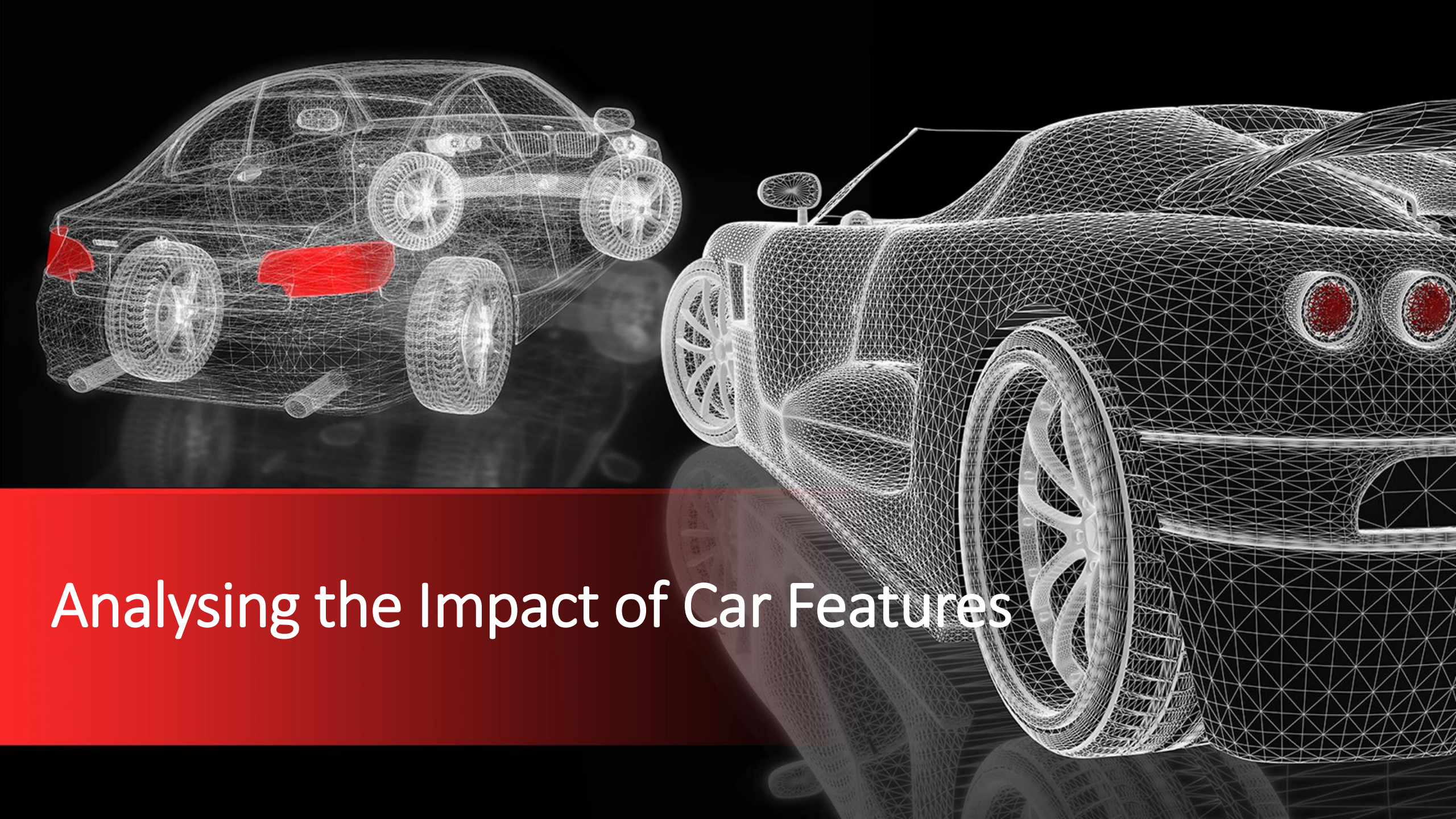


Analysing the Impact of Car Features

Introduction

The automotive industry has undergone significant transformations in recent times, marked by an increasing emphasis on fuel efficiency, environmental consciousness, and technological advancements. As competition among manufacturers intensifies and consumer preferences evolve, understanding the key drivers of consumer demand for cars has become crucial.

Notably, there has been a notable shift towards electric and hybrid vehicles, alongside a rising interest in alternative fuel sources like hydrogen and natural gas. Despite these trends, traditional gasoline-powered cars remain prevalent, with diverse fuel types and grades available to consumers.

The challenge at hand is to help a car manufacturer optimize pricing and product development decisions to maximize profitability while satisfying consumer demand. To tackle this problem, the focus will be on analyzing the synergy between a car's features, market category, and pricing. By employing data analysis techniques like regression analysis and market segmentation, the manufacturer can develop a pricing strategy that strikes a balance between meeting consumer demand and enhancing profitability. Additionally, by identifying the most popular features and market categories, the manufacturer can channel efforts into future product development, thereby bolstering its competitive edge and long-term profitability.

Project Description

We have been provided with a dataset which has information on over 11,000 car models and their specifications, including details on the car's make, model, year, fuel type, engine power, transmission, wheels, number of doors, market category, size, style, estimated miles per gallon, popularity, and manufacturer's suggested retail price (MSRP). The dataset is titled "Car Features and MSRP".

A brief overview of the dataset:

- Number of observations: 11,914
- Number of variables: 16
- File type: CSV (Comma Separated Values)

We used this dataset to gain insights into various aspects of the automotive industry, such as:

- Exploring trends in car features and pricing over time
- Comparing the fuel efficiency of different types of cars
- Investigating the relationship between a car's features and its popularity
- Predicting the price of a car based on its features and market category

Project Description

Before starting the analysis of the given dataset, it was crucial to clean the data thoroughly to ensure accurate and reliable results. The dataset initially contained 11914 rows and 16 columns.

To begin the cleaning process, we identified and removed 715 duplicate values using the "remove duplicates" feature. Next, we focused on columns with blank or null values and deleted those records to maintain data consistency for efficient analysis.

After completing these cleaning steps, we were left with 11097 rows and 16 columns to work with. Additionally, we noticed that some records had car model numbers like "9-3" and "9-5," which were incorrectly displayed as date formats. We corrected this issue during the cleaning process.

Overall, during the dataset cleaning, we fixed column formats, handled missing information, and ensured proper organization of the data, making it more understandable and easier to analyze.

After our analysis, we were able to provide valuable information to the car manufacturers and consumers about how specific features influence car prices, which would help them make better decisions about setting prices and buying cars.

Approach

Microsoft Excel for Microsoft 365 was used to perform the entire analysis on the dataset and to create Dashboard.

In our analysis, we employed the following techniques:

- Descriptive Analysis: Summarizing and describing the car features, market categories, and pricing in the dataset.
- Exploratory Analysis: Uncovering patterns, correlations, and relationships between car features, market categories, and pricing.
- Regression Analysis: Analyzing the relationship between car features and pricing to identify significant predictors.
- Time Series Analysis: Examining data collected over time to identify patterns, trends, and seasonality.

We utilized Pivot Tables and graphical visualizations like bar charts, scatter plots, line charts, and bubble charts to better understand and present our findings.

Link to the Excel File : Impact of Car Features

Approach

The pivot tables allowed for a more organized and insightful analysis of the data, enabling us to uncover valuable insights and connections between different variables.

For the regression analysis aimed at determining the strongest relationship with the car's price, several columns were chosen, including Engine Fuel Type, Transmission Type, Driven_Wheels, Vehicle Size, Vehicle Style, Engine HP, Engine Cylinders, Number of Doors, highway MPG, city MPG, and MSRP.

Among these columns, Engine Fuel Type, Transmission Type, Driven_Wheels, Vehicle Size, and Vehicle Style were non-numeric variables. To conduct the regression analysis, it was necessary to transform the data of these variables. Since these non-numeric variables had a limited number of distinct categories, we assigned numeric labels to each category to prepare the variables for the regression analysis.

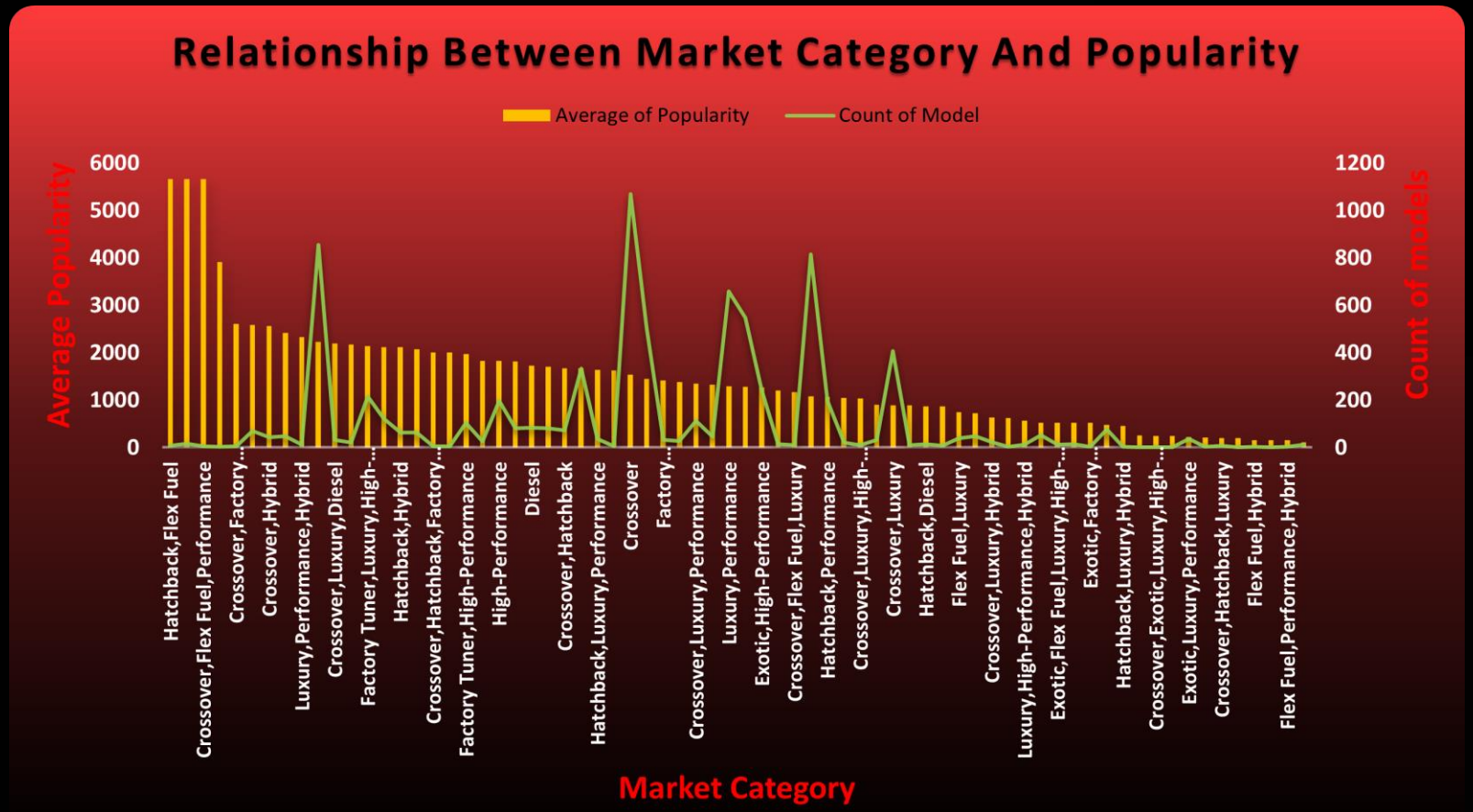
During the creation of scatter plots, challenges arose as the system froze when attempting to assign different colours to the data series. Additionally, when generating bubble charts, extra time was consumed in labelling the bubbles, as each brand was represented by distinct bubbles. These issues likely impacted the efficiency and smoothness of the data visualization process, and efforts were required to address and resolve these obstacles to effectively present the data.

