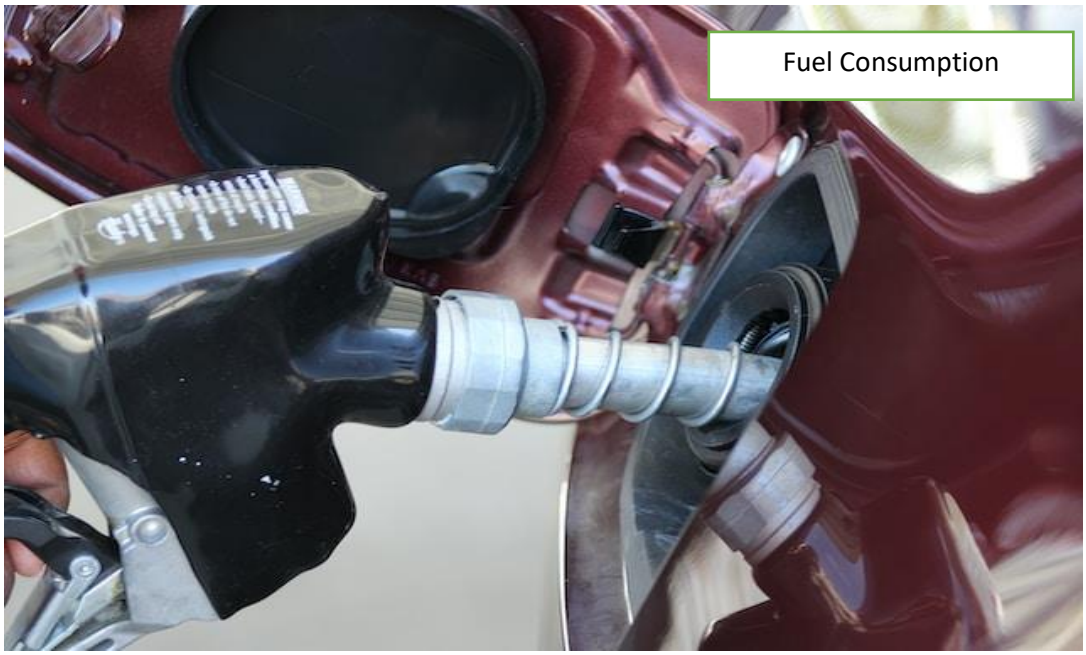
FUEL CONSUMPTION ANALYSIS

Business Problem

The company decided to conduct a market research analysis to understand the current market trends and customer preferences. Identify patterns and insights that could help them make informed decisions about their product offerings.

A market research firm has been hired by a car manufacturer to conduct an analysis of the Canadian car market. The manufacturer wants to understand the preferences of Canadian consumers for different vehicle classes and fuel types, and how these preferences have changed over time. The market research firm has provided a dataset containing information on various vehicles, including their make, model, vehicle class, engine size, fuel type, and fuel consumption.

Through the analysis, we discovered that customers in these segments were increasingly concerned about the environmental impact of their vehicles and were looking for cars with lower fuel consumption and emissions.



Information about Dataset

Datasets provide model-specific fuel consumption ratings and estimated carbon dioxide emissions for new light-duty vehicles for retail sale in Canada.
Data from https://open.canada.ca/data/en/dataset/98f1a129-f628-4ce4-b24d-6f16bf24dd64

Understanding the Table:

Model

- 4WD/4X4 = Four-wheel drive
- AWD = All-wheel drive
- CNG = Compressed natural gas
- FFV = Flexible-fuel vehicle
- NGV = Natural gas vehicle
- # = High output engine that provides more power than the standard engine of the same size

Transmission

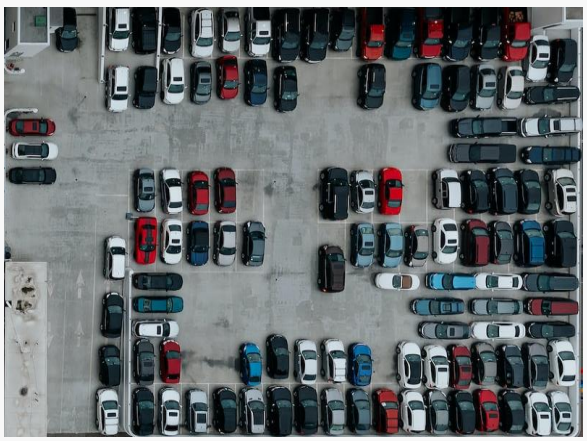
- A = Automatic
- AM = Automated manual
- AS = Automatic with select shift
- AV = Continuously variable
- M = Manual
- 3 - 10 = Number of gears

Fuel Type

- X = Regular gasoline
- Z = Premium gasoline
- D = Diesel
- E = Ethanol (E85)
- N = Natural Gas

Fuel Consumption: City and highway fuel consumption ratings are shown in litres per 100 kilometres (L/100 km) - combined rating (55% city, 45% hwy) is shown in L/100 km and in miles per imperial gallon (mpg).

