Analyzing the Impact of Car Features on Price and Profitability

Description:

The automotive industry is evolving rapidly, emphasizing fuel efficiency, sustainability, and technological advancements. With intensifying competition, car manufacturers must analyze key factors influencing consumer demand and pricing strategies. This project aims to explore how manufacturers can optimize pricing and product development to maximize profitability while meeting market demand.

Tech-Stack Used:

Microsoft Excel: Used for data cleaning, analysis, and visualization.

Project Approach:

We structured our analysis into five main steps:

1. Understanding The Data : Understanding the data and the features it contains to know what impact are we expecting.
2. Cleaning The Data : Handling the irregularities like the null values, outliers , missing values, irrelevant data etc.
3. Analyzing The Data : Analyzing the data, various relations between the features to derive conclusions.
4. Visualizing The Data : Visualize and create a dashboard.
5. Presentation : We show our design to client and wait for feedback.

Dataset Description

The dataset contains information on various car models and their specifications.
Here is a brief overview of the dataset:
- **Number of observations:** 11,159
- **Number of variables:** 16
- **File type:** CSV (Comma Separated Values)

The variables in the dataset are:
- **Make:** the make or brand of the car
- **Model:** the specific model of the car
- **Year:** the year the car was released
- **Engine Fuel Type:** the type of fuel used by the car (gasoline, diesel, etc.)
- **Engine HP:** the horsepower of the car's engine
- **Engine Cylinders:** the number of cylinders in the car's engine
- **Transmission Type:** the type of transmission (automatic or manual)
- **Driven_Wheels:** the type of wheels driven by the car (front, rear, all)
- **Number of Doors:** the number of doors the car has
- **Market Category:** the market category the car belongs to (Luxury, Performance, etc.)
- **Vehicle Size:** the size of the car
- **Vehicle Style:** the style of the car (Sedan, Coupe, etc.)
- **Highway MPG:** the estimated miles per gallon the car gets on the highway
- **City MPG:** the estimated miles per gallon the car gets in the city
- **Popularity:** a ranking of the popularity of the car (based on the number of times it has been viewed on Edmunds.com)
- **MSRP:** the manufacturer's suggested retail price of the car

Cleaning The Data

➢ Cleaning the data is an crucial step in any data analysis as it ensures the data is accurate, reliable and consistent .

➢ Without data cleaning ,Our data analysis will be inaccurate ,incomplete and inconsistent which can lead to serious consequences in decision making.

➢ There are some steps involved in Cleaning the data. Those are :

1. Remove all the null values by dropping the whole row.
2. Delete duplicate rows.
3. Add doller sign with MSRP values
4. Correct the formatting of each column
5. Replace the cells with the 'UNKNOWN' value in the column 'Transmission Type' with its mode i.e. Automatic.
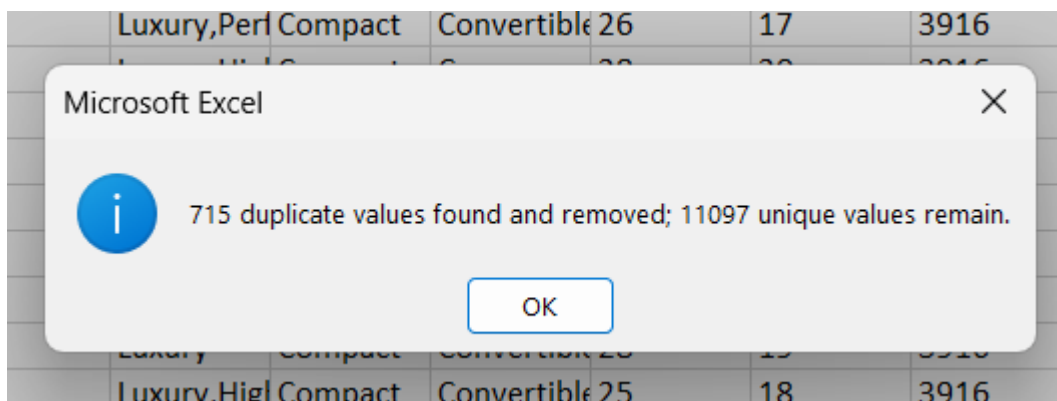

The Cleaned Dataset is provided below for reference:

https://docs.google.com/spreadsheets/d/10rq9tfVzPomVqiqK5AM
C5TagGrap9bjd/edit?usp=drive_link&ouid=1073905935837152228 0
5&rtpof=true&sd=true

Analysis

Insight Required: How does the popularity of a car model vary across different market categories?