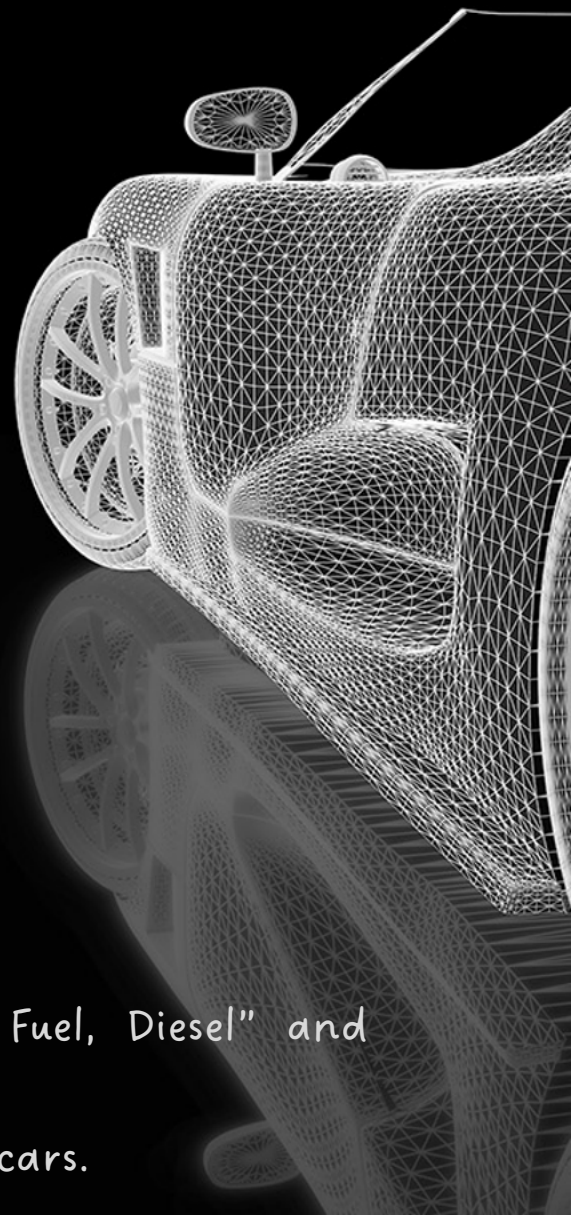
Approach

Our analysis involved gaining insights into the following aspects of the industry, and thereby creating a dashboard for the car manufacturers and consumers to present our insights:

- How does the popularity of a car model vary across different market categories?
- What is the relationship between a car's engine power and its price?
- Which car features are most important in determining a car's price?
- How does the average price of a car vary across different manufacturers?
- What is the relationship between fuel efficiency and the number of cylinders in a car's engine?
- How does the distribution of car prices vary by brand and body style?
- Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?
- How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?
- How does the fuel efficiency of cars vary across different body styles and model years?
- How does the car's horsepower, MPG, and price vary across different Brands?

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

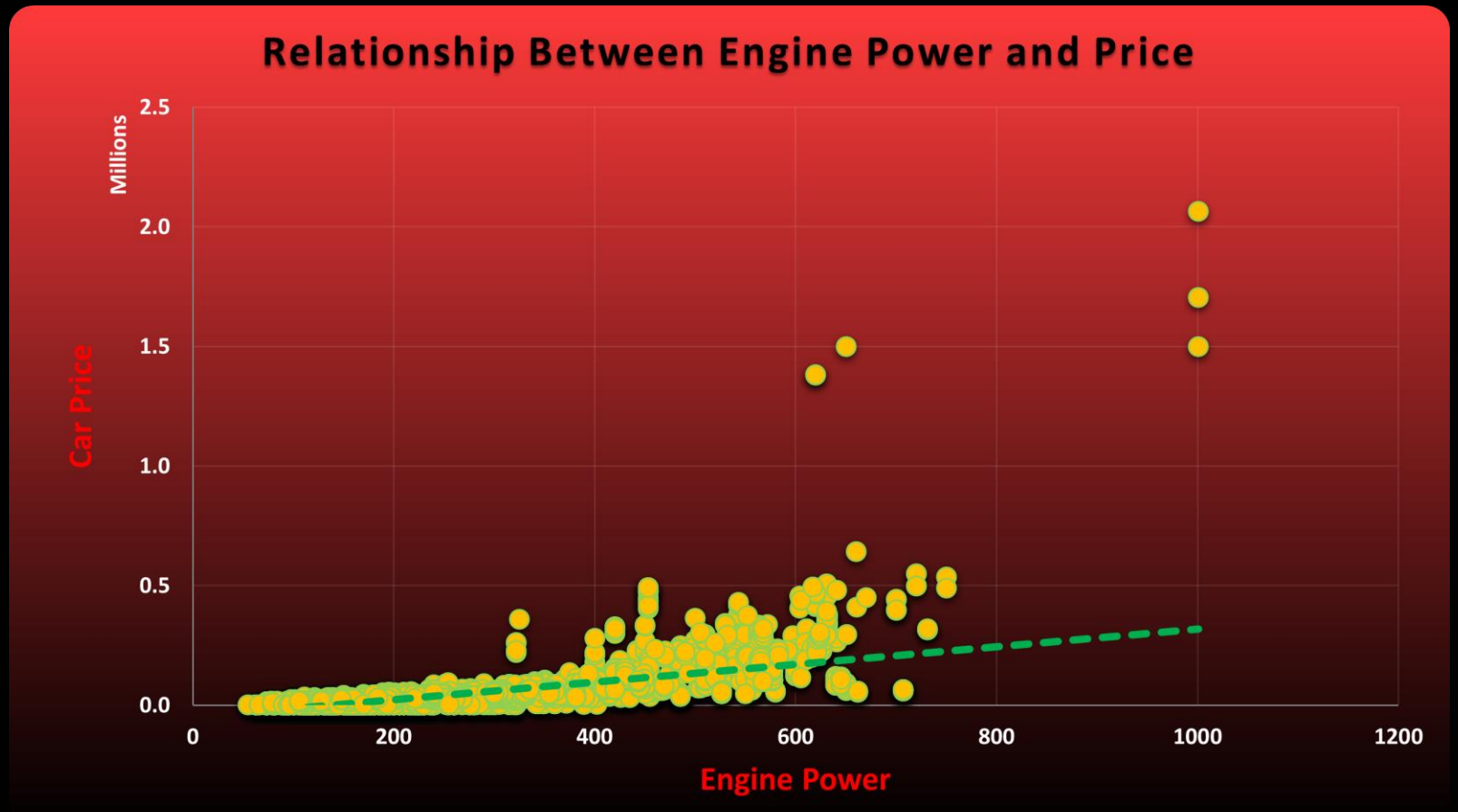


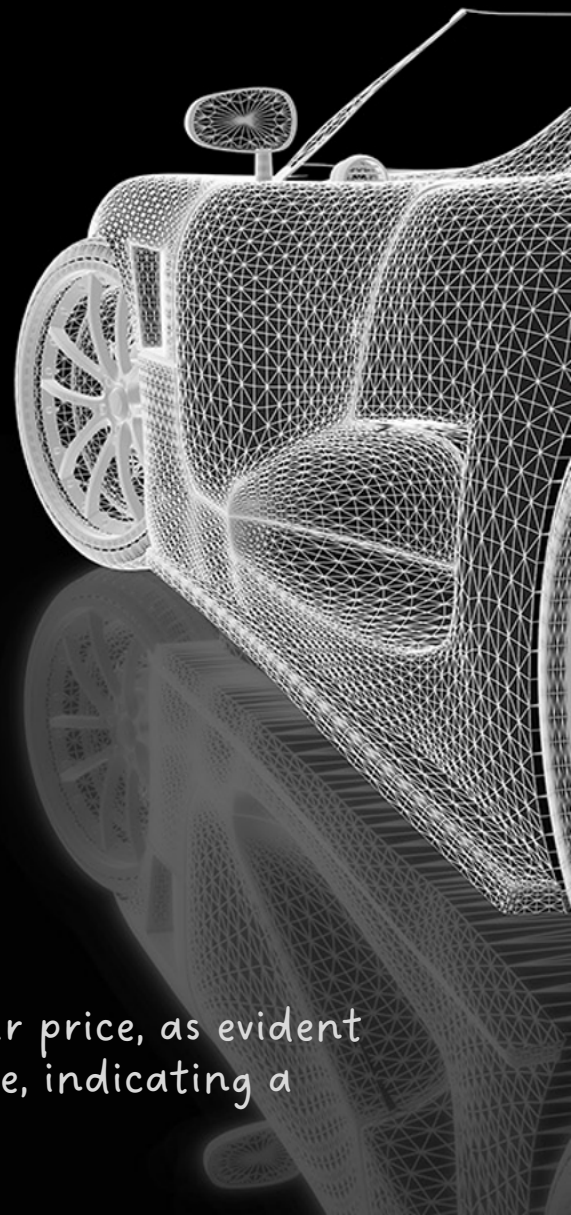


The most popular market categories are "Hatchback, Flex Fuel", "Crossover, "Flex Fuel, Diesel" and "Crossover, Flex Fuel, Performance".

