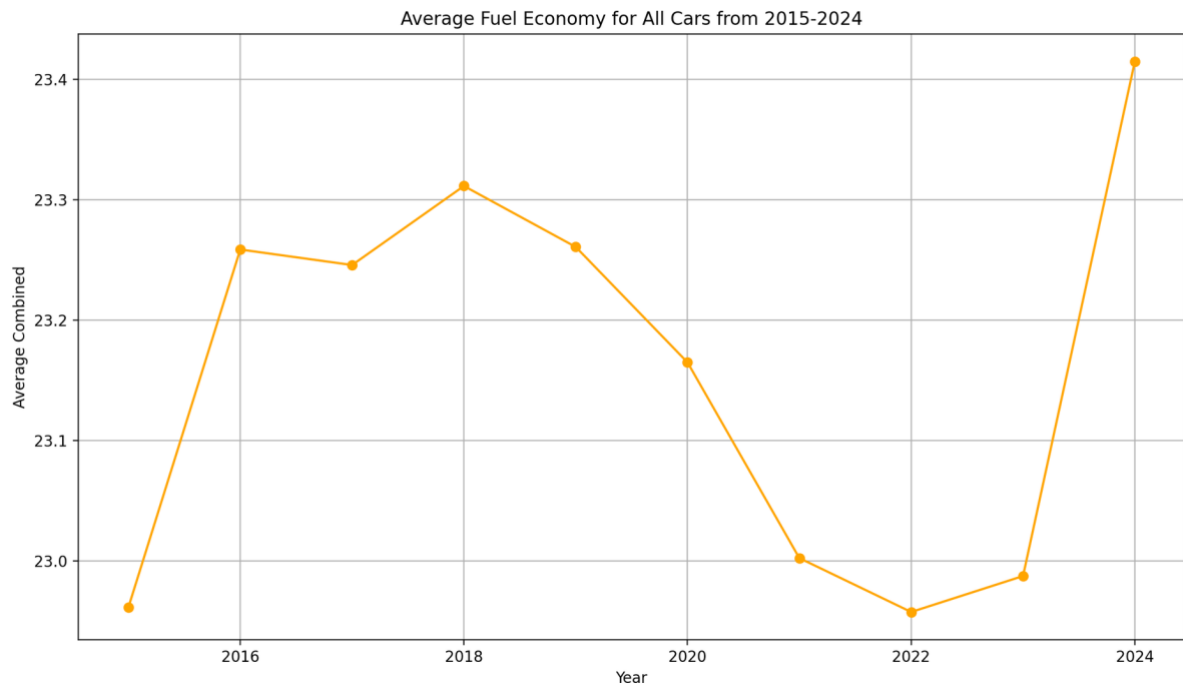
In this project, I have created 10 questions that are designed to analyse data for different types of cars, from 2015 to 2024. In this project I have used many techniques such as ELT operations to clean and merge data from different years, as well as analysis to find possible patterns and correlations between certain attributes. I have also looked holistically at specific data and their progression over a number of years, as well as predictions for 2024, so assess these attributes and whether they've improved or declined over time. I have mainly focused on Fuel economy and CO2 emissions as I wanted to see the overall environmental effects of different cars. Car manufacturers usually aim to improve fuel economy not only for cost savings but also to reduce the environmental impact by decreasing CO2 emissions.

I've used several modules to help analyse the data:

- pandas is essential for data handling, manipulation, and analysis.
- re is necessary for tasks involving string manipulation and pattern matching using regular expressions and used this for cleaning the data
- glob is for file path manipulation and I used this so python could find all my CSV files
- pyplot was imported from the matplotlib library which is the plotting library used to creating visualisations