- **Task 1.A:** Create a pivot table that shows the number of car models in each market category and their corresponding popularity scores.
- **Task 1.B:** Create a combo chart that visualizes the relationship between market category and popularity.
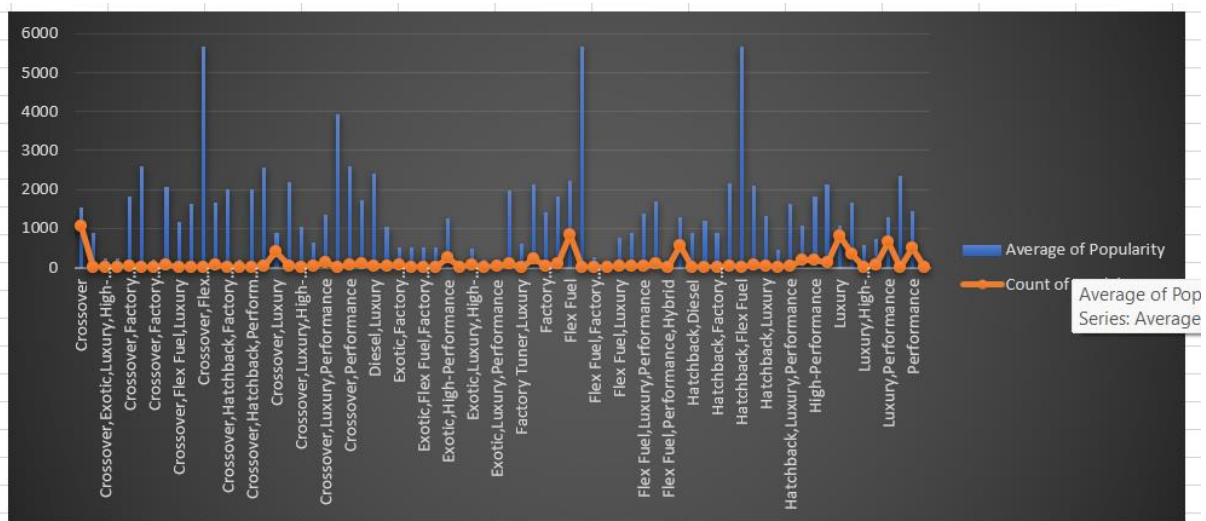
Insights:- Flex Fuel, Diesel, Hatchback, Crossover, Performance are the most popular market category for car models.

Insight Required: What is the relationship between a car's engine power and its price?

- **Task 2:** Create a scatter chart that plots engine power on the x-axis and price on the y-axis. Add a trendline to the chart to visualize the relationship between these variables.