Among these categories, the "Crossover" segment appears to have the largest number of cars.

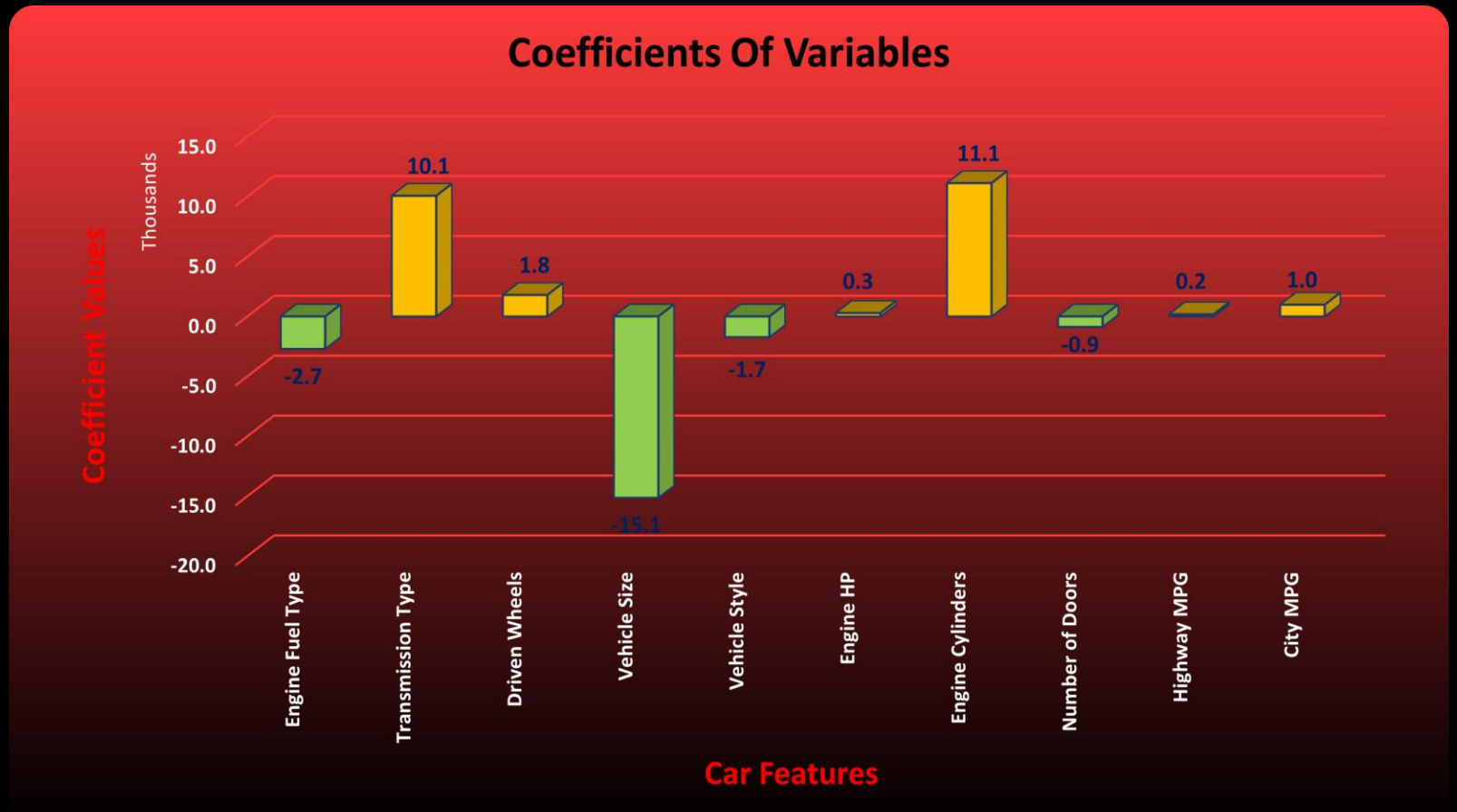
What is the relationship between a car's engine power and its price?

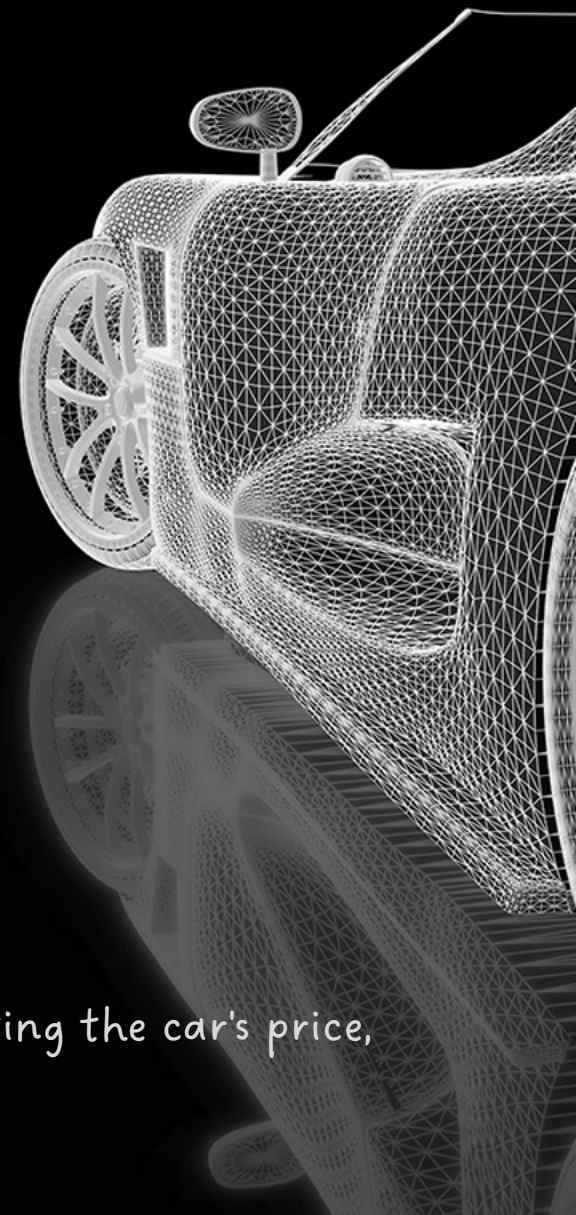




The data suggests a strong linear correlation between the engine horsepower and the car price, as evident from the trendline. This implies that as the engine horsepower rises, so does the car price, indicating a positive relationship between these two variables.

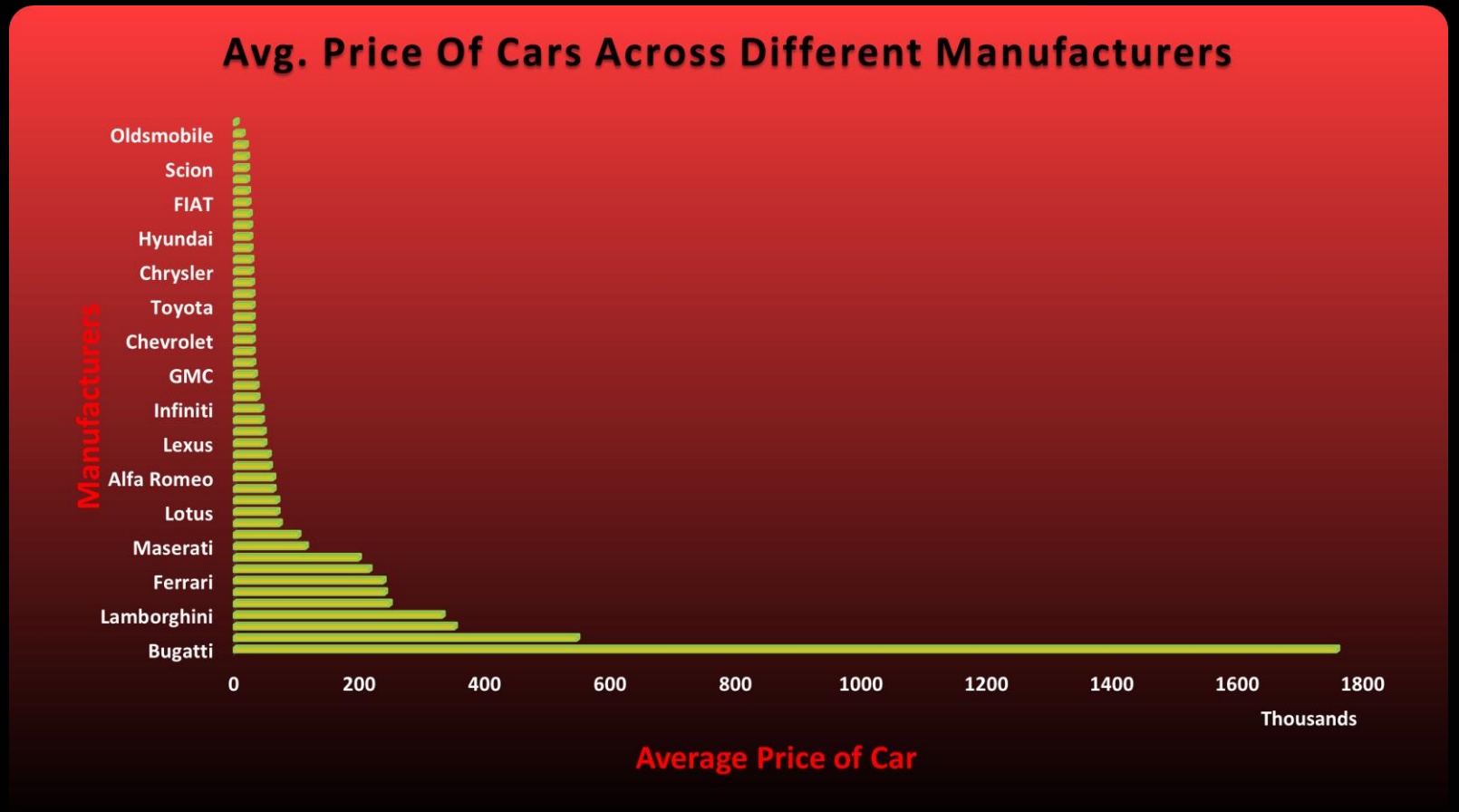
Which car features are most important in determining a car's price?

