



Analyzing the Impact of Car Features on Price and Profitability

Ami Rai E.

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Introduction

- The automotive industry has been rapidly evolving over the past few decades, with a growing focus on fuel efficiency, environmental sustainability, and technological innovation
- In recent years, there has been a growing trend towards electric and hybrid vehicles
- At the same time, traditional gasoline-powered cars remain dominant in the market
- There is an increase in competition among manufacturers
- It has become more important than ever to understand the factors that drive consumer demand for cars

Project Description

- For the given dataset, as a Data Analyst, the client has asked

“How can a car manufacturer optimize pricing and product development decisions to maximize profitability while meeting consumer demand?”

Project Description

- **Data Analysis**
- The following insights are required
 - 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?

Project Description

- **Building the Dashboard**
- The following tasks are to be done
 - 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?

Dataset Description

- The dataset contains information on various car models and their specifications, and is titled "Car Features and MSRP"
- It was collected and made available on Kaggle by Cooper Union, a private college located in New York City
- A brief overview of the dataset:
 - Number of observations: 11,159
 - Number of variables: 16
 - File type: CSV (Comma Separated Values)

Dataset Description

- The variables in the dataset:
 - 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

Approach

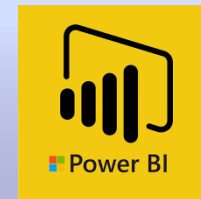
- The steps
 - Downloading the dataset
 - Understanding data columns and data
 - Data analysis
 - Data visualization
 - Summarization

Resources Used

- Microsoft Excel
 - For analyzing data



- Microsoft Power BI
 - For creating the interactive dashboard



- Microsoft PowerPoint
 - For creating the report



Data Cleaning


- Missing values are found in some columns such as Engine Fuel Type, Engine HP, and Engine Cylinder
- COUNTBLANK() is used to find blank values in each column
- Those rows are deleted from the dataset
- In transmission type column, the rows with value “UNKNOWN” are deleted
- Categorical variables such as Engine Fuel Type, Transmission Type, Driven_Wheels, Vehicle Size, and Vehicle Style are converted to numerical variable and stored in new columns