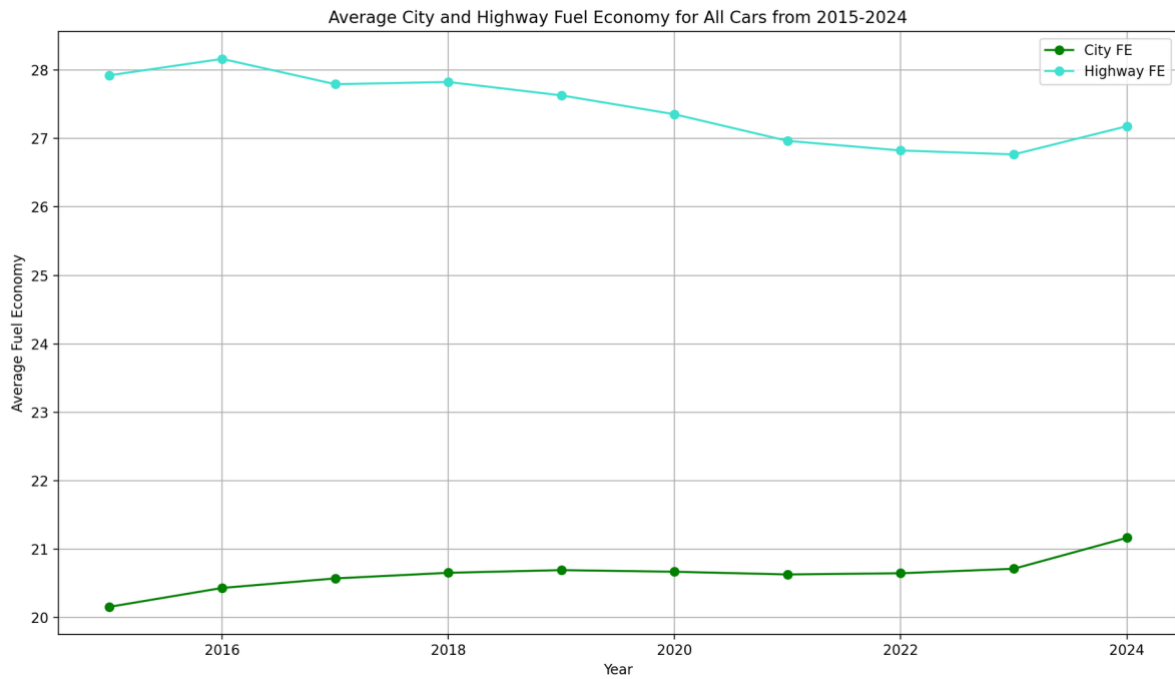
Fuel Economy

1: How has the average fuel economy evolved from to 2015 to 2023, and what have experts predicted for 2024?



