Analyzing the Impact of Car Features on Price and Profitability

Project by Mayur Rajput

Analysis file Link

Project's Agenda

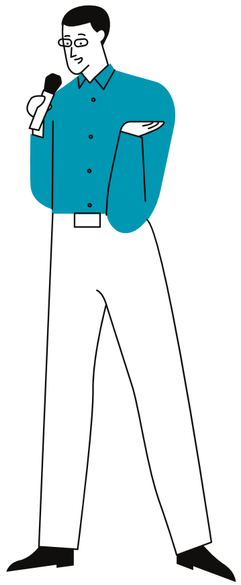
1. Project description
2. Approach & Tech-Stack Used
3. Data Cleaning
4. Data Analysis
5. Interactive Dashboard
6. Insights & Results

Analysis File Link

Project Description

- The goal of this project is to identify How can a car manufacturer optimize pricing and product development decisions to maximize profitability while meeting consumer demand? This problem could be approached by analyzing the relationship between a car's features, market category, and pricing, and identifying which features and categories are most popular among consumers and most profitable for the manufacturer. By using data analysis techniques such as regression analysis and market segmentation, the manufacturer could develop a pricing strategy that balances consumer demand with profitability, and identify which product features to focus on in future product development efforts. This could help the manufacturer improve its competitiveness in the market and increase its profitability over time.

Approach



- **Data Cleaning:** This step involves cleaning the data to make it suitable for analysis. It includes removing duplicates, identifying and handling missing values, converting data types if necessary, and possibly feature engineering.

- **Data Analysis:** This step involves analyzing the data to find How can a car manufacturer optimize pricing and product development decisions to maximize profitability while meeting consumer demand

Tech Stack Used

Microsoft Excel

Microsoft Excel is used to perform data cleaning to make dataset suitable for further analysis and Data Analysis to find How can a car manufacturer optimize pricing and product development decisions to maximize profitability while meeting consumer demand

Canva

Canva is used to prepare this presentation

Data Cleaning

a) Removing Duplicates

Removing Dublicates									Number of variables	16			Number of Rows	11,199		
Make	Model	Year	Engine I	Engine I	Engine C	Transm	Driven_	Numbe	Market	Vehicle	Vehicle	highway	city mp	Popular	MSRP
BMW	1 Series M	2011	premium u	335	6	MANUAL	rear wheel	2	Factory Tu	Compact	Coupe	26	19	3916	46135
BMW	1 Series	2011	premium u	300	6	MANUAL	rear wheel	2	Luxury,Per	Compact	Convertibl	28	19	3916	40650
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BMW	1 Series	201											18	3916	31200
BMW	1 Series	201											17	3916	44100
BMW	1 Series	201											20	3916	39300
BMW	1 Series	201											18	3916	36900
BMW	1 Series	201											18	3916	37200
BMW	1 Series	201											20	3916	39600
BMW	1 Series	201											19	3916	31500
BMW	1 Series	201											19	3916	44400
BMW	1 Series	201											19	3916	37200
BMW	1 Series	201	premium u	320	6	MANUAL	rear wheel	2	Luxury,Hig	Compact	Convertibl	25	18	3916	48250
BMW	1 Series	2013	premium u	320	6	MANUAL	rear wheel	2	Luxury,Hig	Compact	Coupe	28	20	3916	43550
Audi	100	1992	regular unl	172	6	MANUAL	front whee	4	Luxury	Midsize	Sedan	24	17	3105	2000
Audi	100	1992	regular unl	172	6	AUTOMAT	all wheel d	4	Luxury	Midsize	Wagon	20	16	3105	2000
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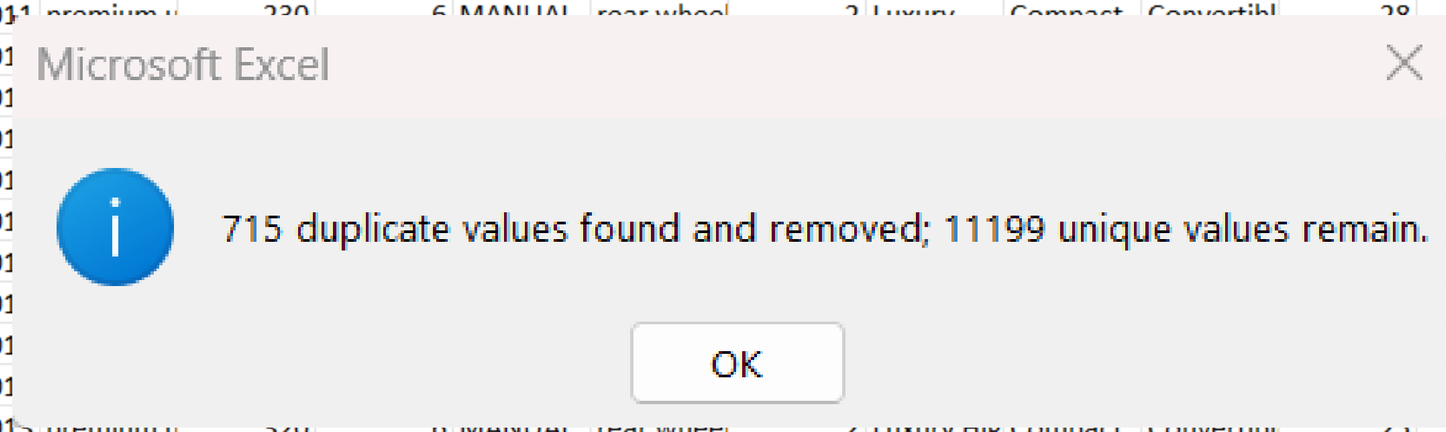

Data Cleaning

b) Identifying Missing Data

Identifying Missing Data						Number of variables			16			Number of Rows			11,199
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Make	Model	Year	Engine I	Engine I	Engine (	Transm	Driven_	Numbe	Market	Vehicle	Vehicle	highwa	city mp	Popular	MSRP
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Audi	100	1993	regular unl	172	6	MANUAL	all wheel d	4	Luxury	Midsize	Sedan	21	16	3105	2000