Data Analysis

Popularity of a Car Model by Market Category

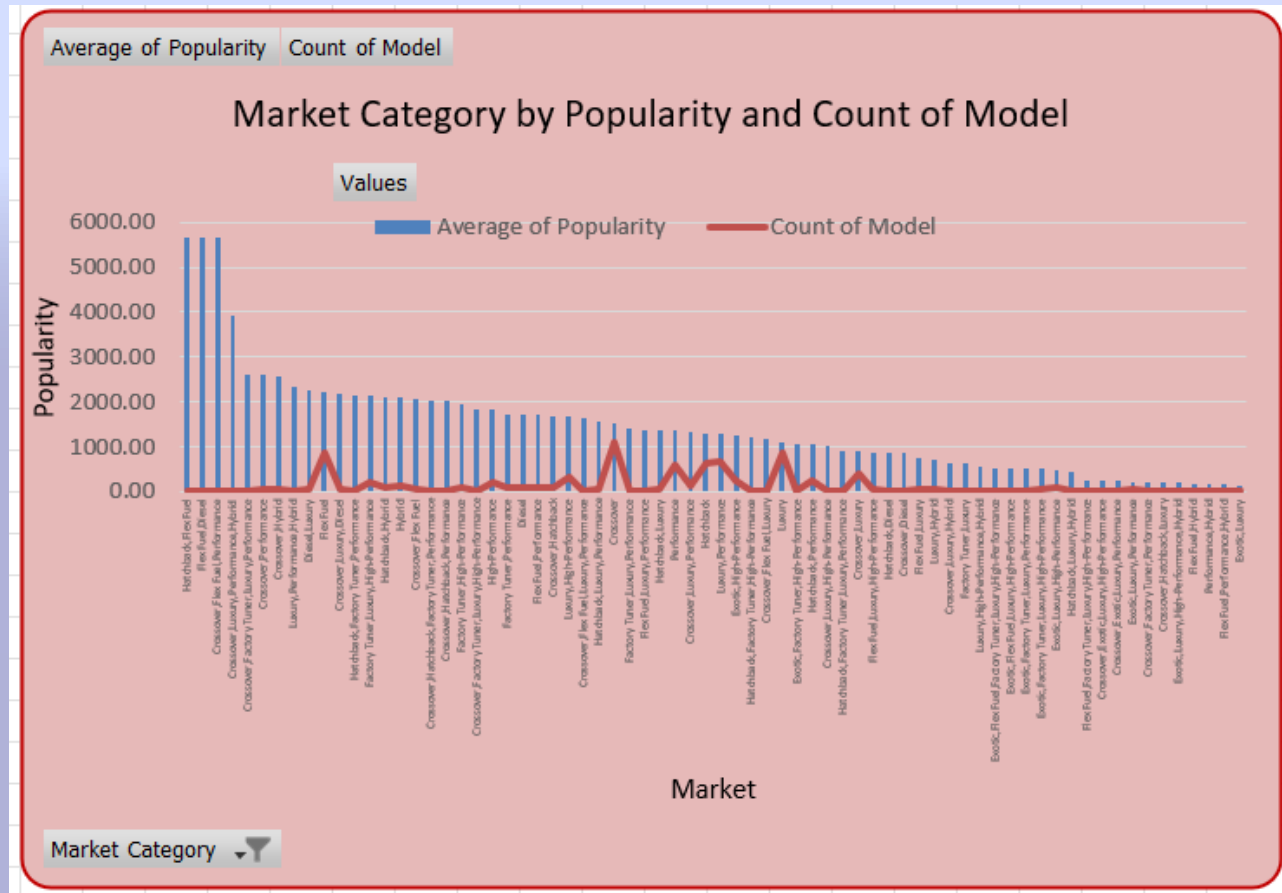
- A pivot table that shows the number of car models in each market category and their corresponding popularity scores and count of model
- The table is sorted on the basis of Average of Popularity in descending order

- Some part of the result is shown in the report

Row Labels	Values	
	 Average of Popularity	Count of Model
Hatchback,Flex Fuel	5657.00	7.00
Flex Fuel,Diesel	5657.00	16.00
Crossover,Flex Fuel,Performance	5657.00	6.00
Crossover,Luxury,Performance,Hybrid	3916.00	2.00
Crossover,Factory Tuner,Luxury,Performance	2607.40	5.00
Crossover,Performance	2585.96	69.00
Crossover,Hybrid	2563.38	42.00
Luxury,Performance,Hybrid	2333.18	11.00
Diesel,Luxury	2275.00	51.00
Flex Fuel	2217.30	872.00
Crossover,Luxury,Diesel	2195.85	33.00
Hatchback,Factory Tuner,Performance	2159.05	22.00
Factory Tuner,Luxury,High-Performance	2133.37	215.00
Hatchback,Hybrid	2121.25	72.00
Hybrid	2105.57	123.00
Crossover,Flex Fuel	2073.75	64.00
Crossover,Hatchback,Factory Tuner,Performance	2009.00	6.00