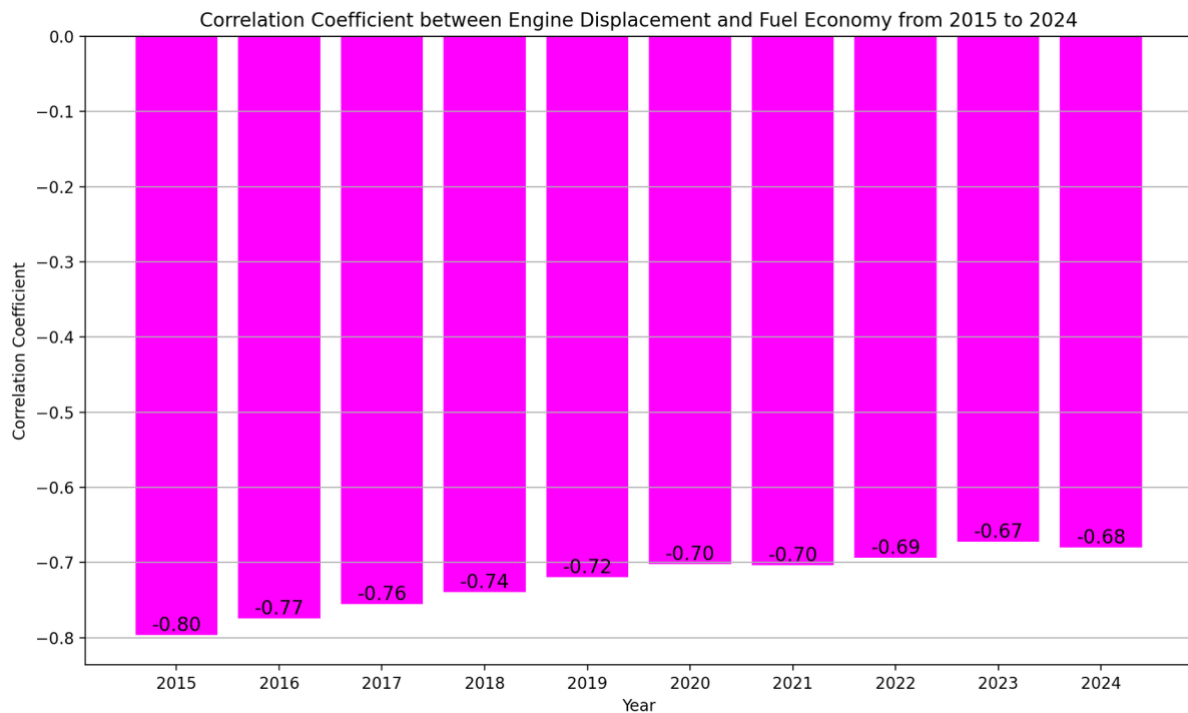
As shown in the graph above, there has been a lot of fluctuations in the fuel economy of cars over the past few years. From 2015 to 2023, the highest fuel economy was in 2018. After this point there was a massive drop in fuel economy, with fuel economy reaching its lowest in 2022. There has been a slight improvement in fuel economy in 2023. In 2024, it's predicted by experts that fuel economy will drastically improve in 2024. However this looks quite unrealistic.

2: Compare City fuel economy and Highway Fuel Economy in terms of how they've evolved from 2015 to 2023, and what experts have predicted for 2024.



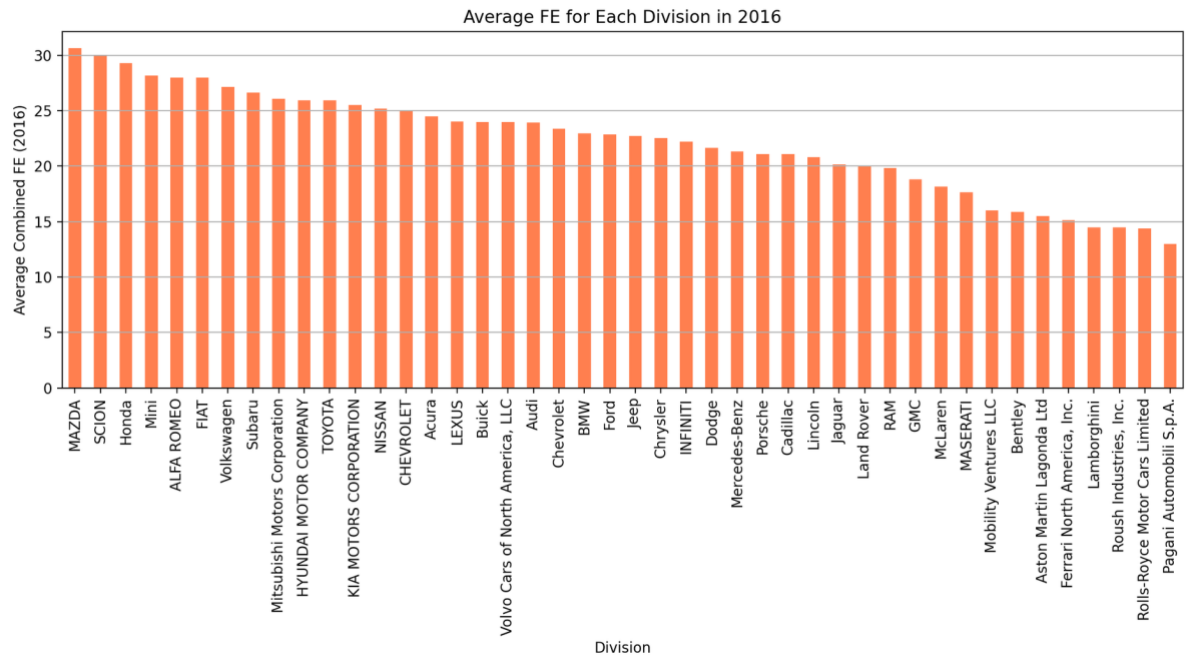
As shown above, City fuel economy is significantly higher on average than Highway Fuel economy for all years from 2015 to 2023, and this is predicted to be the case in 2024 as well. This could be because city driving often involves frequent stops, and slower speeds due to traffic signals or congestion. This stop-and-go driving consumes more fuel compared to highway driving, where vehicles can maintain more consistent speeds for longer durations.