MSRP
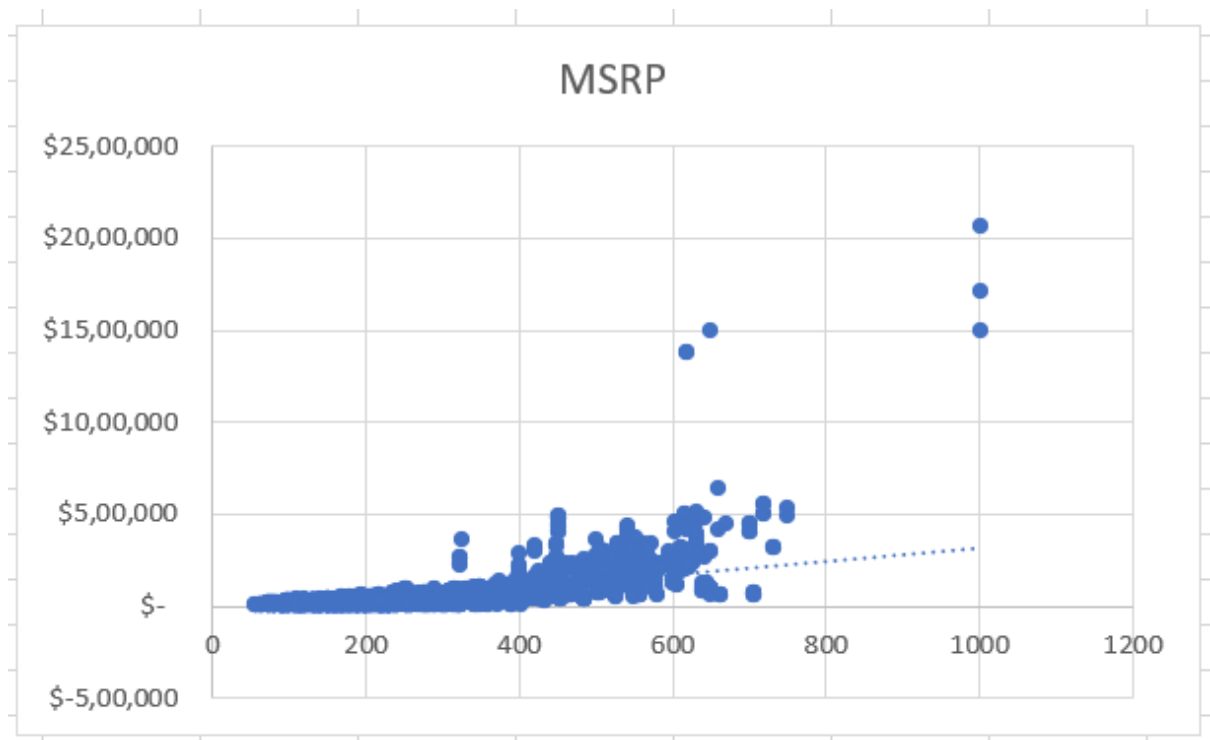
Insights: - If Engine power increases Price will also increase. So, it's positive relationship between both of them.

Insight Required: Which car features are most important in determining a car's price?

- **Task 3:** Use regression analysis to identify the variables that have the strongest relationship with a car's price. Then create a bar chart that shows the coefficient values for each variable to visualize their relative importance.

Coefficients Of Variables

Variable	Coefficient
city mpg	1193.47926
highway MPG	540.5580602
Number of Doors	-4654.18699
Engine Cylinders	7483.325697
Engine HP	319.4607229

Insights: - Engine Cylinders are the most important features in determining a car's price.

Insight Required: How does the average price of a car vary across different manufacturers?
- **Task 4.A:** Create a pivot table that shows the average price of cars for each manufacturer.
- **Task 4.B:** Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.


Insights: - Bugatti has the highest Average price and Plymouth has the lowest average price.

Insight Required: What is the relationship between fuel efficiency and the number of cylinders in a car's engine?
- **Task 5.A:** Create a scatter plot with the number of cylinders on the x-axis and highway MPG on the y-axis. Then create a trendline on the scatter plot to visually estimate the slope of the relationship and assess its significance.

- **Task 5.B:** Calculate the correlation coefficient between the number of cylinders and highway MPG to quantify the strength and direction of the relationship.
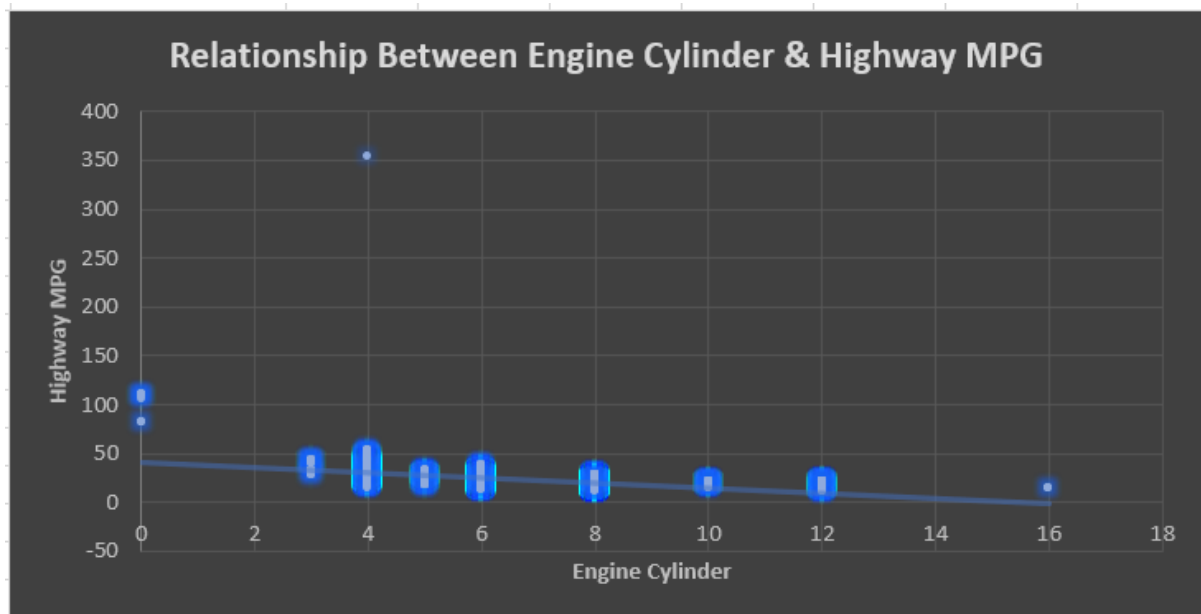