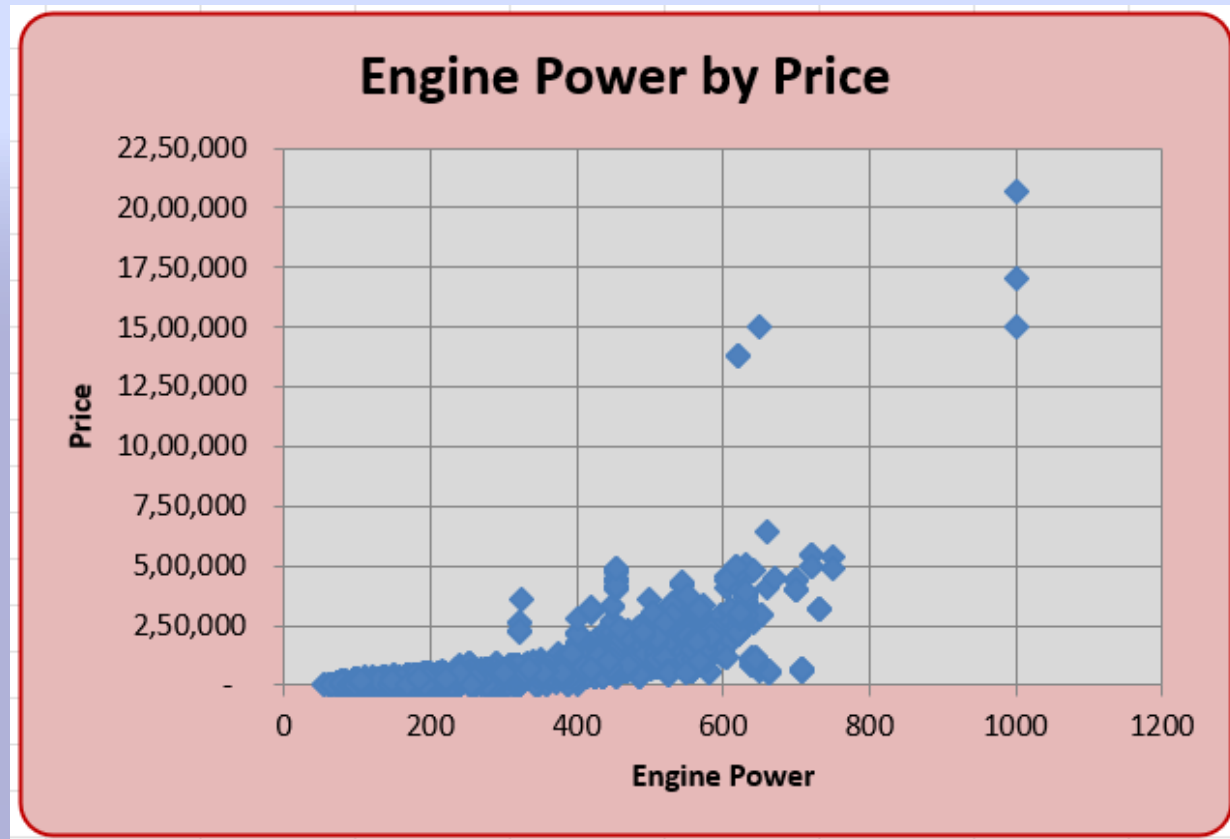
Popularity of a Car Model by Market Category

- A combo chart that visualizes the relationship between market category, popularity, and count of model