3: Is there a correlation between engine displacement and fuel economy in the years between 2015 to 2023, and what have experts predicted for 2024?



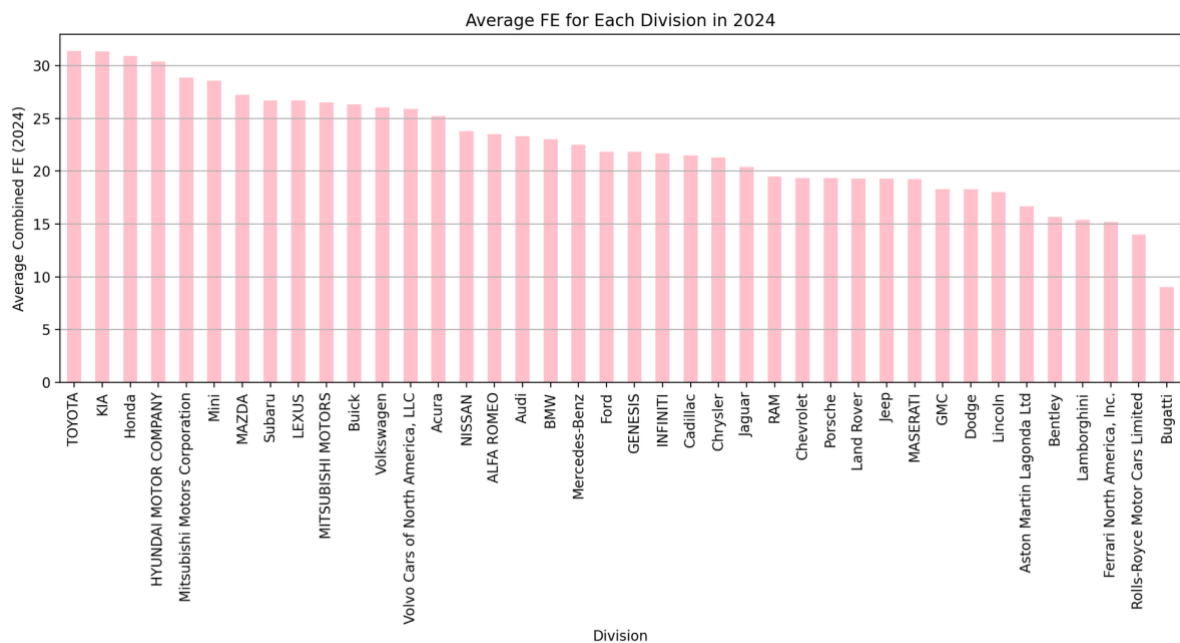
As shown in the graph above, we can see that all the correlation coefficients for all the years are negative, and they are all quite close to the modulus of 1 which shows quite a strong negative correlation. This shows that for all years between 2015 and 2023, larger engine displacements are associated with lower combined fuel economy, and this is predicted to be the case for 2024 as well. However this correlation gets weaker from 2015 to 2024. This is because larger engines are designed to provide increased power and performance, but this comes at the cost of higher fuel consumption and therefore lower fuel economy.

4: Create a visualisation that shows the average fuel economy for each division in 2016.