Data Cleaning

c) Handling Missing Data

After performing CCA, 11,097 Rows left

Identifying Missing Data						Number of variables			16			Number of Rows			11,097
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Make	Model	Year	Engine I	Engine I	Engine (	Transm	Driven_	Numbe	Market	Vehicle	Vehicle	highwa	city mp	Popular	MSRP
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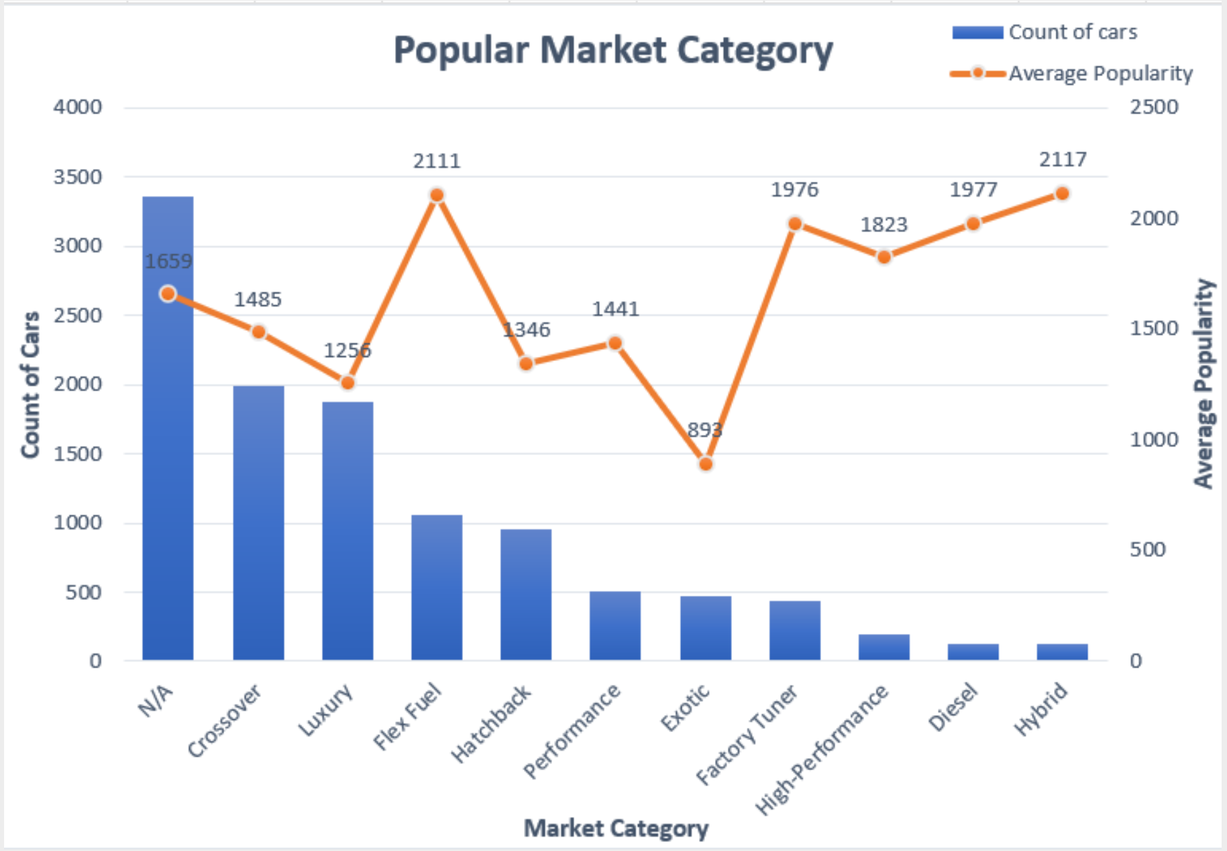
Data Analysis

Task 1 : How does the popularity of a car model vary across different market categories?

Create a pivot table and combo chart to show number of car models in each market category and their corresponding popularity scores.

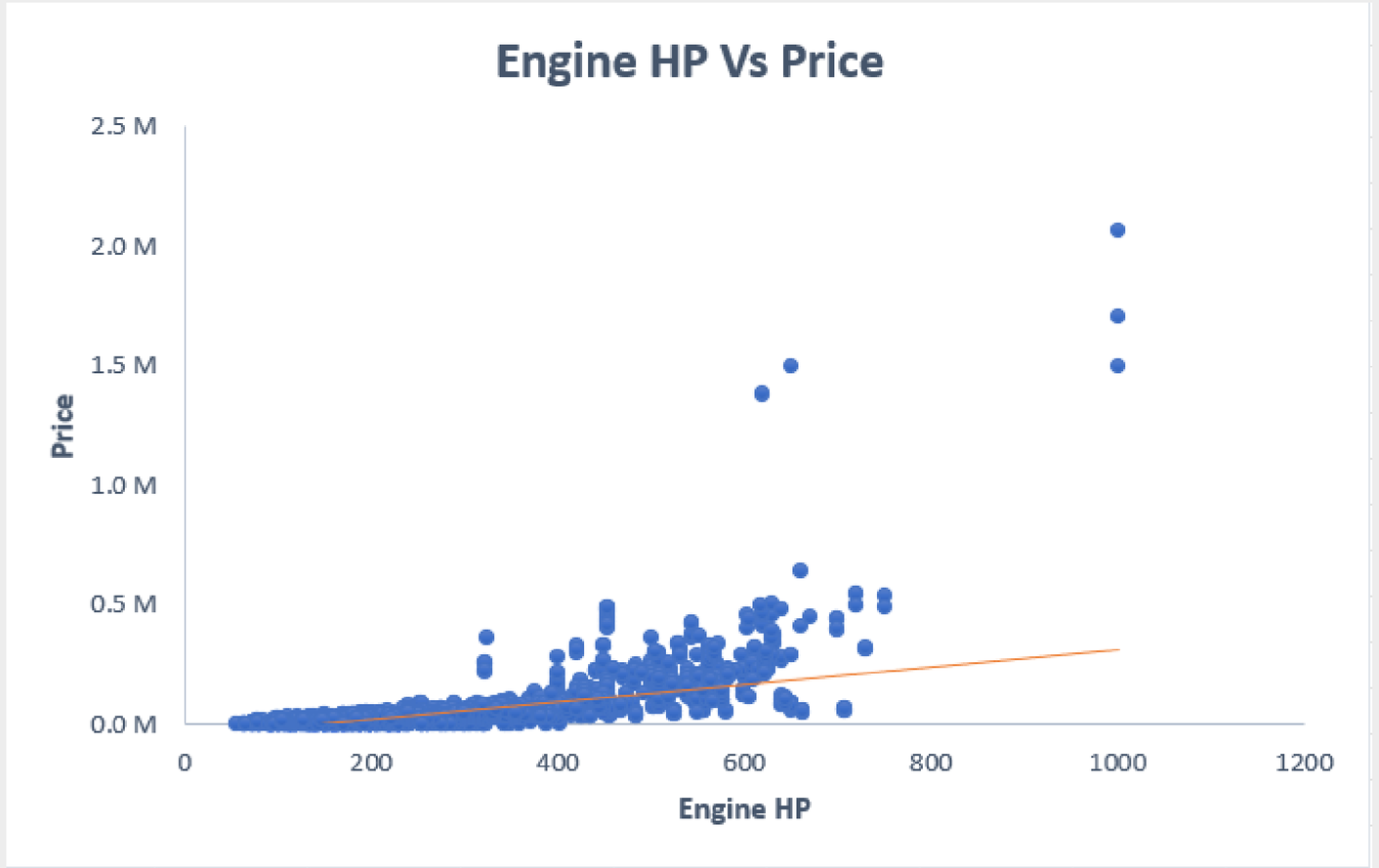
Market Category	Count of cars	Average Popularity
N/A	3362	1659
Crossover	1986	1485
Luxury	1879	1256
Flex Fuel	1056	2111
Hatchback	957	1346
Performance	504	1441
Exotic	470	893
Factory Tuner	433	1976
High-Performance	198	1823
Diesel	131	1977
Hybrid	121	2117



Flex fuel, Hybrid are popular market categories while most of cars sold belongs to N/A, Crossover, Luxury market categories.