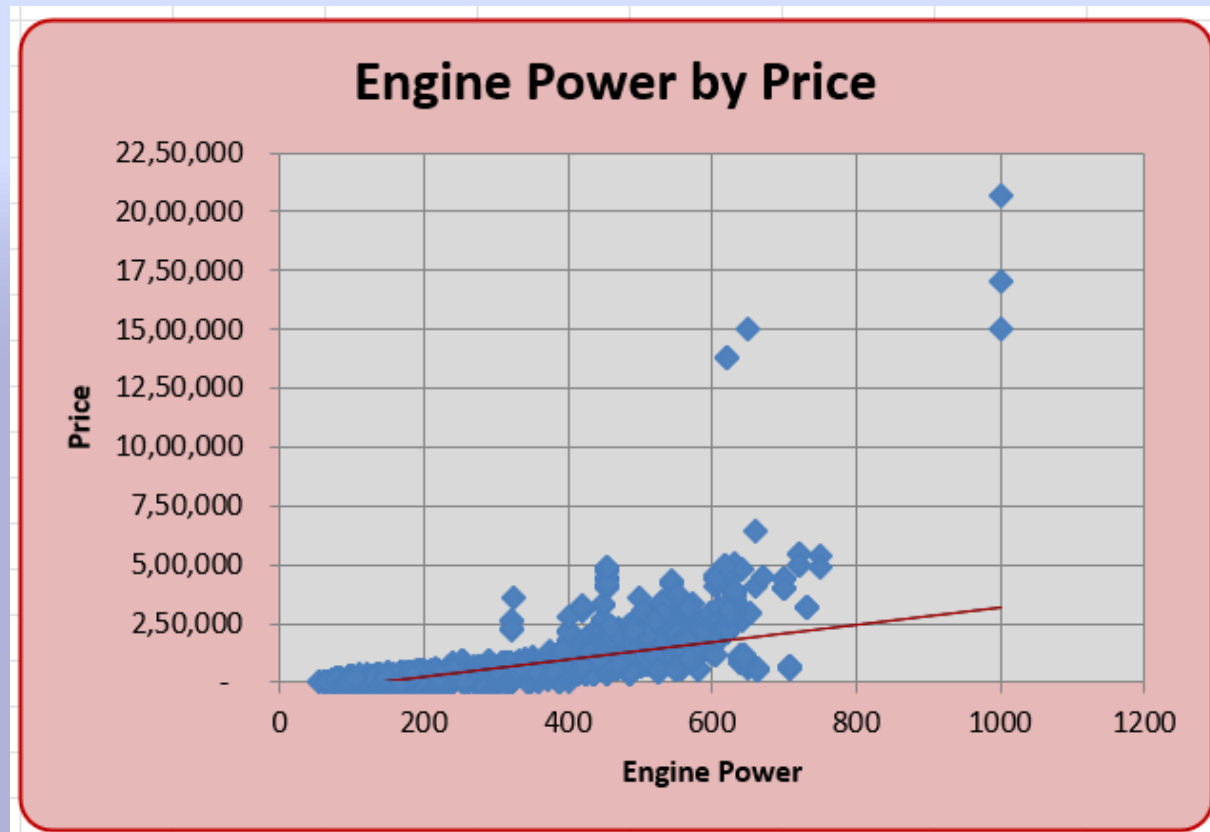
Engine Power and Price

- A scatter chart that plots engine power on the x-axis and price on the y-axis



Engine Power and Price

- A trendline to visualize the relationship between Engine Power and Price



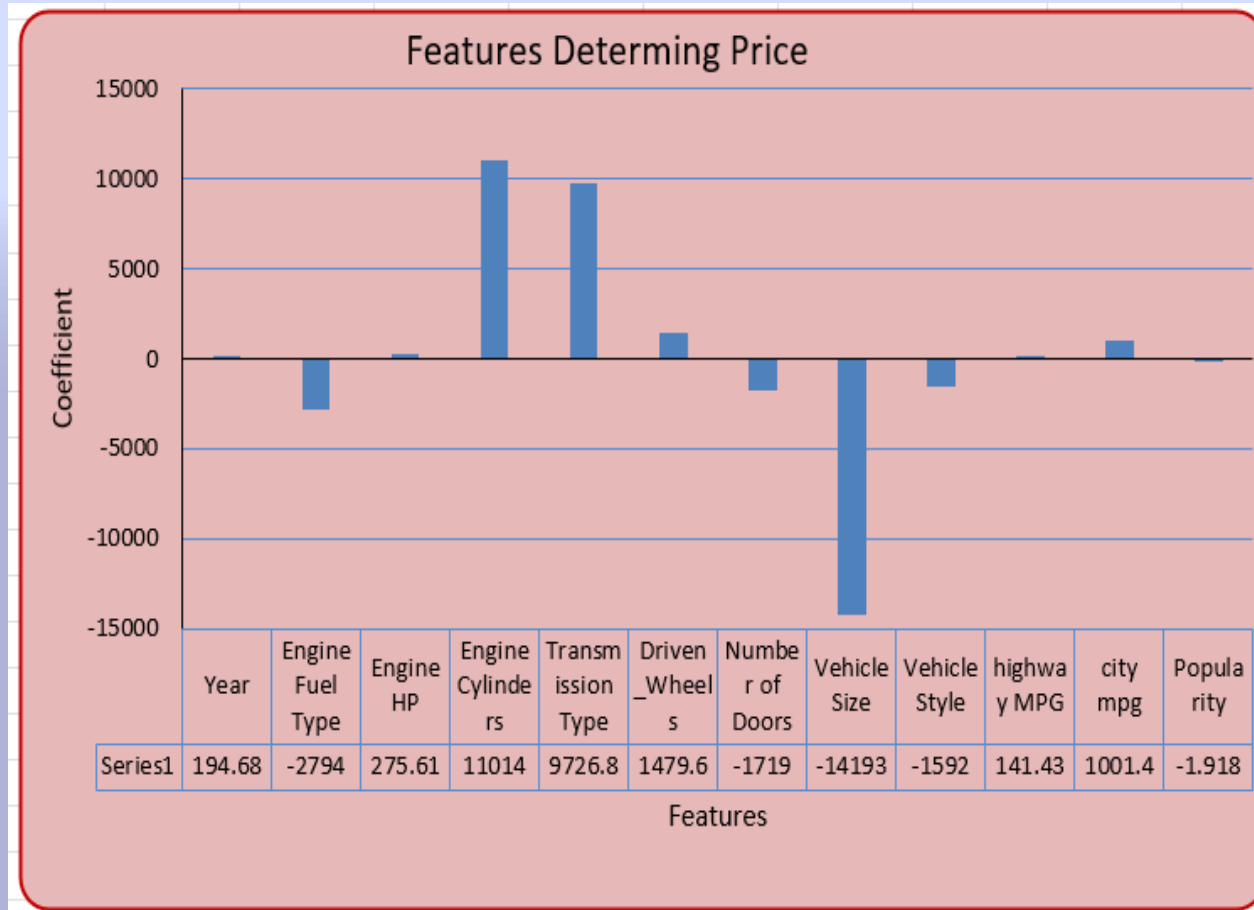
Features Determining Price

- Regression analysis to identify the variables that have the strongest relationship with a car's price
- Target variable (dependent variable) – MSRP
- Independent variables – Year, Engine Fuel Type, Engine HP, Engine Cylinders, Transmission Type, Driven_Wheels, Number of Doors, Vehicle Size, Vehicle Style, highway MPG, city mpg, Popularity

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-475699.6231	151534.7952	-3.139210518	0.001698221	-772732.8835	-178666.3627	-772732.8835	-178666.3627
Year	194.6840142	76.31948658	2.550908332	0.010756789	45.08519835	344.2828301	45.08519835	344.2828301
Engine Fuel Type	-2794.227927	423.1225561	-6.60382645	4.17904E-11	-3623.618116	-1964.837739	-3623.618116	-1964.837739