The graph shows that in 2016, the division of cars with the highest fuel economy was MAZDA. The division of cars with the lowest fuel economy in 2016 was Pagani Automobile.

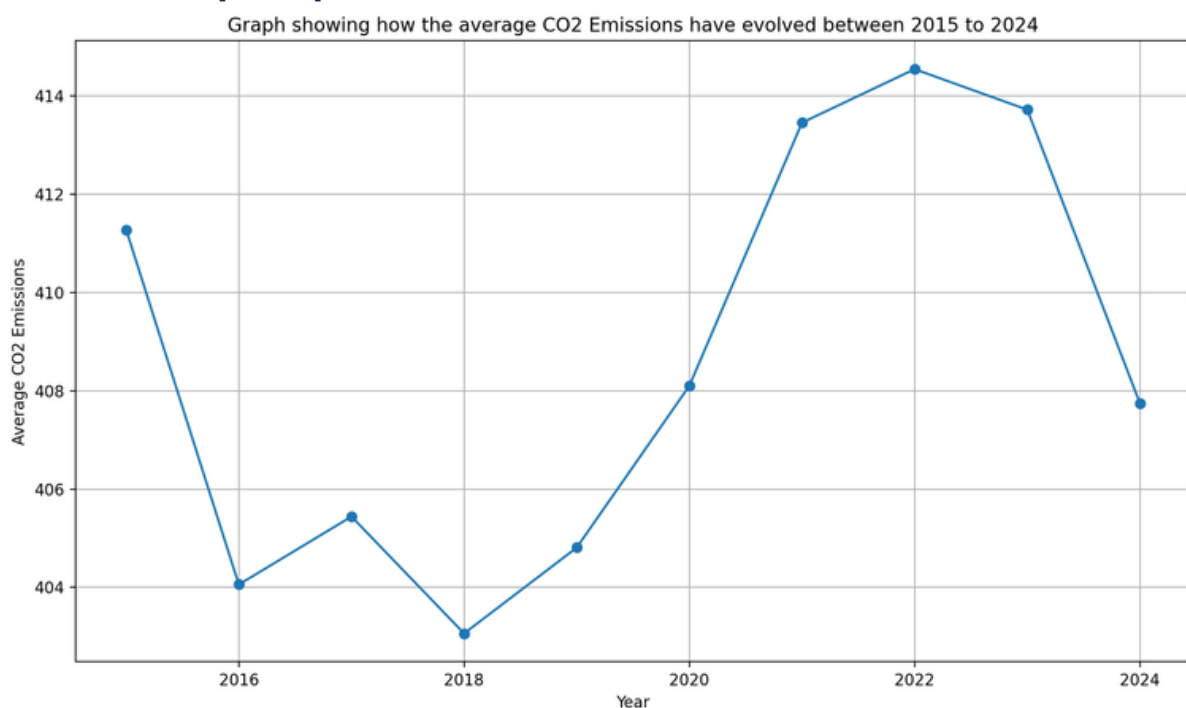
5: Create a visualisation that shows what experts have predicted for the average fuel economy for each division in 2024.



The graph shows that in 2024, it's predicted that the division of cars with the highest average fuel economy will be Toyota and the division of cars with the lowest average fuel economy will be Bugatti. Notably, it's predicted that MAZDA will no longer have the highest fuel economy as it did in 2016.