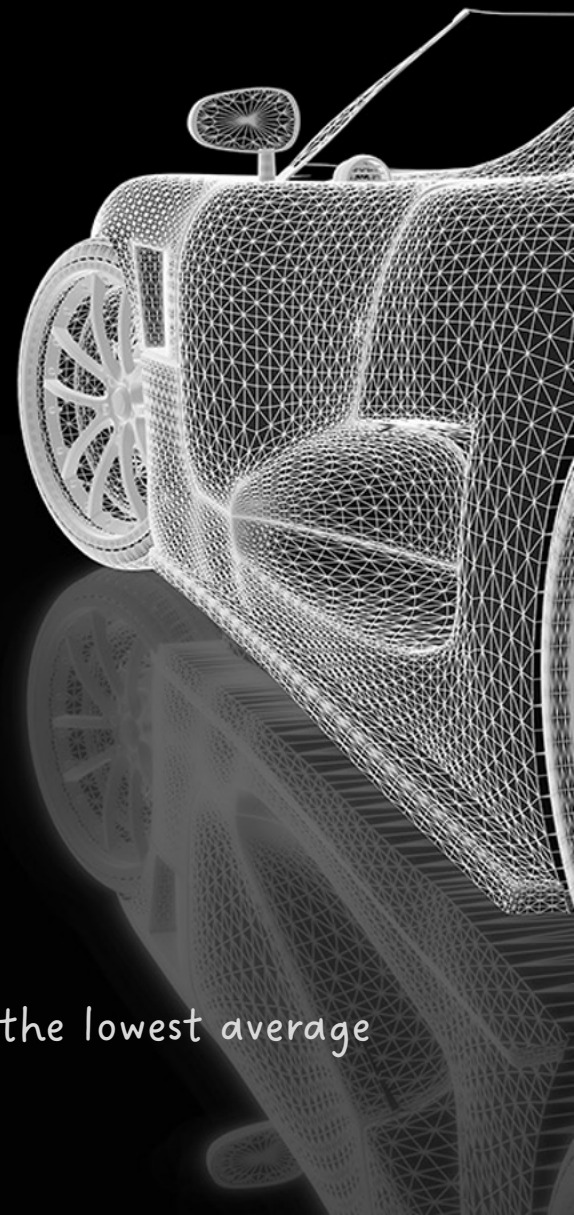




The number of engine cylinders and the type of transmission are crucial factors affecting the car's price, while the vehicle size seems to be least relevant in this context.

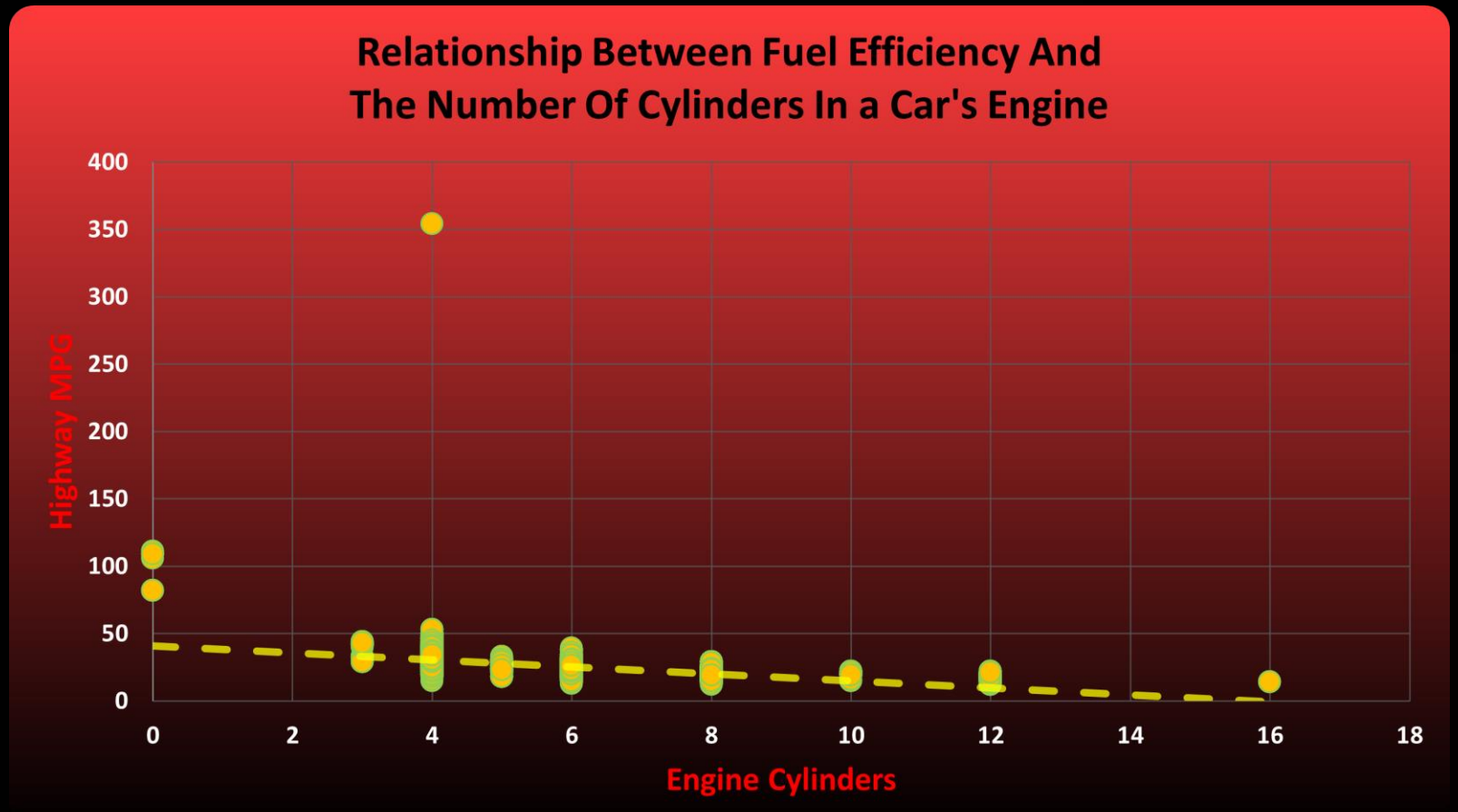
How does the average price of a car vary across different manufacturers?

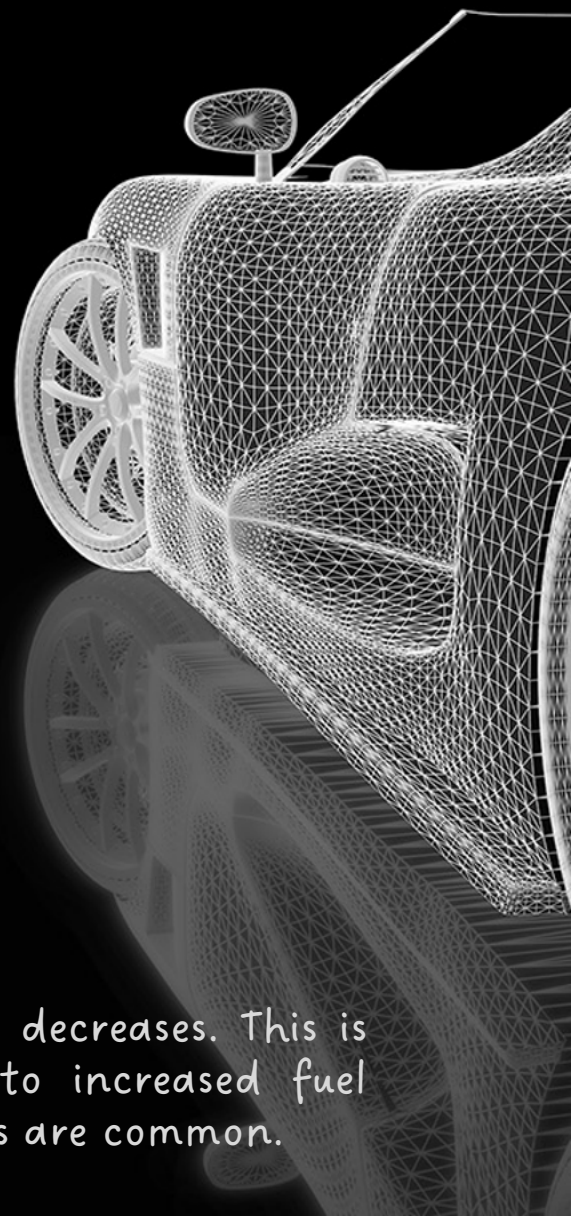




Bugatti, Maybach and Rolls-Royce have the highest average price, while Plymouth has the lowest average price.