Engine HP	275.6116137	8.057953891	34.20367223	1.5359E-244	259.8166914	291.406536	259.8166914	291.406536
Engine Cylinders	11014.03944	476.8730859	23.09637463	1.8104E-115	10079.28933	11948.78956	10079.28933	11948.78956
Transmission Type	9726.78302	848.5110755	11.46335422	2.91593E-30	8063.56098	11390.00506	8063.56098	11390.00506
Driven_Wheels	1479.638572	427.4018726	3.461937505	0.000538205	641.8602157	2317.416929	641.8602157	2317.416929
Number of Doors	-1718.542508	524.9382059	-3.273799636	0.001064178	-2747.508209	-689.5768065	-2747.508209	-689.5768065
Vehicle Size	-14193.40538	639.1463181	-22.20681708	4.5673E-107	-15446.23787	-12940.57289	-15446.23787	-12940.57289
Vehicle Style	-1591.862808	142.9739401	-11.13393676	1.19182E-28	-1872.115377	-1311.61024	-1872.115377	-1311.61024
highway MPG	141.4258333	111.8200231	1.264763049	0.205981301	-77.75990539	360.6115719	-77.75990539	360.6115719
city mpg	1001.425789	118.8529444	8.425754987	3.99917E-17	768.4543616	1234.397217	768.4543616	1234.397217
Popularity	-1.918025773	0.27995389	-6.851220284	7.68696E-12	-2.466781698	-1.369269847	-2.466781698	-1.369269847