Task 2 : What is the relationship between a car's engine power and its price?

Create a scatter chart to visualize the relationship between Engine HP and MSRP variables.

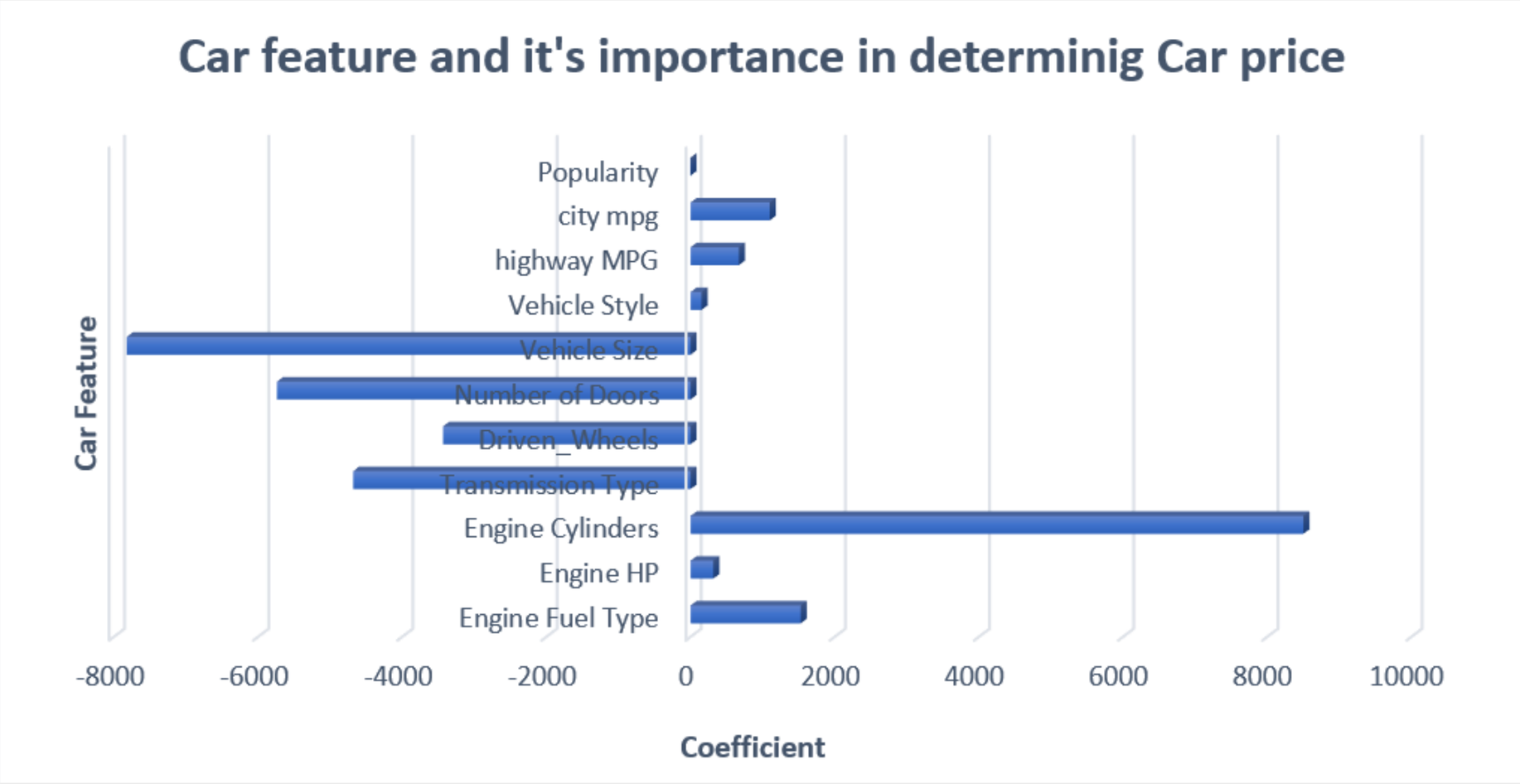


Correlation Coefficient	0.66

The Engine HP is directly related to the car prices and as per Correlation coefficient both variables have tendency to decrease or increase together

Task 3 : Which car features are most important in determining a car's price?

Use regression analysis and create bar chart to identify car features that are most important in determining a car's price

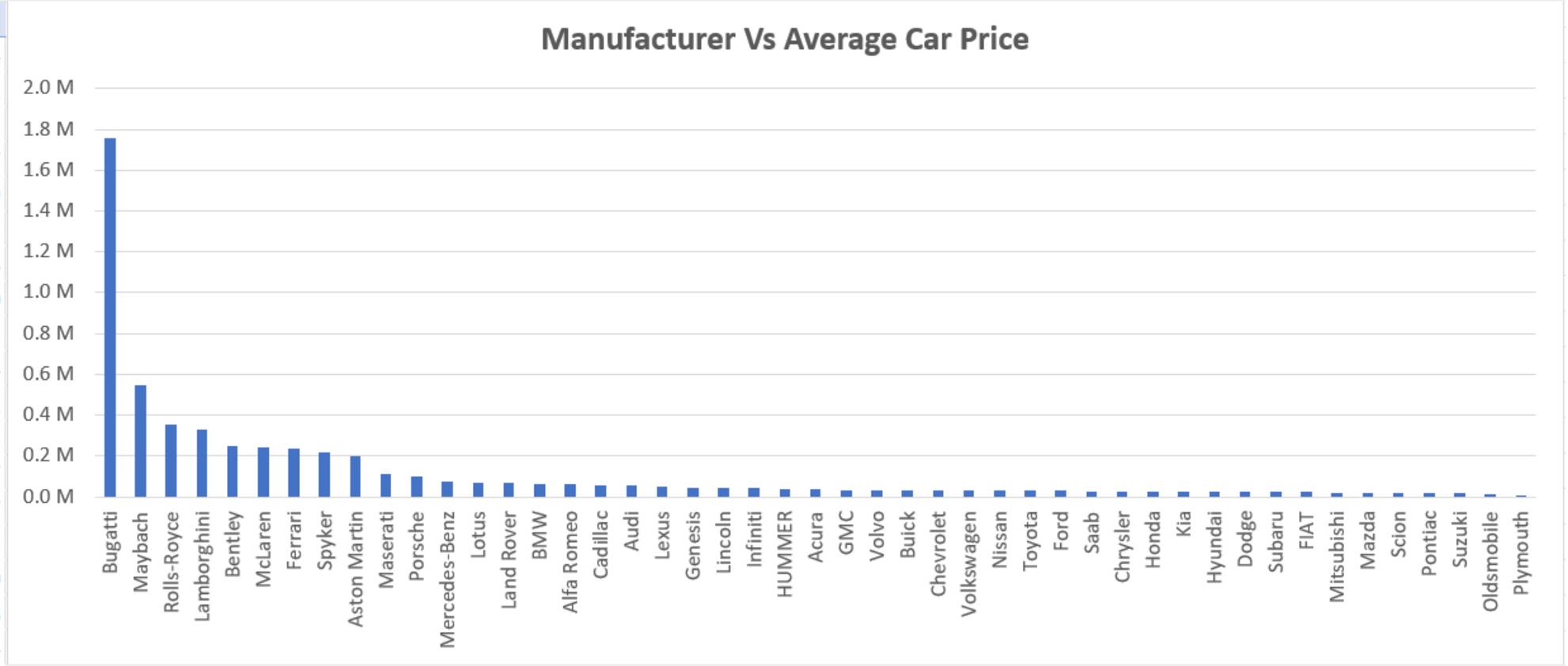


In determining car price, the most important car feature is Engine cylinder while the least important car feature is vehicle size