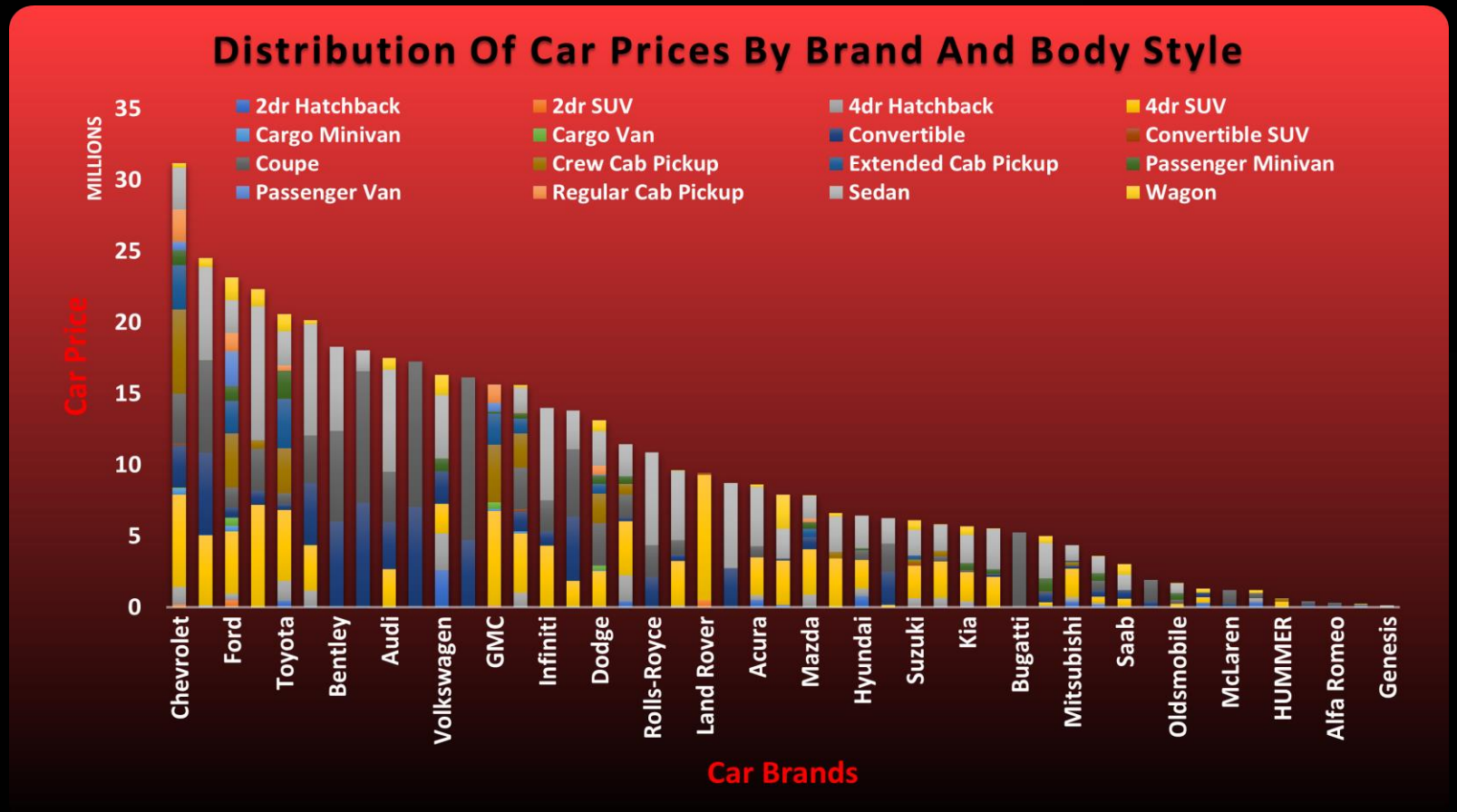
What is the relationship between fuel efficiency and the number of cylinders in a car's engine?

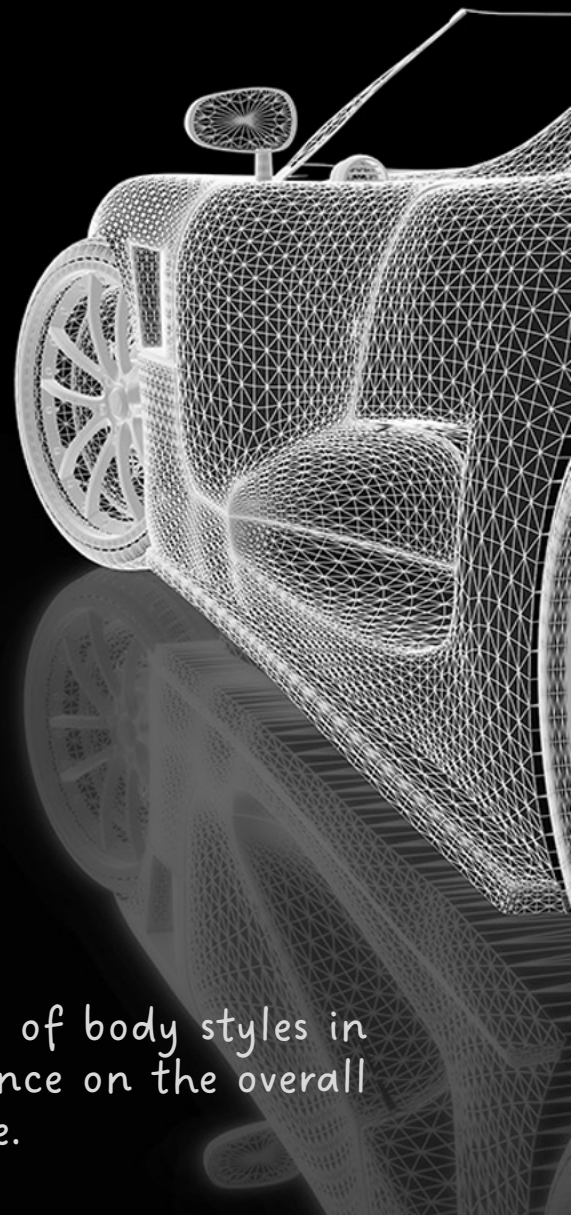




As the number of cylinders in a car engine increases, the fuel efficiency of highway decreases. This is because engines with more cylinders often produce more power, which can lead to increased fuel consumption, especially during highway driving where higher speeds and power demands are common.

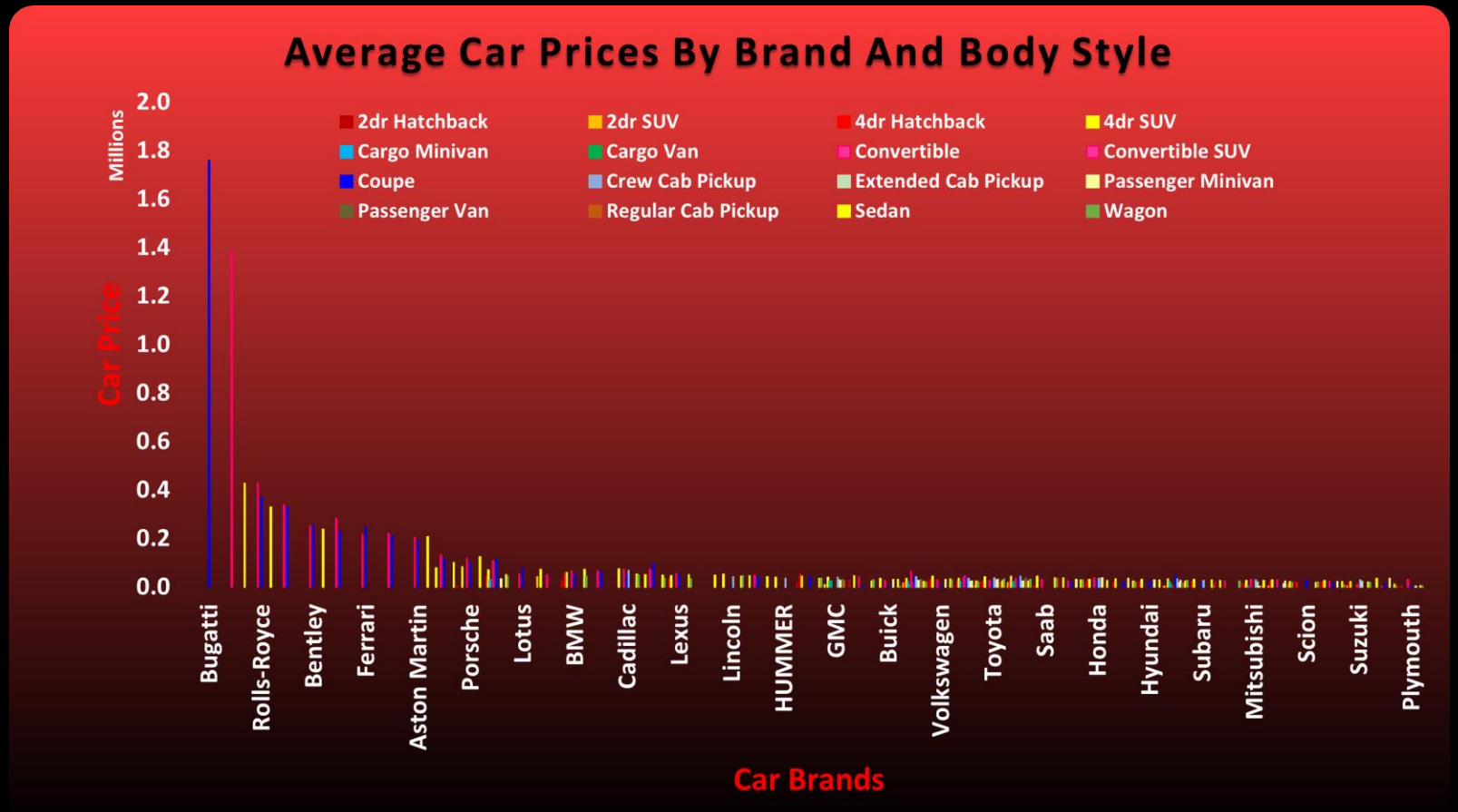
How does the distribution of car prices vary by brand and body style?