Insights: - Number of Cylinders will increase then highway MPG will decrease. It's negative relationship between both of them.

The Results Dataset Link:-

https://docs.google.com/spreadsheets/d/1FCkOhL2nDoUbRJuWlvwrY5mz4QZTqfbS/edit?usp=drive_link&ouid=107390593583715222805&rtpof=true&sd=true

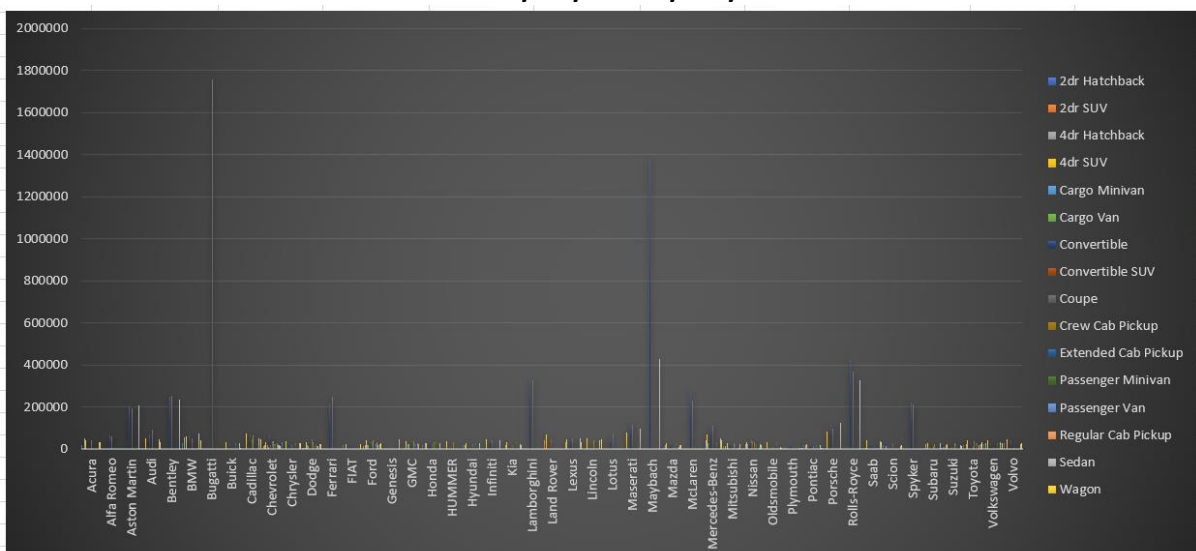# Building The Dashboard

Task 1: How does the distribution of car prices vary by brand and body style?
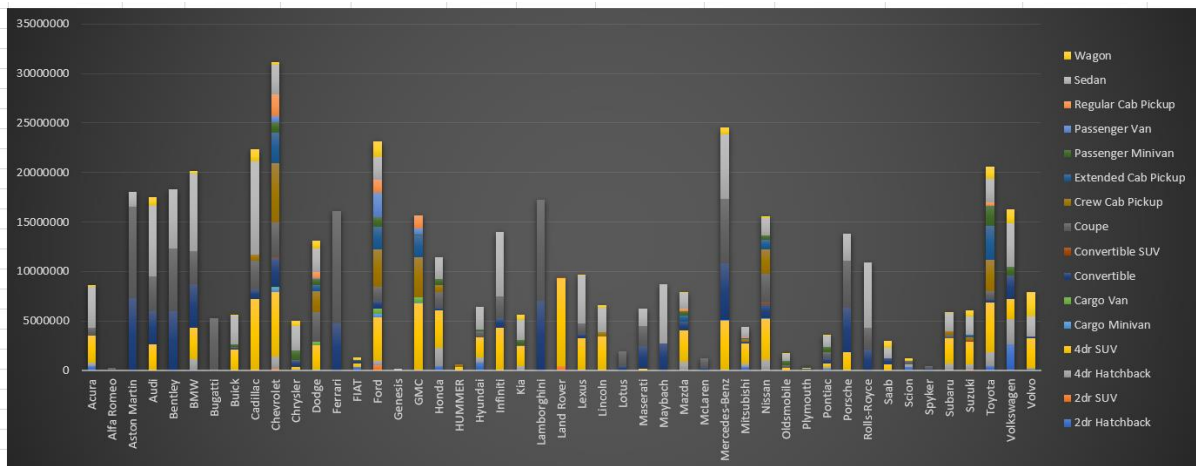
Insights: - Chevrolet has the highest price distribution by body style.
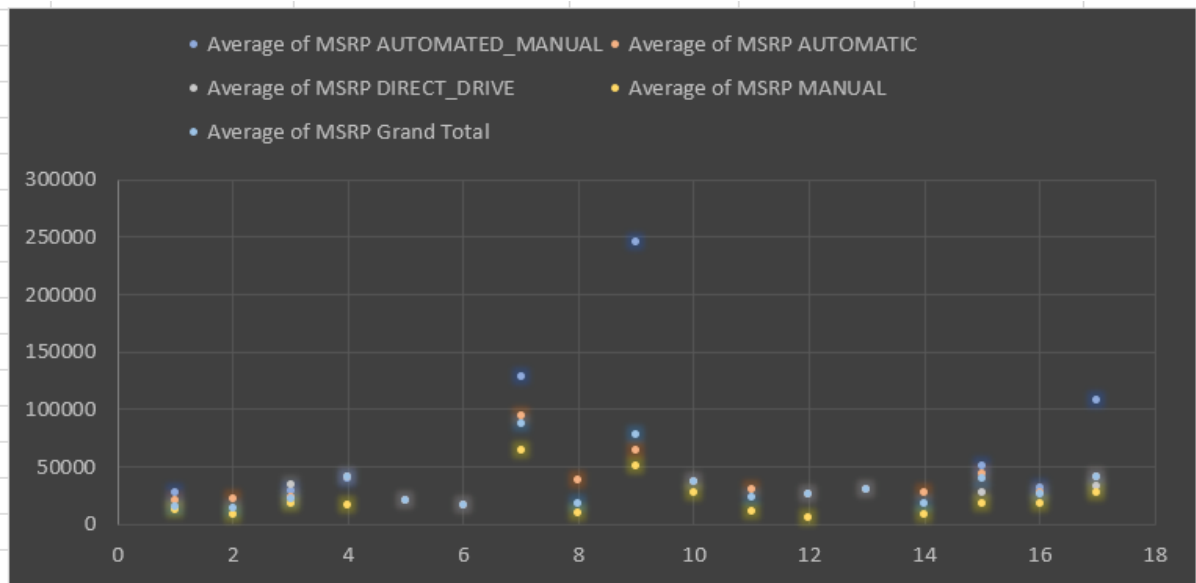
Task 2: Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?