Task 4 : How does the average price of a car vary across different manufacturers

Create a pivot table and bar chart to show the average price of cars for each manufacturer.

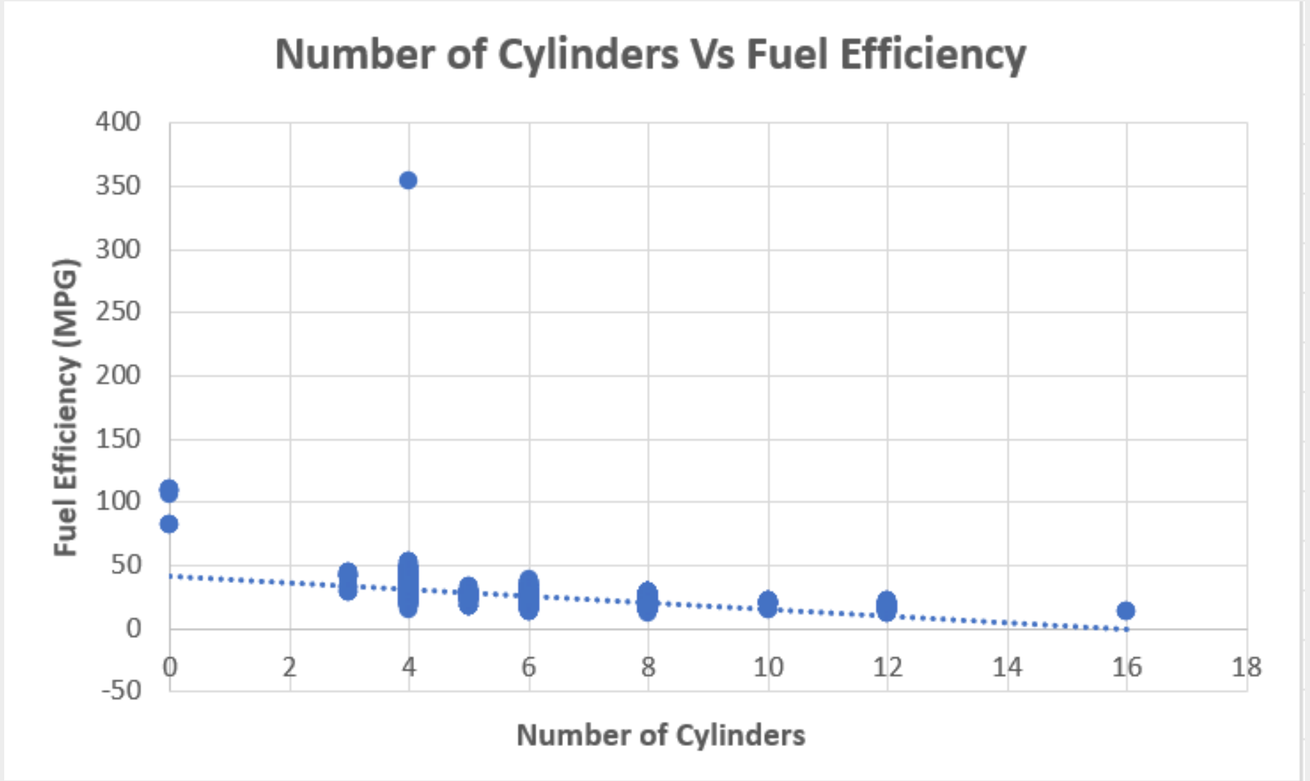
Manufacturer	Average Price
Bugatti	1757224
Maybach	546222
Rolls-Royce	351131
Lamborghini	331567
Bentley	247169
McLaren	239805
Ferrari	237384
Spyker	214990
Aston Martin	198123
Maserati	113684
Porsche	101622
Mercedes-Benz	72135
Lotus	68377
Land Rover	68067
BMW	62163
Alfa Romeo	61600
Cadillac	56368
Audi	54574
Lexus	47549
Genesis	46617
Lincoln	43560
Infiniti	42640
HUMMER	36464



Bugatti, Maybach and Rolls Royce are the manufacturers with the highest average price of cars while Plymouth is the manufacturer with lowest average price of car.

Task 5 : What is the relationship between fuel efficiency and the number of cylinders in a car's engine?

Create a scatter plot and Calculate the correlation coefficient between the number of cylinders and highway MPG to identify relationship between them.