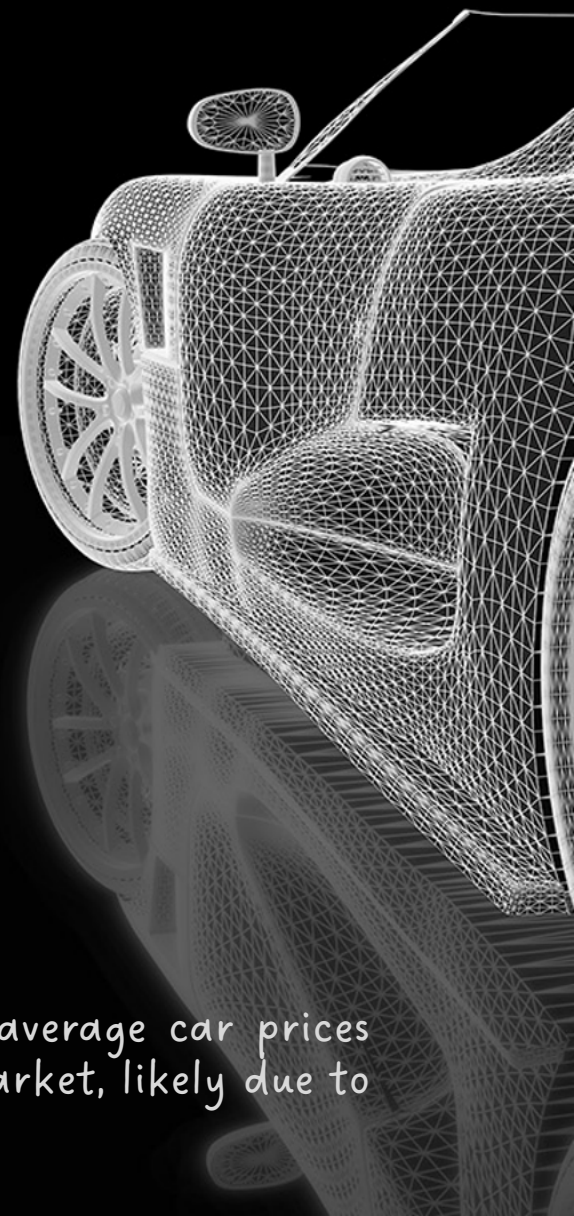




It appears that Chevrolet, Mercedes-Benz, and Ford are the brands with a wide range of body styles in their car offerings. Additionally, these three brands seem to have a significant influence on the overall car prices in the dataset, contributing prominently to the higher end of the price range.

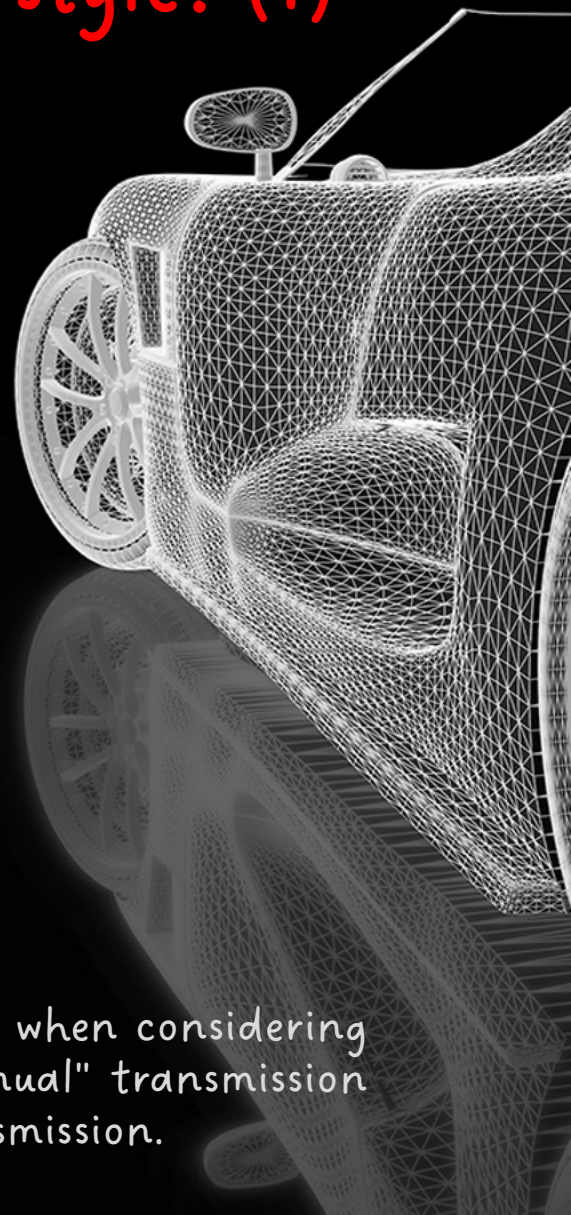
Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?





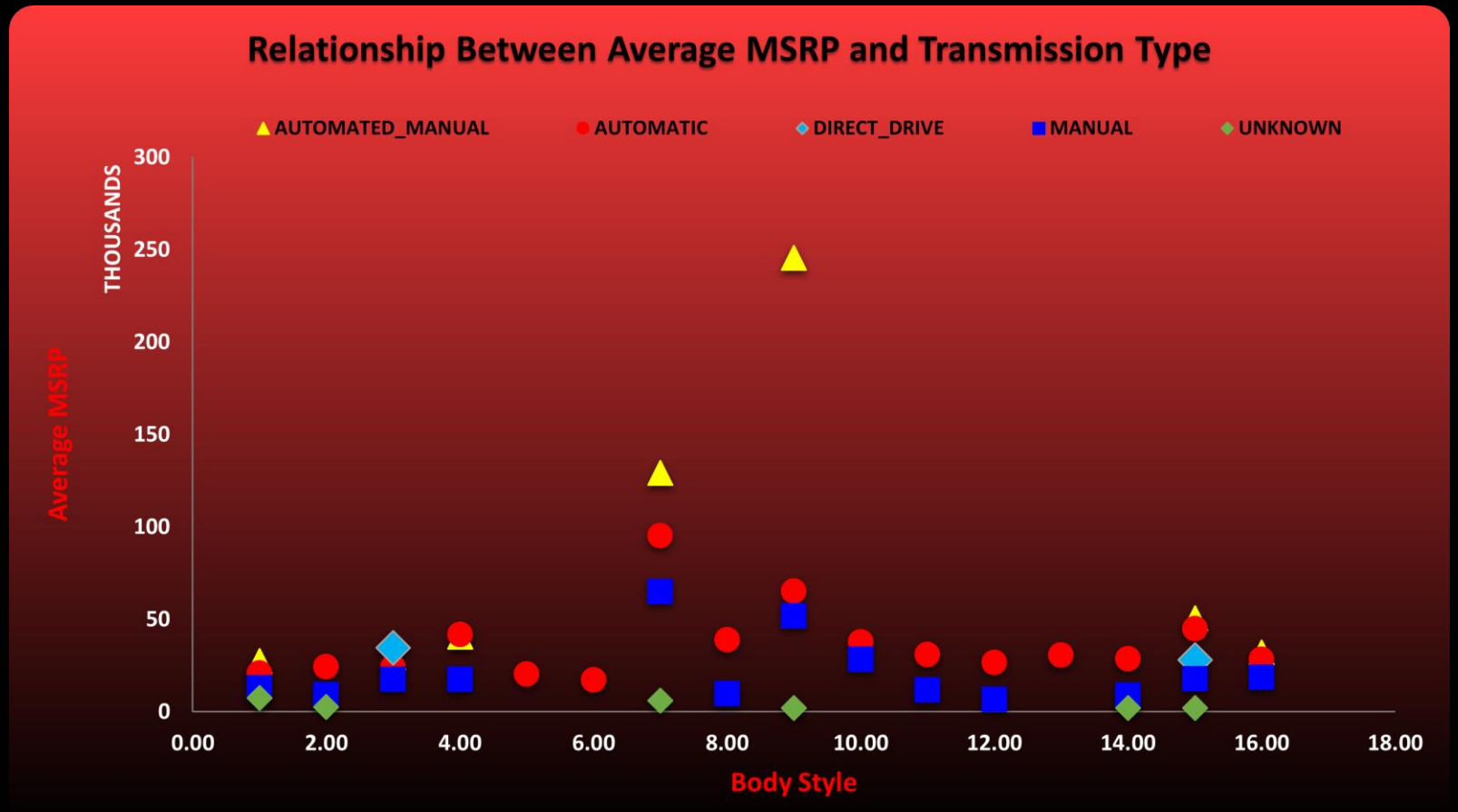
The Coupe style of Bugatti and the Convertible style of Maybach have the highest average car prices among the different body styles. These two seem to command premium prices in the market, likely due to their exclusivity, luxury features, and high-performance characteristics.

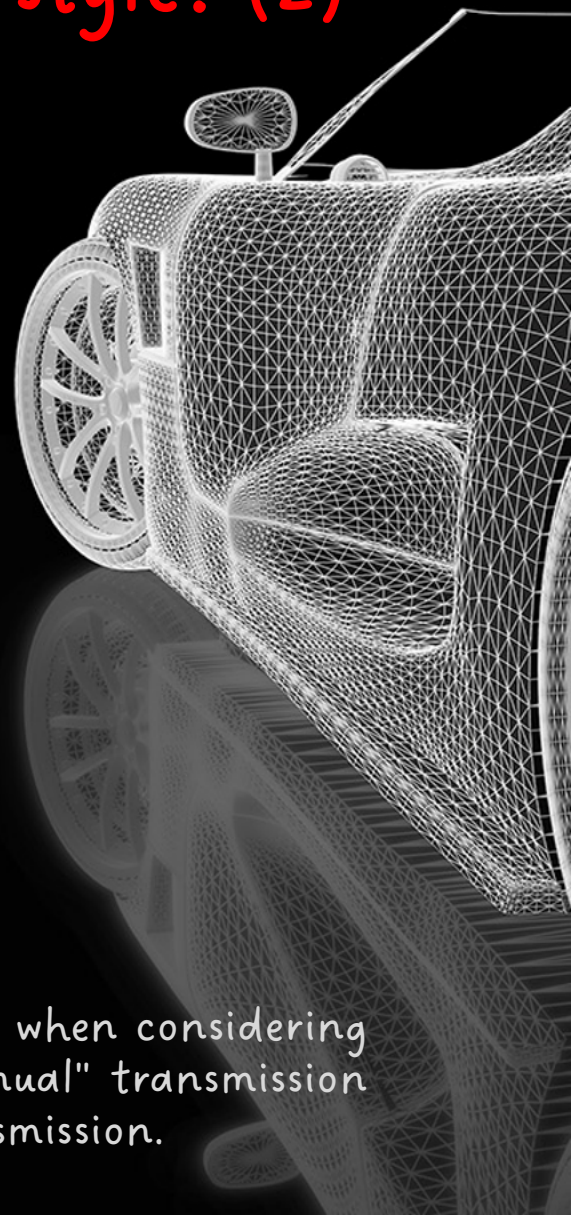
How do the different feature such as transmission type affect the MSRP, and how does this vary by body style? (1)



The average car price is significantly influenced by the transmission type, particularly when considering different body styles. "Coupes" and "Convertibles" equipped with an "Automated Manual" transmission have the highest average price, closely followed by "Convertibles" with "Automatic" transmission.