CO2 Emissions: the tailpipe emissions of carbon dioxide (in grams per kilometre) for combined city and highway driving.



Introduction

Fuel consumption is a measure of how much fuel a vehicle uses to travel a given distance. It is an important indicator of vehicle performance, environmental impact, and cost efficiency. In this analysis, I will explore the data of fuel consumption from year 2000 to year 2023, which contains information on year, model, engine size, engine size, fuel type, fuel consumption and CO2 emission. I will use Excel to perform various statistical and graphical techniques to answer some relevant questions and gain insights into the trends and patterns of fuel consumption for different models and factors. My goal is to understand how fuel consumption has changed over time and what factors affect it. I hope this analysis will help me improve my data analysis skills and learn more about fuel consumption.

Assumptions

The data is accurate and complete: It is assumed that the data provided in the dataset is accurate and complete, with no missing values or errors.

The vehicles in the dataset are representative of the market: The assumption is that the vehicles included in the dataset are representative of the wider market.

The fuel consumption and CO2 emissions figures are reliable: The assumption is that the fuel consumption and CO2 emissions figures for each vehicle in the dataset are reliable and based on standardized testing methods.

The dataset is relevant for the analysis: It is assumed that the dataset is relevant for the specific analysis being performed.

The market conditions remain constant: The assumption is that the market conditions and regulations for fuel consumption and CO2 emissions remain constant throughout the period covered by the dataset.

Questions for data analysis on the fuel consumption dataset

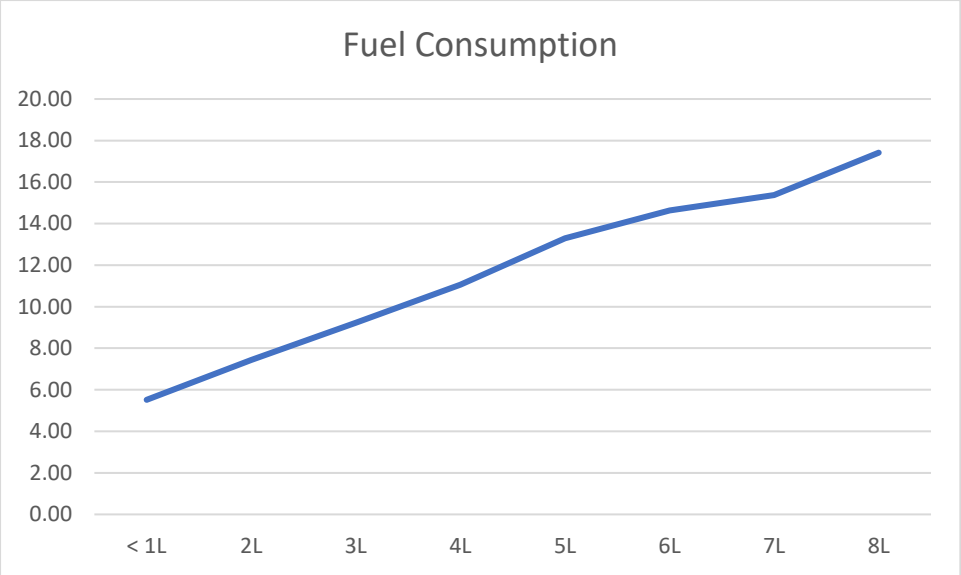
Q1. Which models have the lowest and highest fuel consumption in each year?