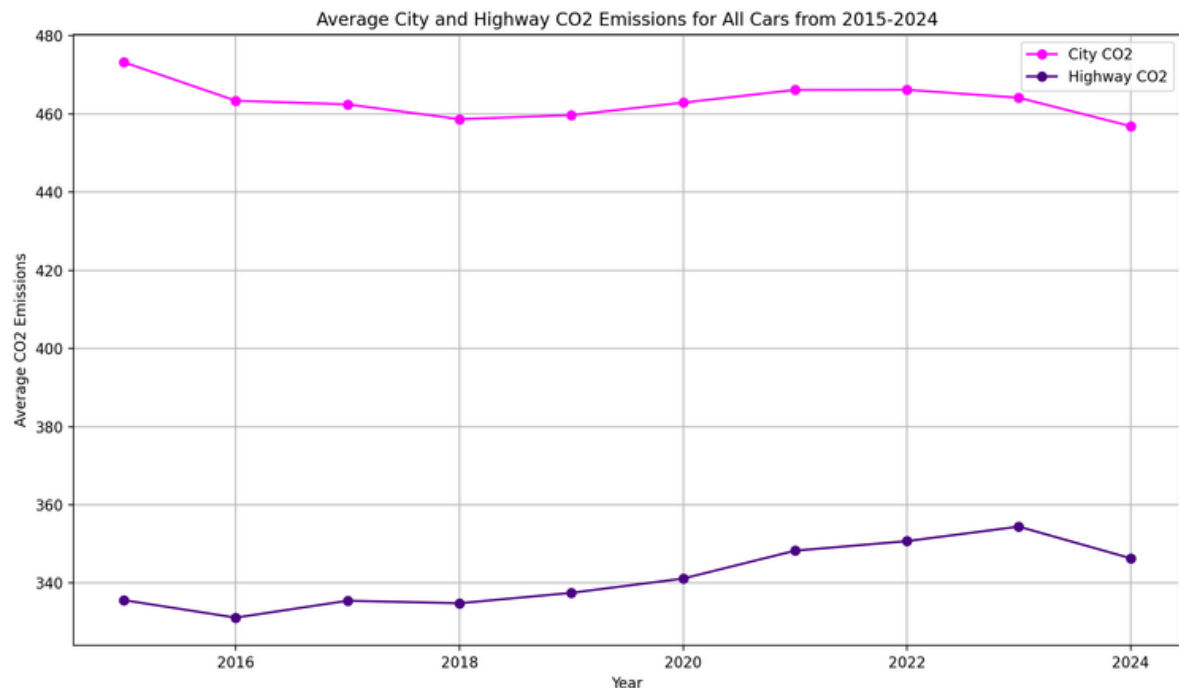
CO2 Emissions

6: How has the average CO2 emissions evolved from 2015 to 2023, and what have experts predicted for 2024?



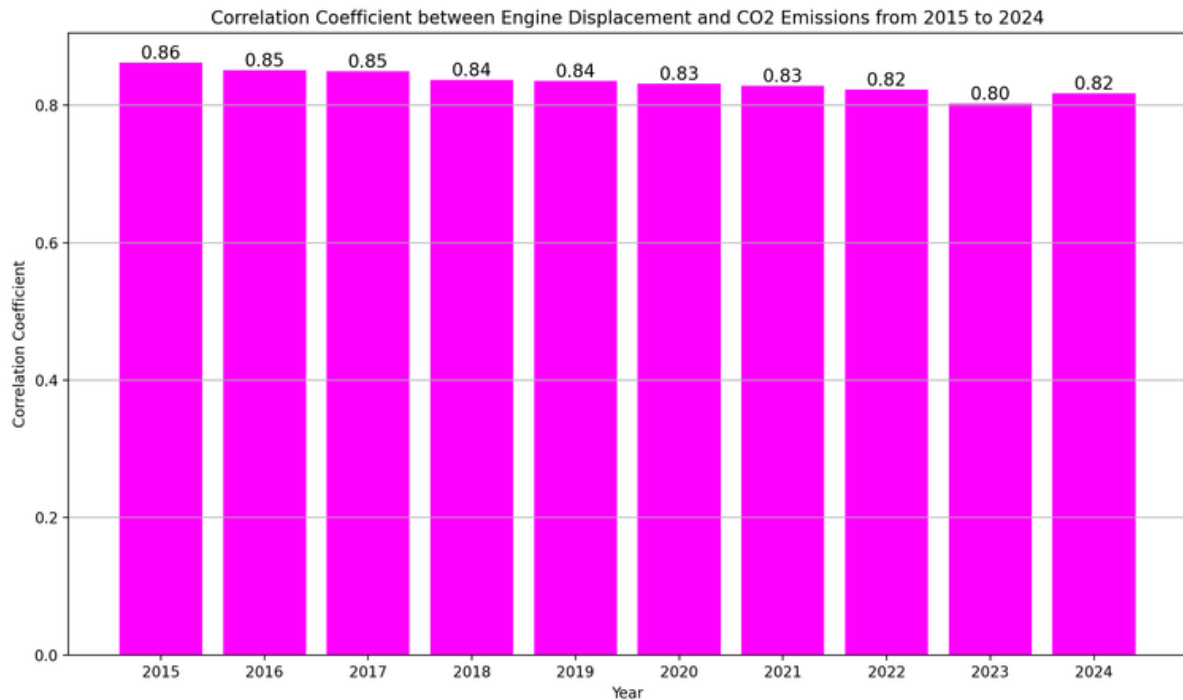
As shown in the graph above, there has been a lot of fluctuations in CO2 emissions from cars over the past few years. There was a massive drop in CO2 emissions from 2015 to 2016. There was then a slight increase in CO2 emissions from 2016 to 2017, and this dropped from 2017 to 2018. However from 2018 to 2022, there has been a large gradual increase in CO2 emissions, with the peak CO2 emissions being in 2022. This has slightly dropped in 2023 but it's expected to drop drastically by 2024.