Insights: - Bugatti has the highest average MSRPs and Plymouth has the lowest average MSRPs by body style.
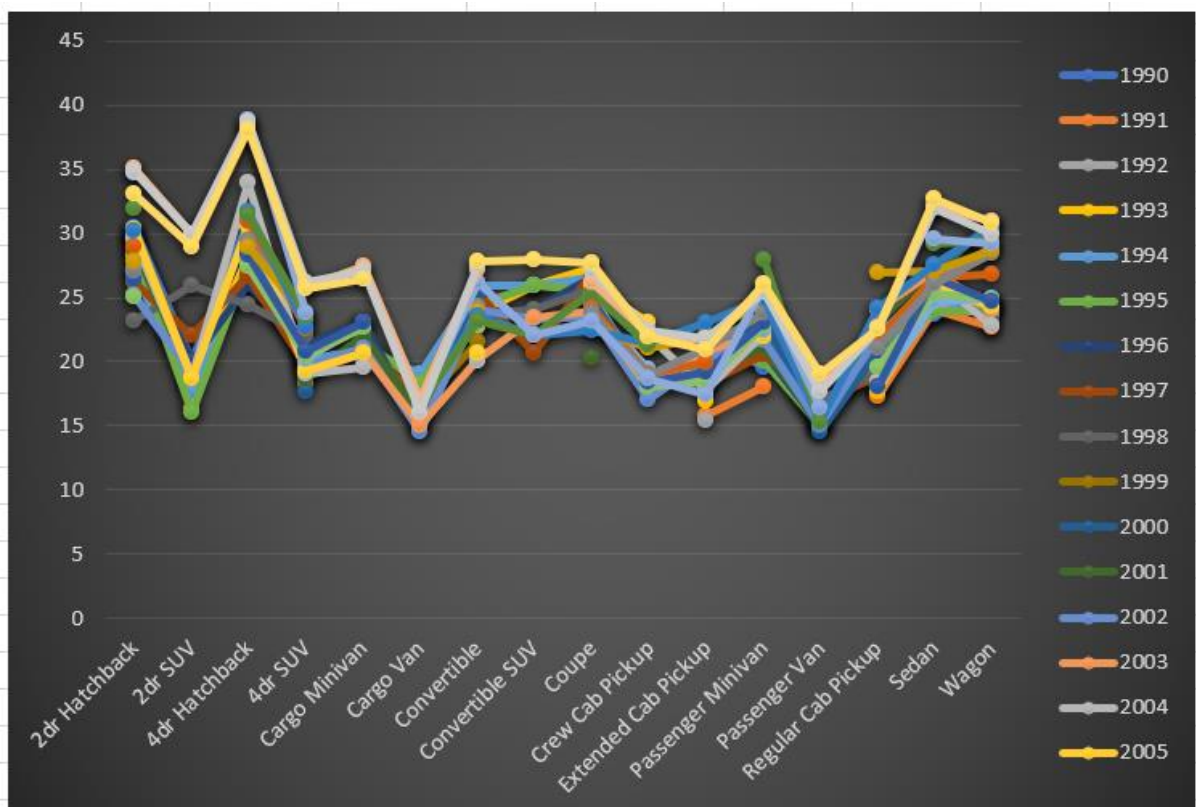
Task 3: How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?


Insights: - AUTOMATED_MANUAL with Coupe body style is the most expensive transmission.

**Task 4:** How does the fuel efficiency of cars vary across different body styles and model years?

Insights: - Fuel efficiency of cars increased across different body styles and model years. Wagon body style has the highest fuel efficiency in 2017.

Task 5: How does the car's horsepower, MPG, and price vary across different Brands?
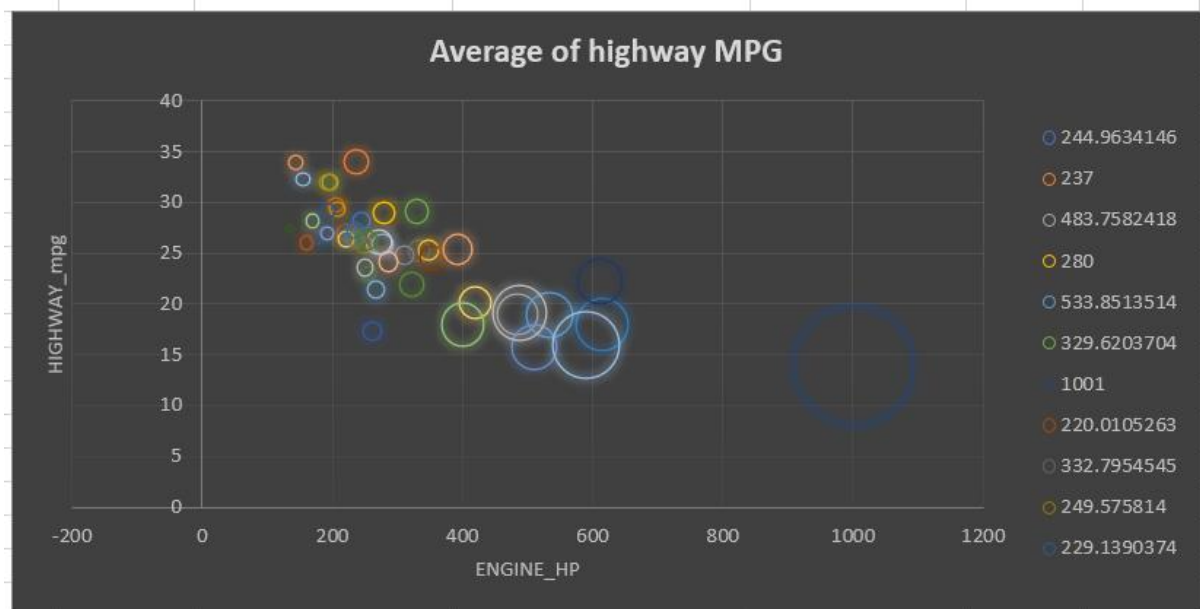
Insights: - If Engine HP goes up, Highway MPG goes down but price increases.