Year	Highest	Value	Lowest	Value
2000	FERRARI	19.66	SATURN	8.15
2001	DODGE	14.86	SATURN	8.12
2002	FERRARI	18.35	HONDA	8.21
2003	FERRARI	19.86	MINI	7.70
2004	BENTLEY	19.30	MINI	7.70
2005	BENTLEY	18.50	SMART	4.20
2006	BENTLEY	18.05	SMART	4.20
2007	LAMBORGHINI	17.45	MINI	7.70
2008	LAMBORGHINI	18.64	SMART	5.40
2009	BENTLEY	17.73	SMART	5.40
2010	BUGATTI	22.10	SMART	5.40
2011	BUGATTI	21.30	SMART	5.40
2012	BUGATTI	21.30	SMART	5.30
2013	BENTLEY	15.78	SMART	5.30
2014	LAMBORGHINI	15.03	SMART	5.30
2015	LAMBORGHINI	17.63	SMART	6.50
2016	ROLLS-ROYCE	16.66	SMART	6.90
2017	LAMBORGHINI	17.47	SMART	6.70
2018	BUGATTI	22.20	HONDA	7.98
2019	BUGATTI	22.20	HONDA	8.04
2020	BUGATTI	22.60	HONDA	8.03
2021	BUGATTI	24.15	HONDA	7.91
2022	BUGATTI	24.80	HYUNDAI	7.99
2023	BUGATTI	24.80	KIA	8.14

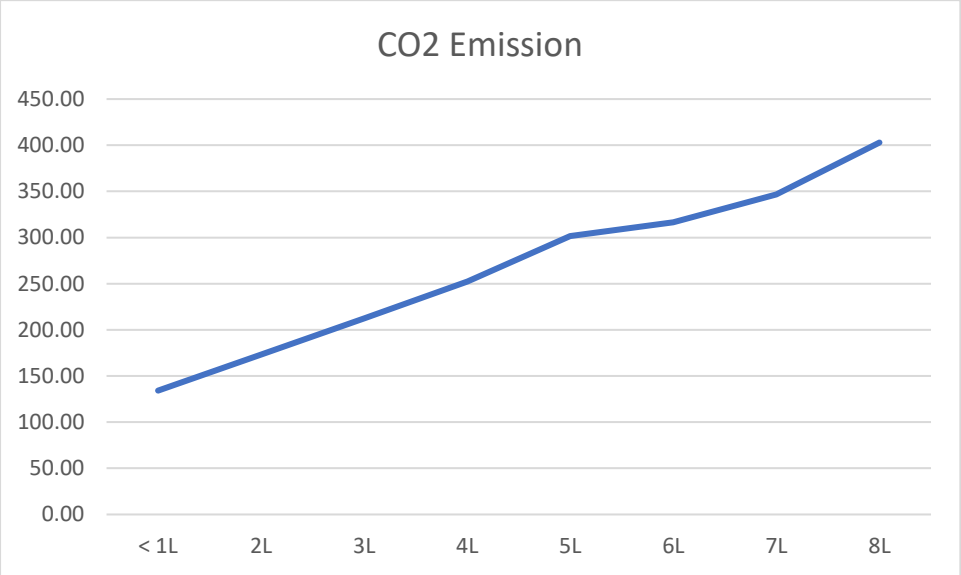
Highest fuel consumptions are from makers like Ferrari, Bugatti etc., of overall approx. 20L/100KM as they manufacture high-performance sports cars, typically feature powerful engines.

Lowest fuel consumptions are from makers like Honda, Smart etc., of overall approx. 8L/100KM as manufacturers targets lower segments with small engines.

Q2. How does the engine size affect the fuel consumption and CO2 emission?