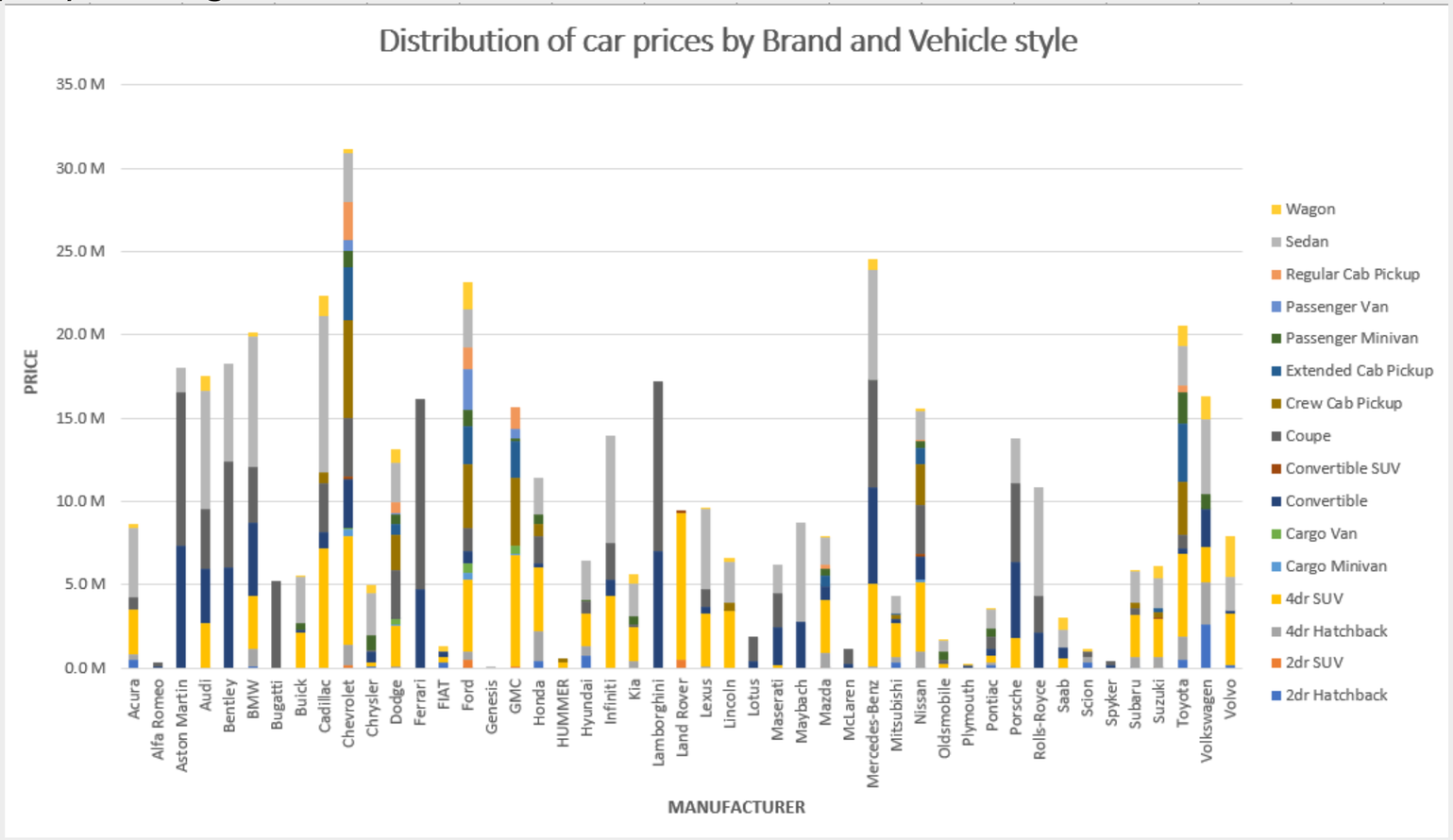
Correlation Coefficient	-0.61

Correlation coefficient shows moderate negative correlation between number of cylinders and Fuel efficiency, This indicates that there is a notable tendency that if one variable increases other variable decreases.

Interactive Dashboard

Task 1 : How does the distribution of car prices vary by brand and body style?

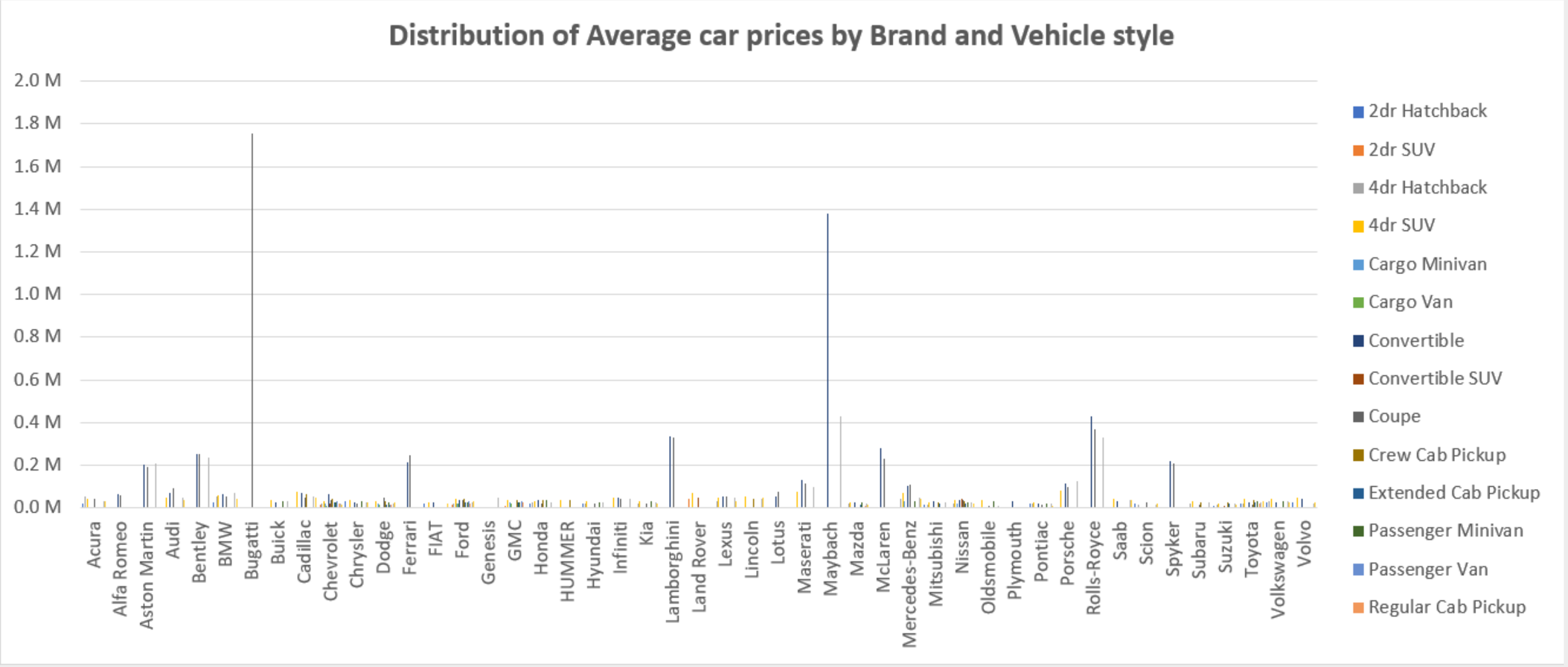
Create a stacked column chart to show the distribution of car prices by brand and body style. Calculate the total MSRP for each brand and body style using SUMIF or Pivot Tables.



Brands like Chevrolet, Mercedes-Benz have higher car price as compared to others. Body styles like 4dr SUV, Sedan have higher contribution to car prices as compare to other body styles

Task 2 : Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?