Final Dashboard :
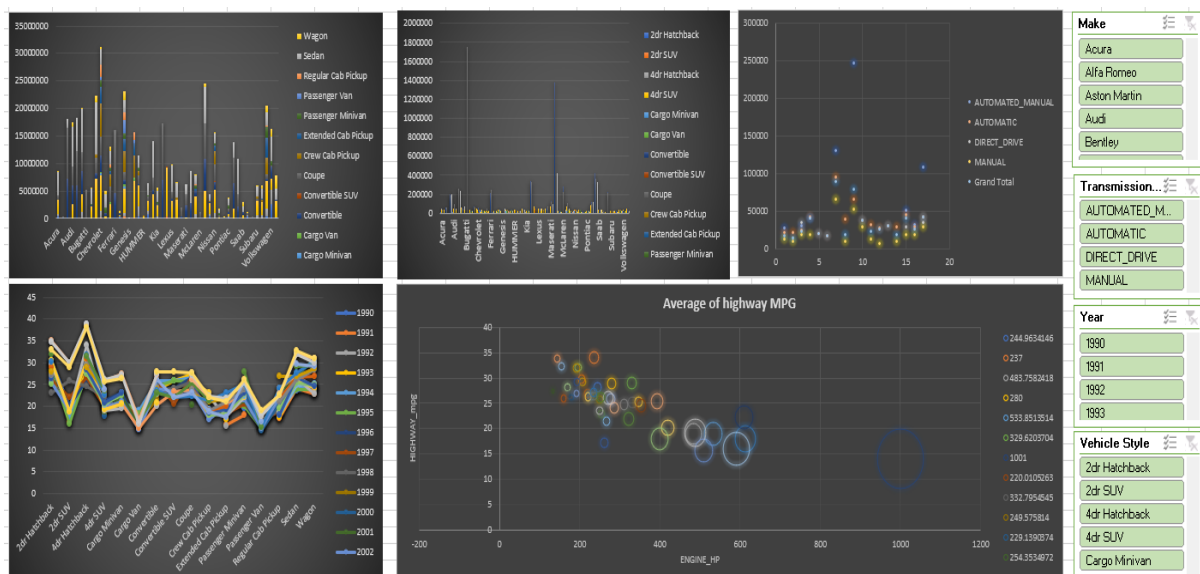
The Dashboard Dataset Link:-

https://docs.google.com/spreadsheets/d/1eMgi640bCNkSeBW-GwAHAmey5gsqgZNJ/edit?usp=drive_link&ouid=107390593583715222805&rtpof=true&sd=true

Conclusion:

➢ We found several key insights, such as the significant impact of engine power on car prices, the varying popularity of car models across market categories, and the relationship between fuel efficiency and engine specifications.

➢ These insights directly address the business problem by providing actionable information for car manufacturers to optimize pricing strategies, identify profitable market segments and prioritize product developmant efforts.

➢ Based on insights gained, we recommend that car manufacturers focus on developing fuel-efficient models, strategically price cars based on feature importance, and tailor marketing strategies to target popular market categories.