7: Compare City CO2 emissions and Highway CO2 emissions in terms of how they've evolved from 2015 to 2023, and what have experts predicted for 2024?



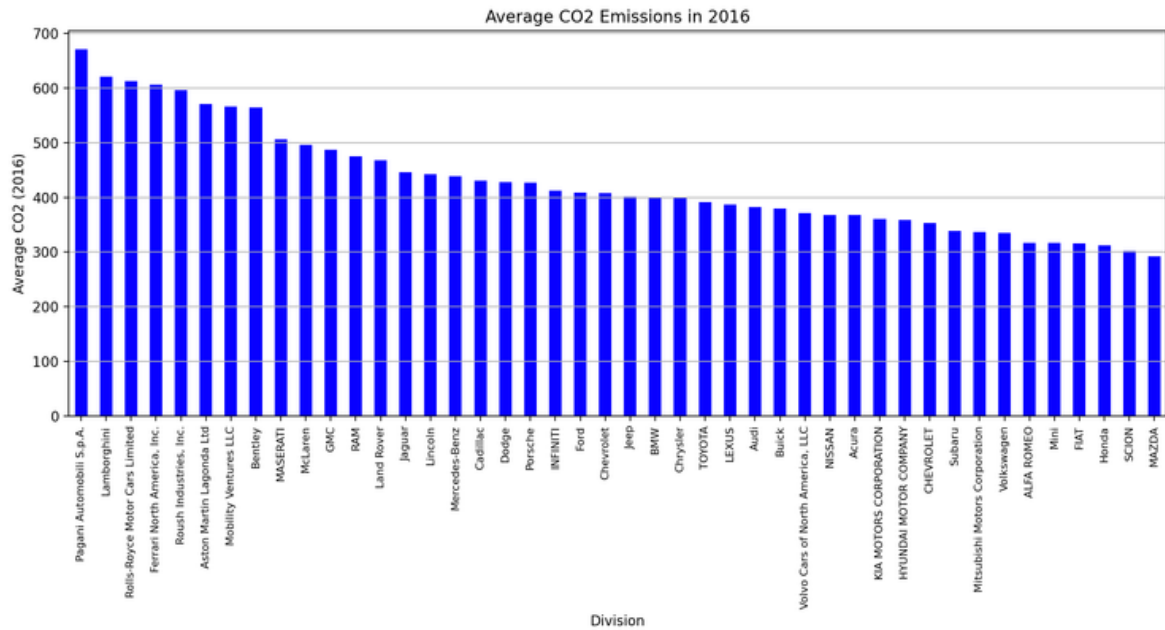
As shown above, City CO2 emissions is significantly higher on average than Highway CO2 emissions for all years from 2015 to 2023, and this is predicted to be the case in 2024 as well. This could be because city driving usually involves frequent stops in traffic, and more acceleration and deceleration compared to highway driving, where cars can maintain more consistent speeds. In stop-and-go traffic, vehicles tend to burn more fuel and emit more CO2 due to the increased energy required for frequent acceleration. (This slightly contradicts figure 2)

8: Is there a correlation between engine displacement and CO2 emissions in the years between 2015 to 2023, and what have experts predicted for 2024?