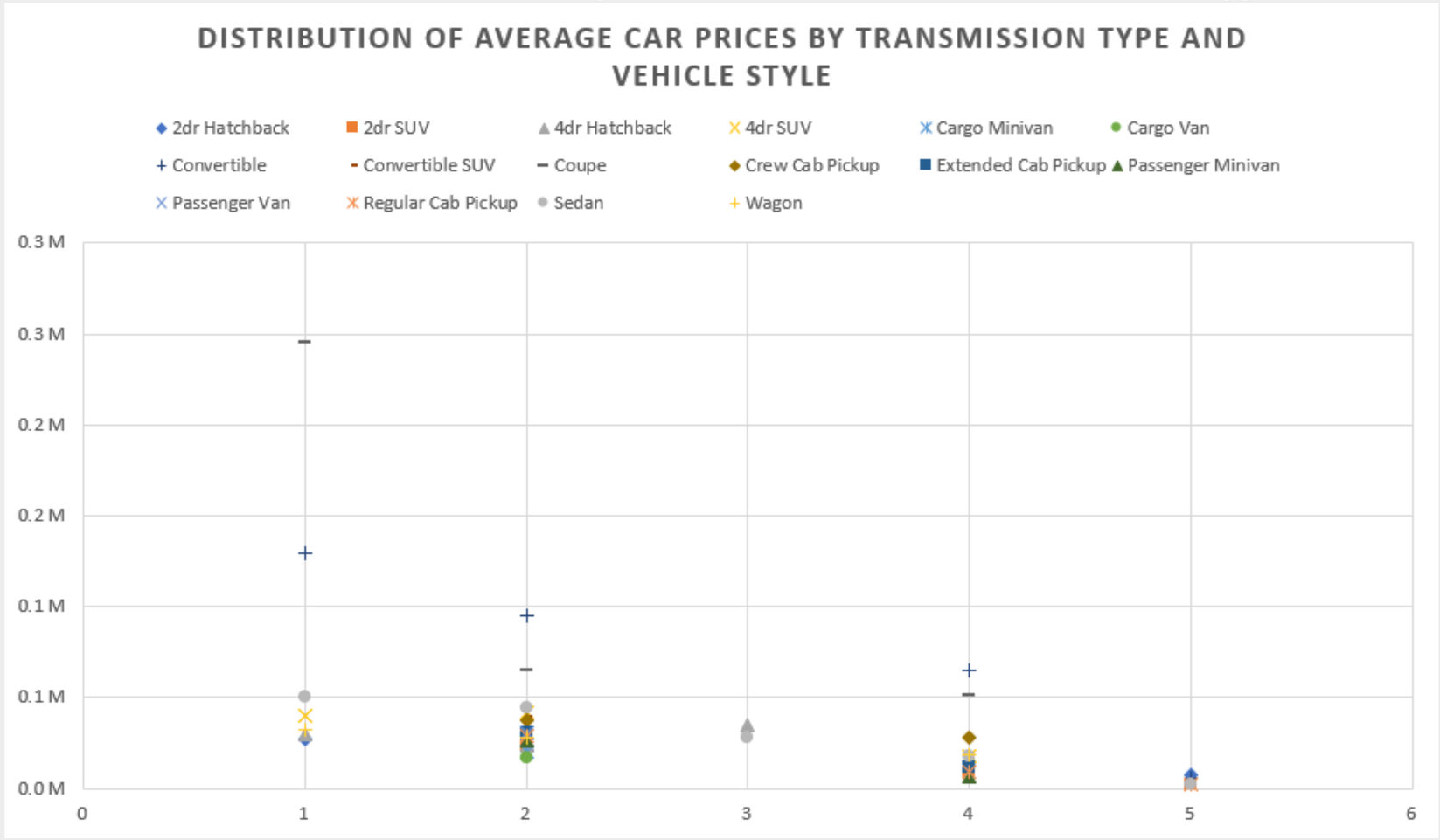
Create a Clustered column chart to compare the average MSRPs across different car brands and body styles.



Brands like as Bugatti, Maybach have higher average car price compared to others and Plymouth have lowest average car price. vehicle style also influences the price range of cars.

Task 3 : How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?

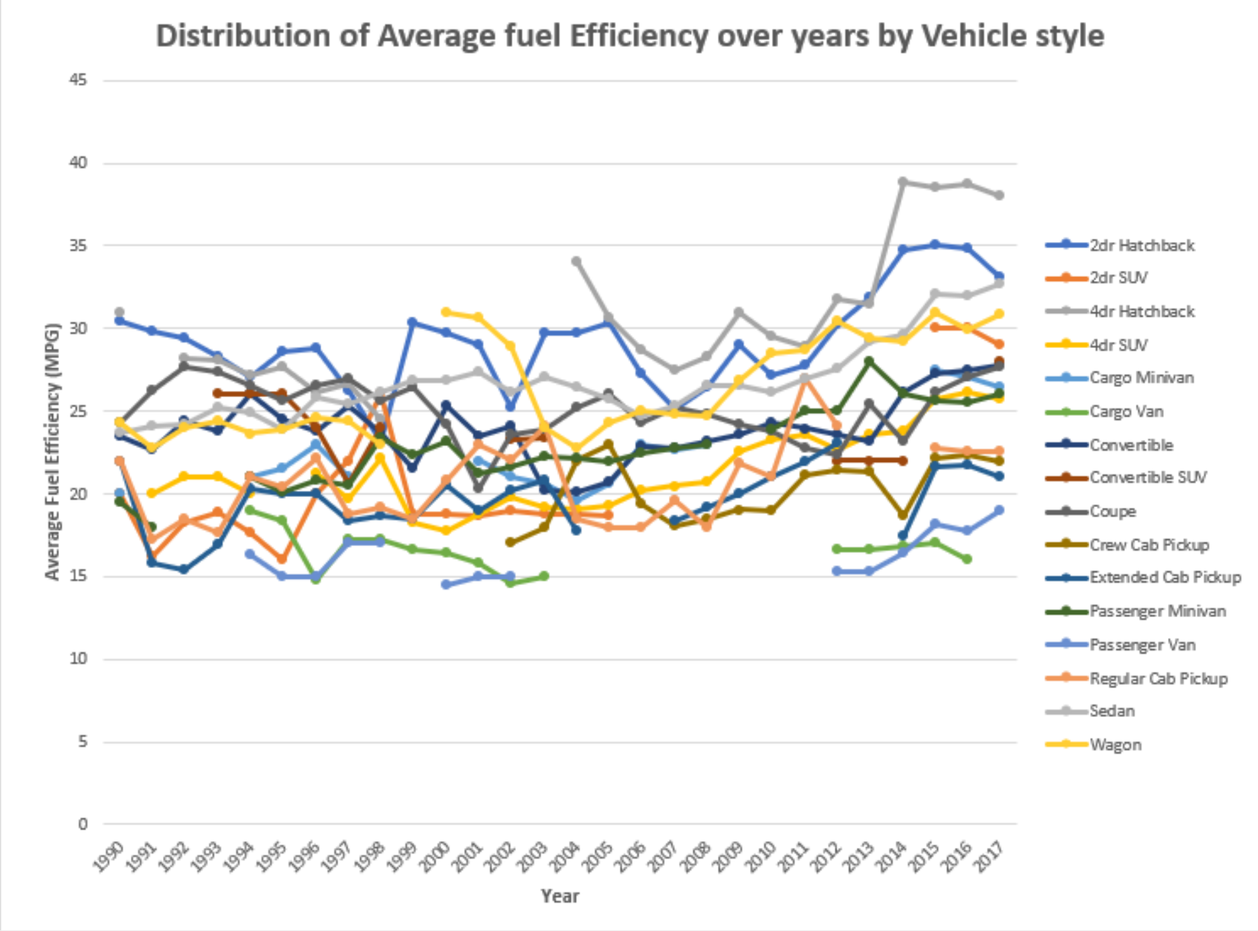
Create a scatter plot chart to visualize the relationship between MSRP and transmission type, with different symbols for each body style.