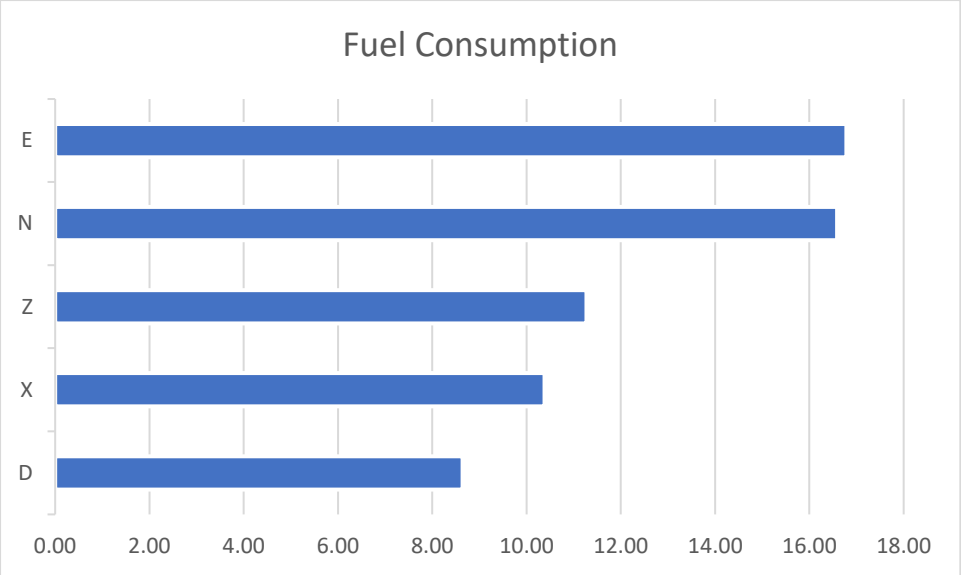


Engine size increases, fuel consumption increases, form 5.5L/100KM for 1L engine to 17.4L/100KM for 8L engine.

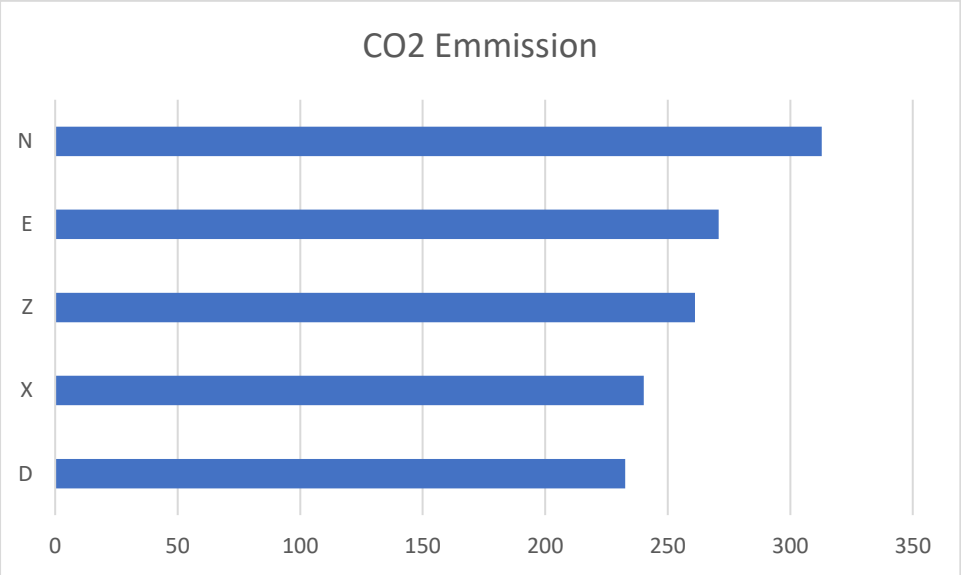


Also, here engine size increase, fuel consumption also increases, form 134g/KM for 1L engine to 402g/KM for 8L engine.

Q3. How does the fuel type influence the fuel consumption and CO2 emission?

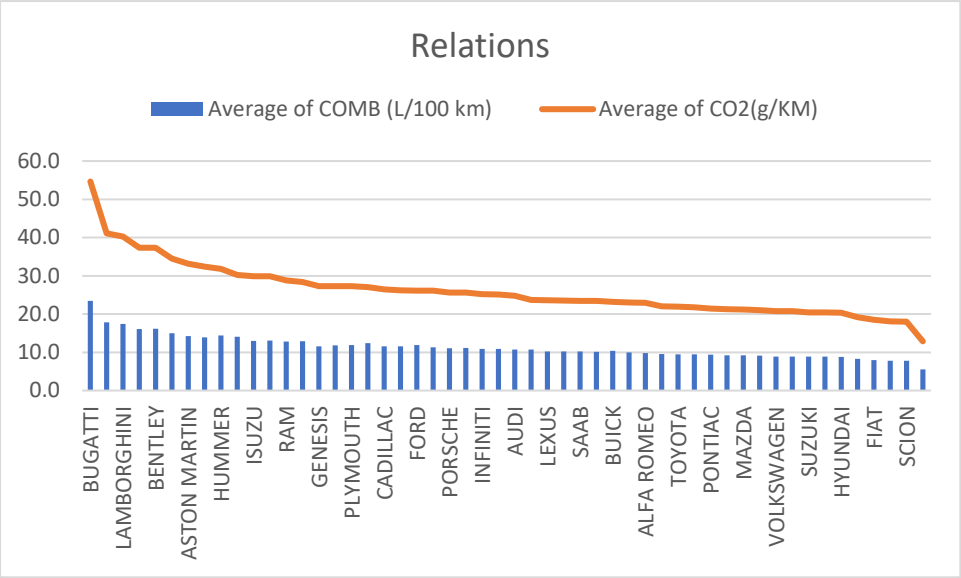


From above bar chart, comparatively E (Ethanol) and N (Natural Gas) have higher fuel consumption about 16.7L/100KM followed by Z (Premium Gasoline) 11.3L/100KM, X (Regular Gasoline) 10.4L/100KM and D (Diesel) 8.6L/100KM.