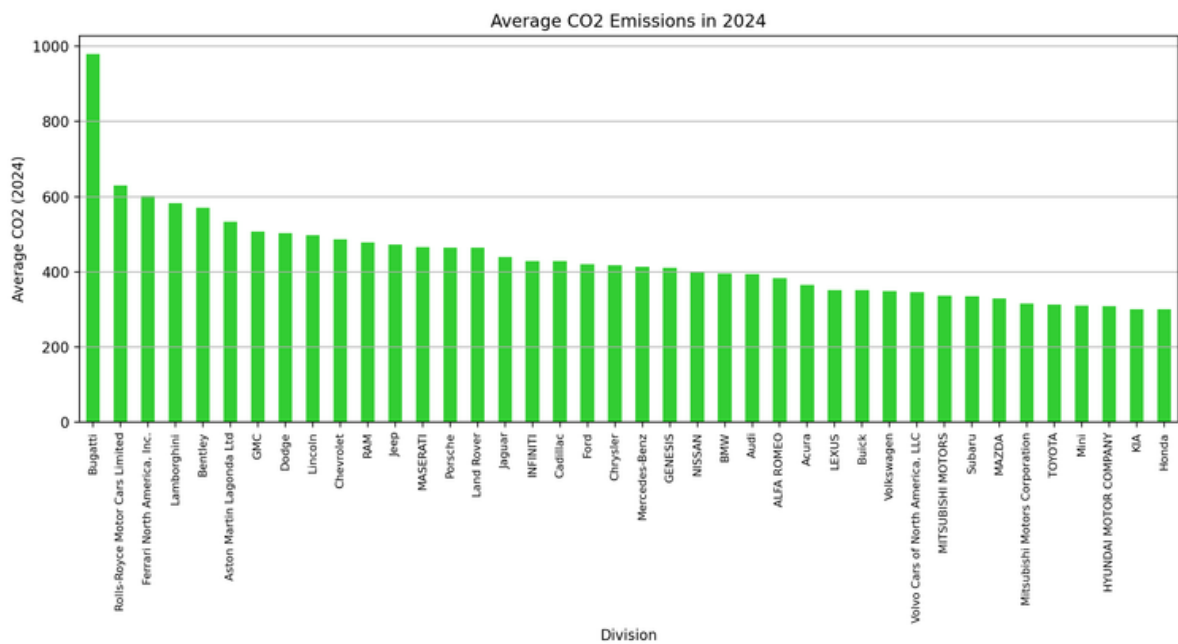
As shown in the graph above, we can see that all the correlation coefficients for all the years are positive, and they are all quite close to the modulus of 1 which shows quite a strong positive correlation. This shows that for all years between 2015 and 2023, larger engine displacements are associated with higher CO2 emissions, and this is predicted to be the case for 2024 as well. This is because larger engines are designed to provide increased power and performance, but this comes at the cost of higher fuel consumption and therefore higher CO2 emissions.

9: Create a visualisation that shows the average CO2 emissions for each division in 2016.



The graph shows that in 2016, the division of cars with the highest average CO2 emissions was Pagani Automobile and the division of cars with the lowest average CO2 emissions was MAZDA. This is expected as it's the opposite of figure 4.

10: Create a visualisation that shows what experts have predicted for the average CO2 emissions for each division in 2024.



The graph shows that in 2024, it's predicted that the division of cars with the highest average CO2 emissions will be Bugatti and the division of cars with the lowest average CO2 emissions will be Honda.