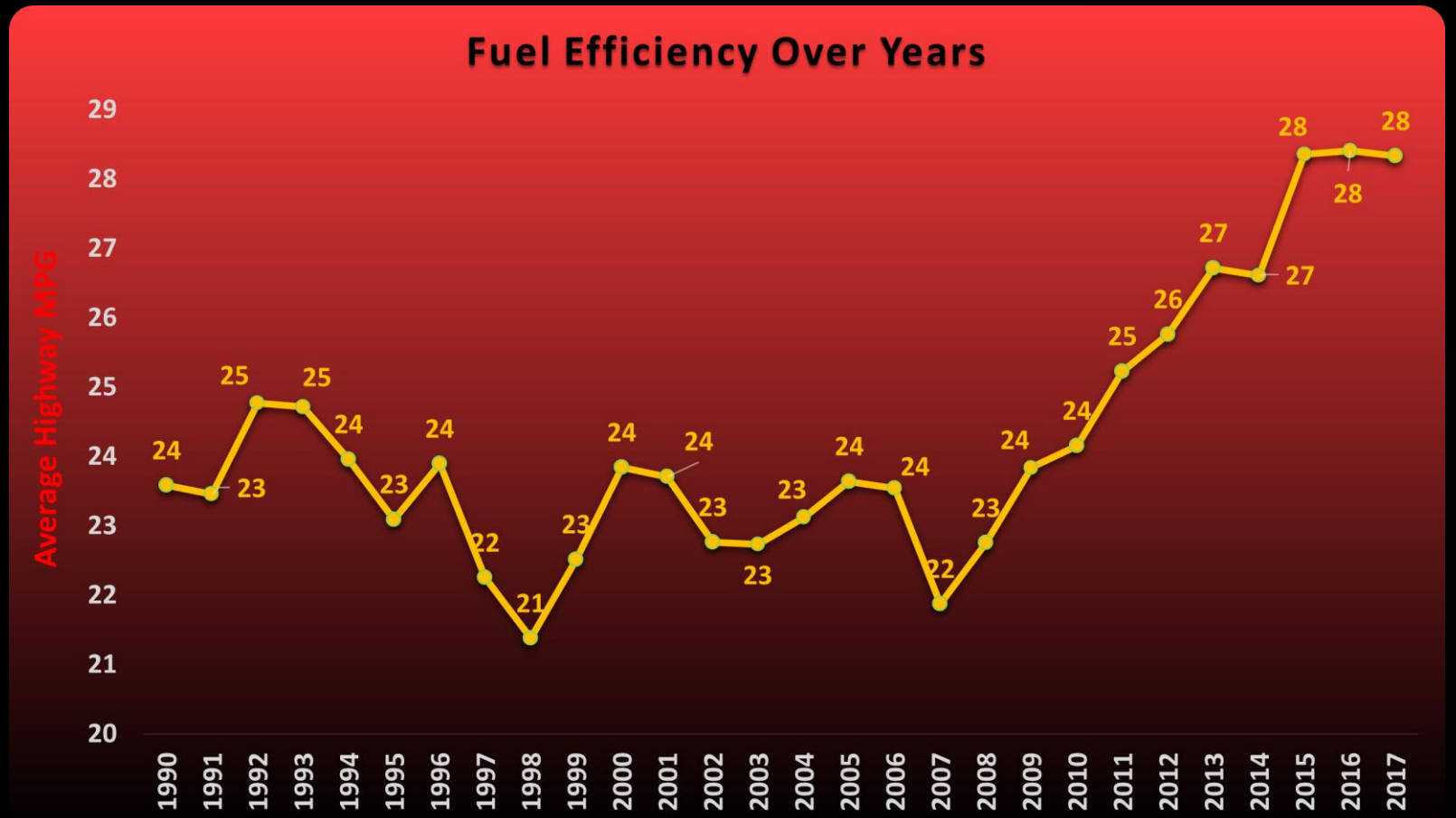
How do the different feature such as transmission type affect the MSRP, and how does this vary by body style? (2)

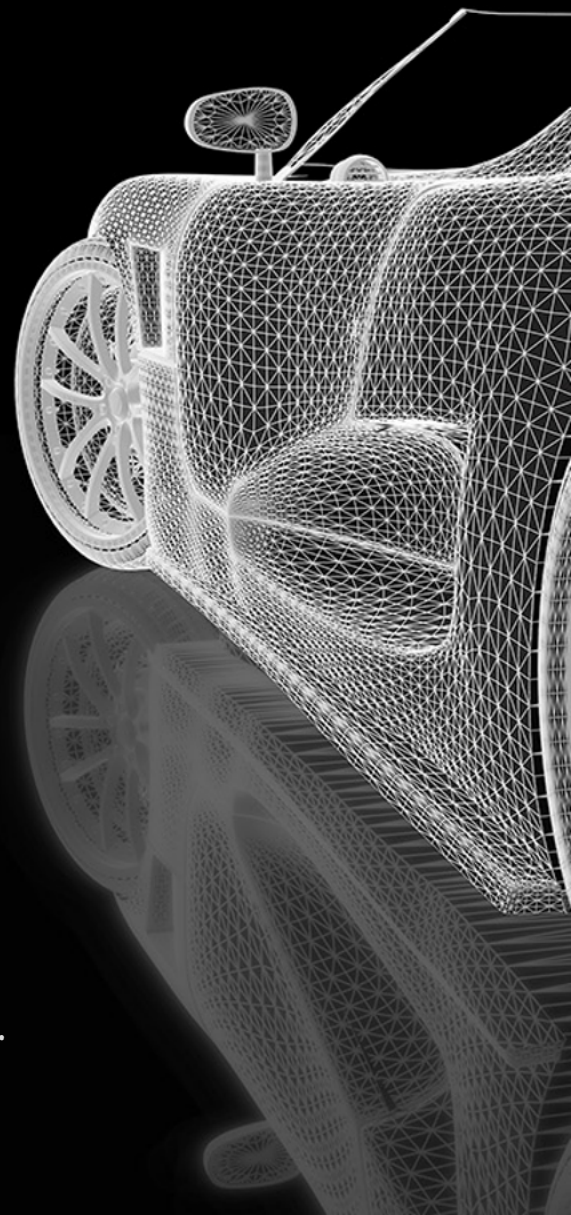




The average car price is significantly influenced by the transmission type, particularly when considering different body styles. "Coupes" and "Convertibles" equipped with an "Automated Manual" transmission have the highest average price, closely followed by "Convertibles" with "Automatic" transmission.

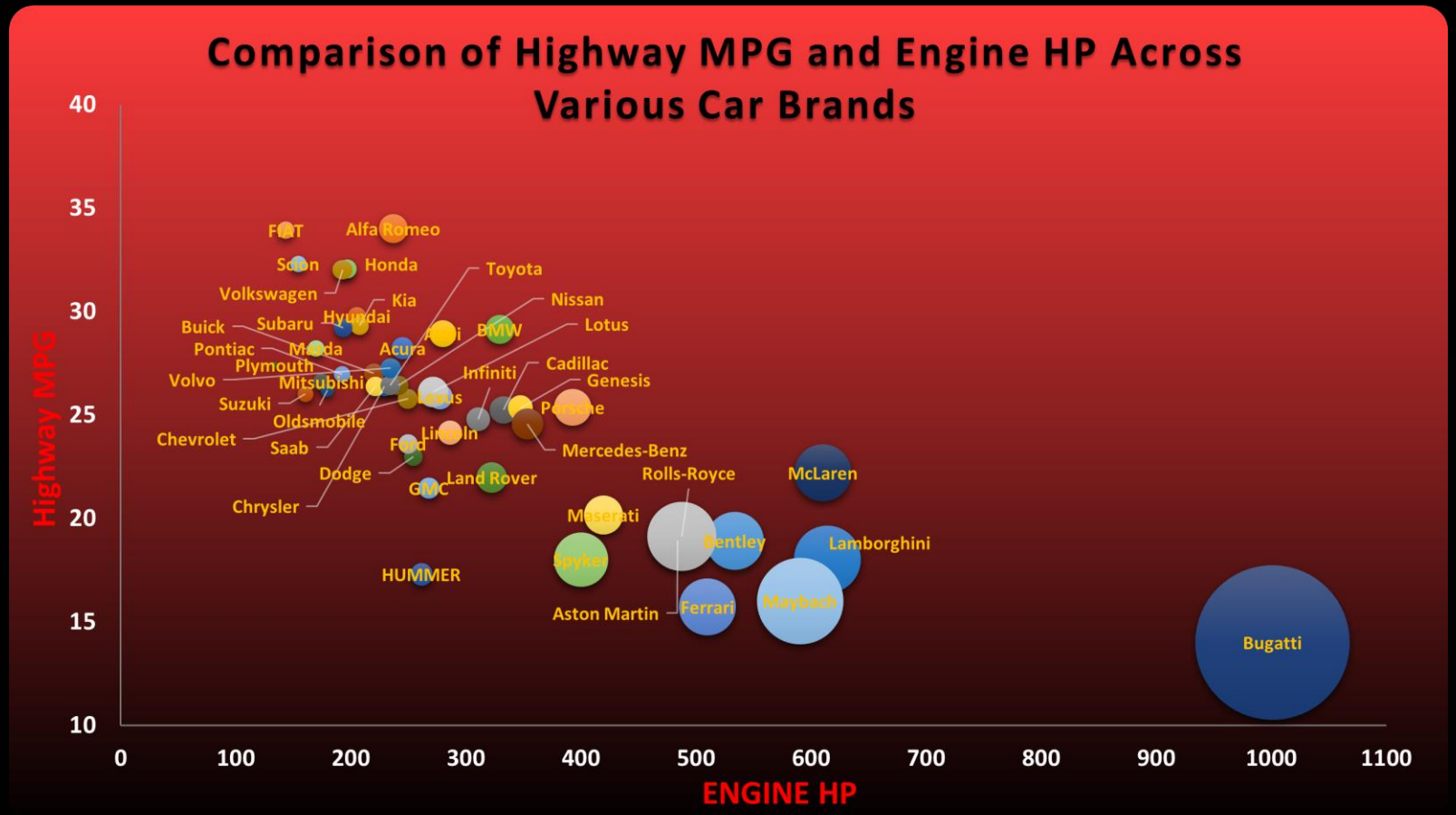
How does the fuel efficiency of cars vary across different body styles and model years?