According to above chart N (Nature Gas) has higher CO2 emission about 313g/KM followed by E(Ethanol) 271g/KM, Z (Premium Gasoline) 261g/KM, X (Regular Gasoline) 240g/KM and D (Diesel) 233g/KM.

Q4. What is the correlation between fuel consumption and CO2 emission for different models?

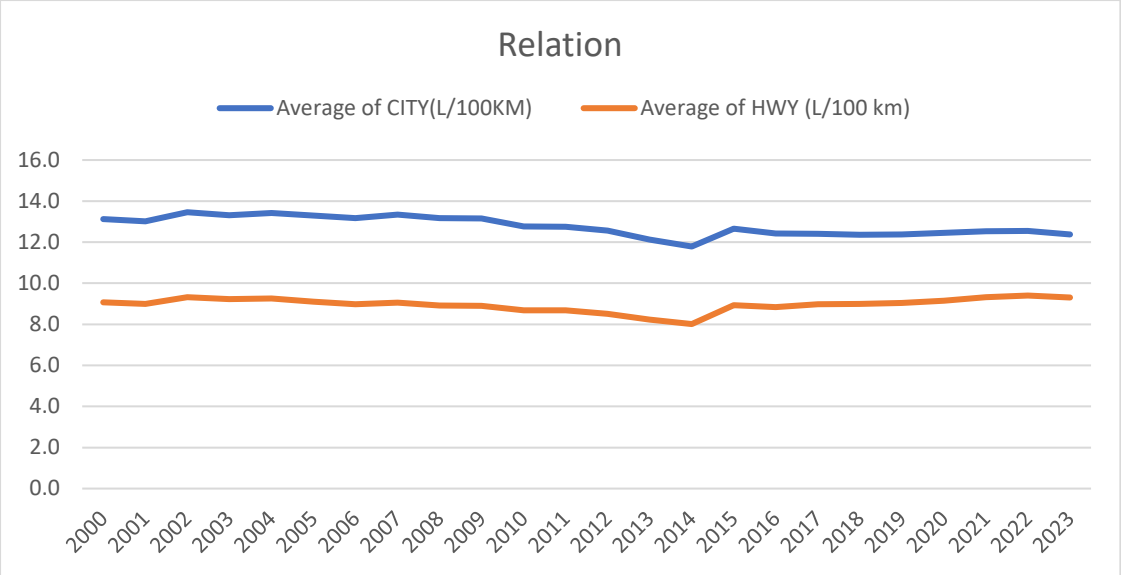


As Fuel Consumption increases, CO2 Emission also increases, the amount of CO2 produced by a vehicle is directly proportional to the amount of fuel it consumes. This relationship is due to the fact that burning more fuel produces more energy, which in turn requires more oxygen to be burned, and therefore produces more CO2.

Q5. What are some factors that can explain the differences in fuel consumption among models?

- Larger and more powerful engines consume more fuel than smaller and less powerful ones as we see in Q2.
- Heavier and less aerodynamic vehicles have more inertia and drag, requiring more energy to move.
- A larger engine has more cylinders or larger cylinders that can hold more air-fuel mixture and produce more power. However, a larger engine also consumes more fuel than a smaller engine of the same type and efficiency.

Q6. What is the different between Fuel Consumption in CITY and in HIGHWAY for different years?



Fuel Consumption comparatively low in HIGHWAY than in CITY. Because highway driving generally involves maintaining a consistent speed for longer periods of time, which allows the engine to operate at its most efficient RPM range. This means that the engine is not working as hard to maintain speed, and therefore burns less fuel per mile travelled compared to stop-and-go city driving, where the engine is frequently starting and stopping and shifting gears. Also, highways typically have fewer obstacles such as traffic lights, stop signs, and pedestrians, which means that drivers do not have to accelerate and brake as frequently, further reducing fuel consumption.

Thankyou