A car with transmission type as AUTOMATED_MANUAL, AUTOMATIC and body style as Coupe, Convertible tend to have higher average price.

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

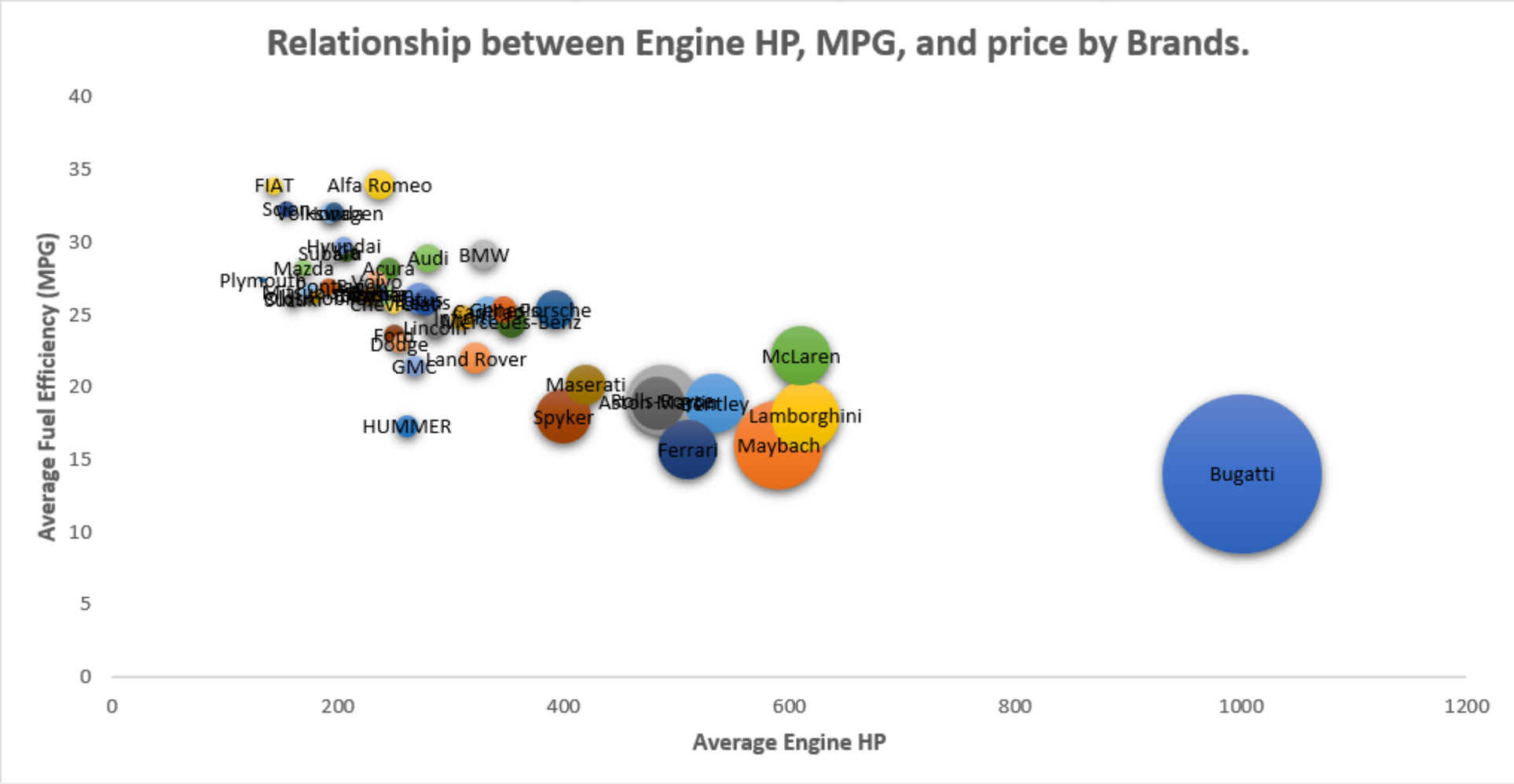
Create a line chart to show the trend of fuel efficiency (MPG) over time for each body style.



Over the time fuel efficiency is increasing at slow speed and Cars with 2dr, 4dr hatchback body style tend to have higher average fuel efficiency than others

Task 5 : How does the car's horsepower, MPG, and price vary across different Brands?

Create a Bubble chart to visualize the relationship between horsepower, MPG, and price across different car brands



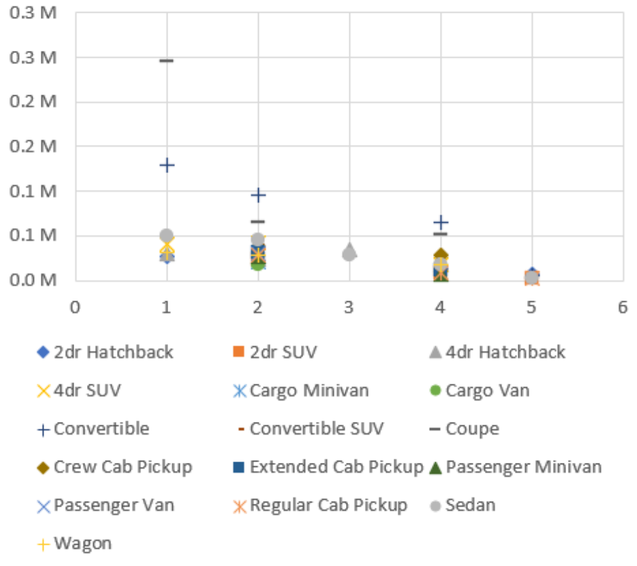
As Engine Hp of car’s increases, Fuel efficiency decreases and Price of car also increases.

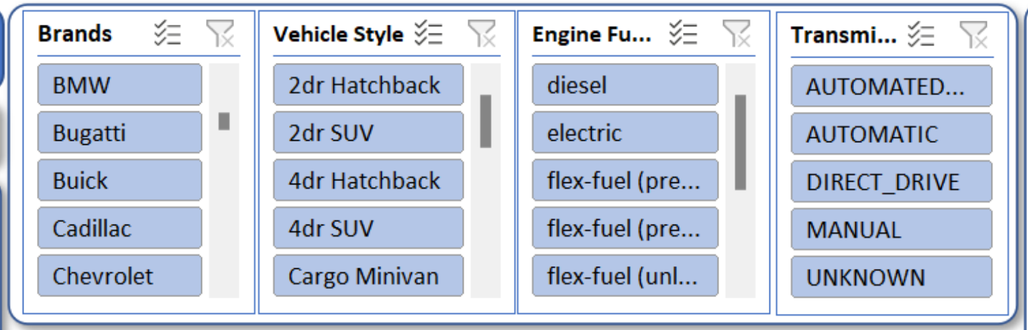
Interactive Dashboard:

Impact of Car Features

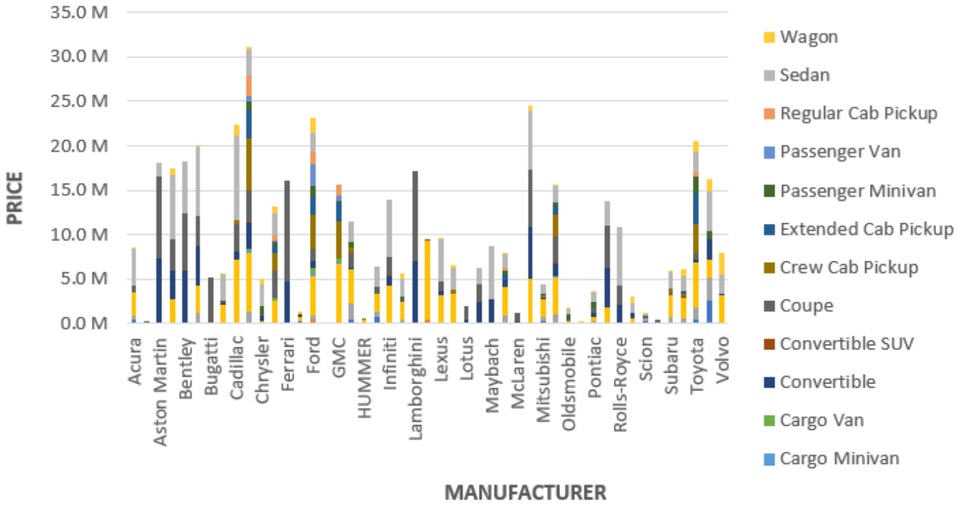
Project By: Mayur Rajput

Distribution of Average car prices by Transmission type and Vehicle style

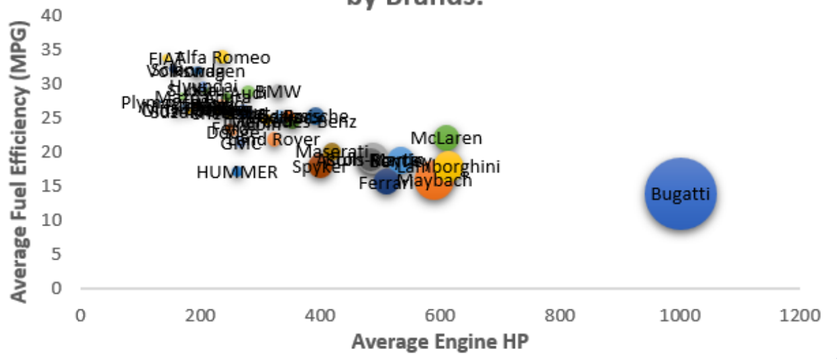




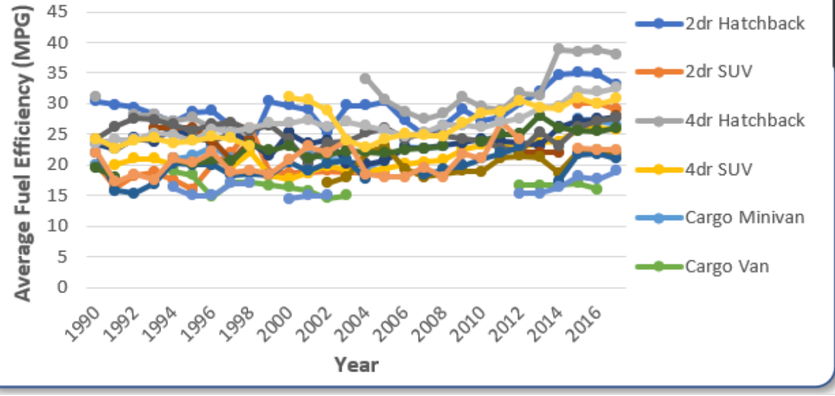
Distribution of car prices by Brand and Vehicle style



Relationship between Engine HP, MPG, and price by Brands.



Distribution of Average Fuel efficiency over years by Vehicle style



Insights :

- Flex fuel, Hybrid are popular market categories while most of cars sold belongs to N/A, Crossover, Luxury market categories.
- The Engine HP is directly related to the car prices and as per Correlation coefficient both variables have tendency to decrease or increase together.
- In determining car price, the most important car feature is Engine cylinder while the least important car feature is vehicle size.
- Bugatti, Maybach and Rolls Royce are the manufacturers with the highest average price of cars while Plymouth is the manufacturer with lowest average price of car.
- Correlation coefficient shows moderate negative correlation between number of cylinders and Fuel efficiency, This indicates that there is a notable tendency that if one variable increases other variable decreases.
- Brands like Chevrolet, Mercedes-Benz have higher car price as compared to others. Body styles like 4dr SUV, Sedan have higher contribution to car prices as compare to other body styles
- Brands like as Bugatti, Maybach have higher average car price compared to others and Plymouth have lowest average car price. vehicle style also influences the price range of cars.
- A car with transmission type as AUTOMATED_MANUAL, AUTOMATIC and body style as Coupe, Convertible tend to have higher average price.
- Over the time fuel efficiency is increasing at slow speed and Cars with 2dr, 4dr hatchback body style tend to have higher average fuel efficiency than others
- As Engine Hp of car’s increases, Fuel efficiency decreases and Price of car also increases.

Results :

A car manufacturer can take the following actions to optimize pricing and product development decisions while maximizing profitability and meeting consumer demand :

- **Market Focus:**
  - Invest more in research and development for flex fuel and hybrid vehicles, as they are popular market categories.
- **Engine HP and Pricing**:
  - Use engine horsepower as a key factor in pricing decisions. Consider offering higher HP options for premium models and lower HP options for budget-friendly vehicles.
- **Feature Importance:**
  - Engine cylinder count is a major selling point, especially in marketing and product descriptions.
  - While vehicle size may be less important, still offer a variety of sizes to cater to different consumer preferences.
- **Cylinder Count and Fuel Efficiency:**
  - Leverage the negative correlation between cylinder count and fuel efficiency by offering fuel-efficient models with fewer cylinders and premium, high-performance models with more cylinders.
- **Brand and Body Style Influence:**
  - Continue to position brands like Chevrolet and Mercedes-Benz as premium options with higher prices.
  - Focus on developing and marketing 4dr SUV and Sedan body styles to maximize profitability.

Results :

A car manufacturer can take the following actions to optimize pricing and product development decisions while maximizing profitability and meeting consumer demand :

- **Transmission and Body Style:**
  - Develop and market more AUTOMATED_MANUAL and AUTOMATIC transmission vehicles, particularly in Coupe and Convertible body styles, to capture higher price points.
- **Fuel Efficiency Improvement:**
  - Continue investing in research and development to improve overall fuel efficiency, especially for 2dr and 4dr hatchback models.
  - Highlight the fuel efficiency gains over time as a selling point for newer models.
- **Engine HP, Fuel Efficiency, and Pricing:**
  - Carefully balance engine horsepower with fuel efficiency to meet consumer preferences. Offer a range of options, ensuring that high-performance models justify their higher prices.