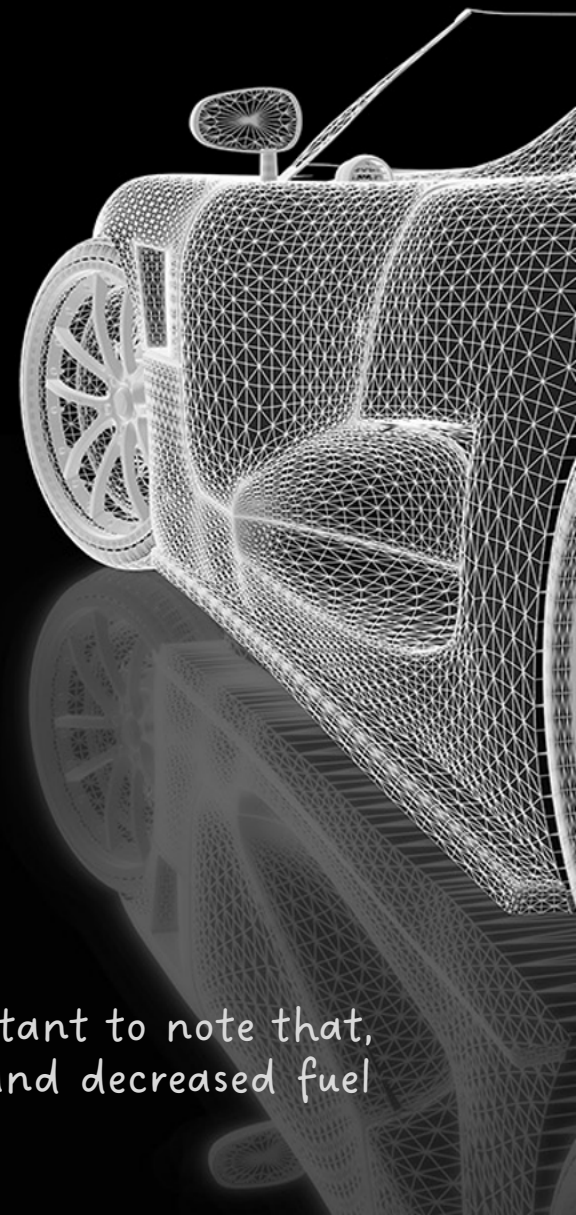




Over time, there has been an improvement in fuel efficiency (Highway MPG) for vehicles.

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





As the power of the engine increases, the price of the car also rises. However, it's important to note that, simultaneously, its fuel efficiency decreases. This trade-off between increased power and decreased fuel efficiency is a common trend observed in many vehicles.

Dashboard

IMPACT OF CAR FEATURES : DASHBOARD

Make

Acura	Alfa Romeo
Aston Martin	Audi
Bentley	BMW
Bugatti	Buick
Cadillac	Chevrolet

Vehicle Style

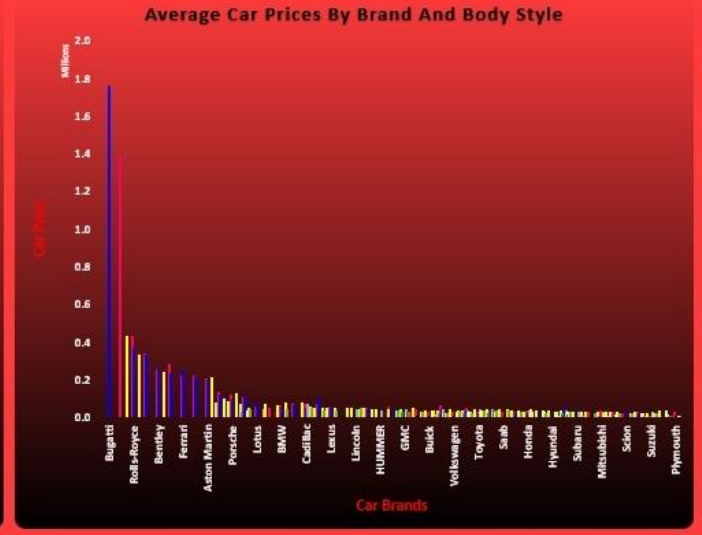
2dr Hatchback	2dr SUV
4dr Hatchback	4dr SUV
Cargo Minivan	Cargo Van
Convertible	Convertible SUV
Coupe	Crew Cab Pickup

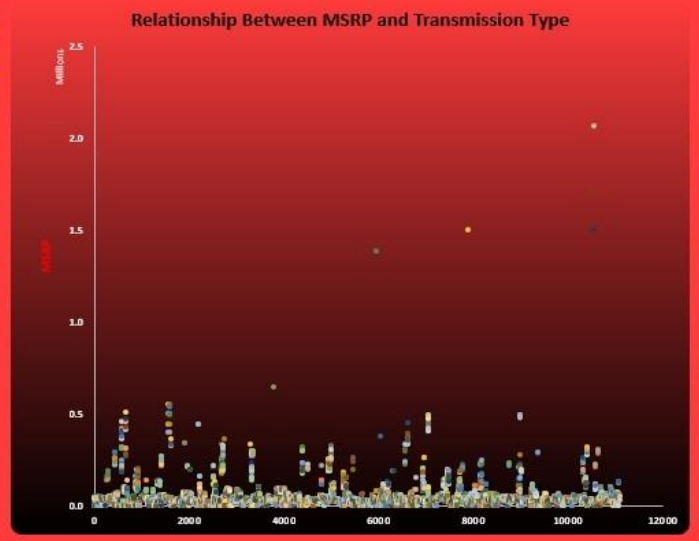
Transmission Type

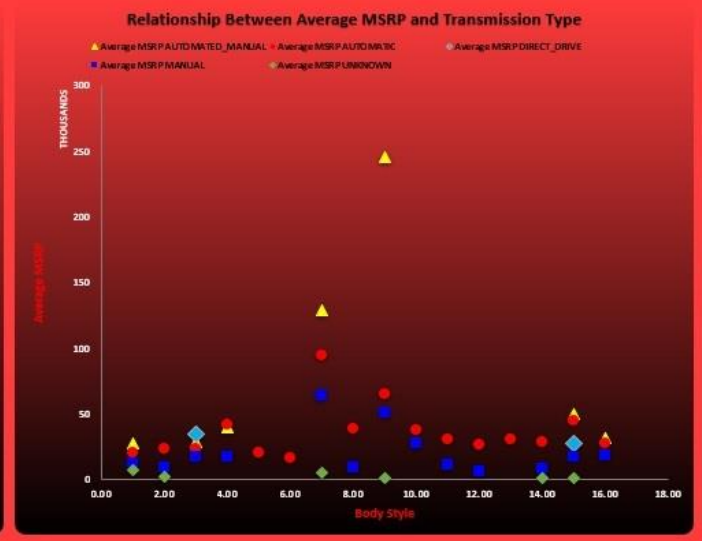
- AUTOMATED_MANUAL
- AUTOMATIC
- DIRECT_DRIVE
- MANUAL
- UNKNOWN

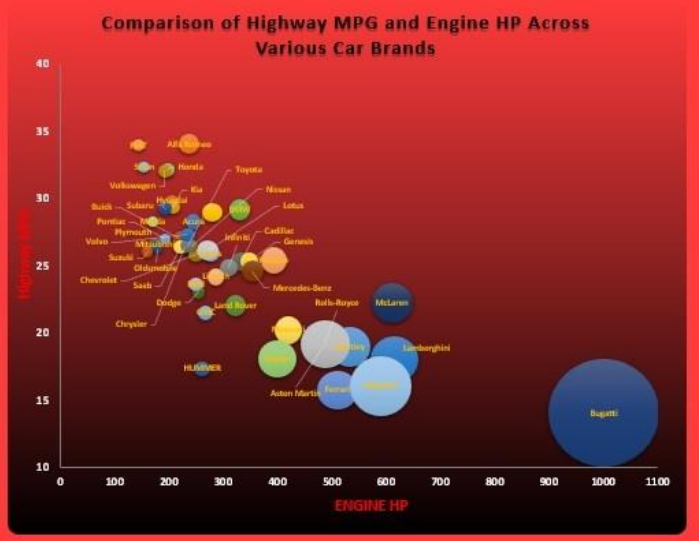
Year

1990	1991
1992	1993
1994	1995
1996	1997
1998	1999









Conclusion

Following insights were gained after completing the analysis:

- Popular market categories: "Hatchback, Flex Fuel," "Crossover, Flex Fuel, Diesel," and "Crossover, Flex Fuel, Performance," with highest numbers in the "Crossover" segment.
- Strong linear correlation between engine horsepower and car price.
- Engine cylinders and transmission type crucial for car price; vehicle size less relevant.
- Bugatti, Maybach, and Rolls-Royce have highest average prices; Plymouth has lowest.
- More cylinders decrease highway fuel efficiency due to increased power and consumption.
- Chevrolet, Mercedes-Benz, and Ford offer diverse body styles and influence prices.
- Bugatti's Coupe and Maybach's Convertible have highest average prices among body styles.
- Transmission type significantly impacts average car price for different body styles.
- Improved fuel efficiency observed over time.
- Higher engine power increases car price but decreases fuel efficiency, a common trade-off.

Thank You