Features Determining Price

- A bar chart that shows the coefficient values for each variable to visualize their relative importance



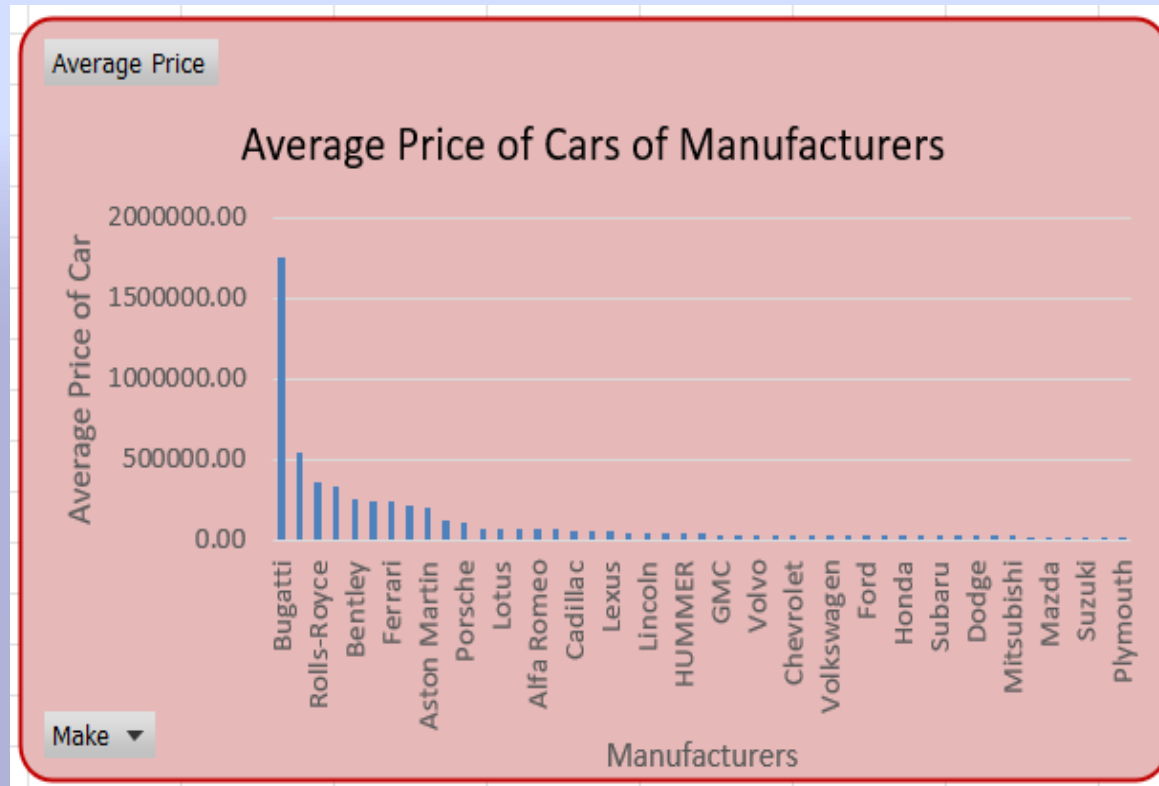
Average Price by Manufacturers

- A pivot table that shows the average price of cars for each manufacturer
- The table is sorted on the basis of average price of cars in the descending order
- Top 10 manufactures are displayed in the report

Manufacturers 	Average Price
Bugatti	1757223.67
Maybach	546221.88
Rolls-Royce	351130.65
Lamborghini	331567.31
Bentley	247169.32
McLaren	239805.00
Ferrari	237383.82
Spyker	213323.33
Aston Martin	197910.38
Maserati	114207.71

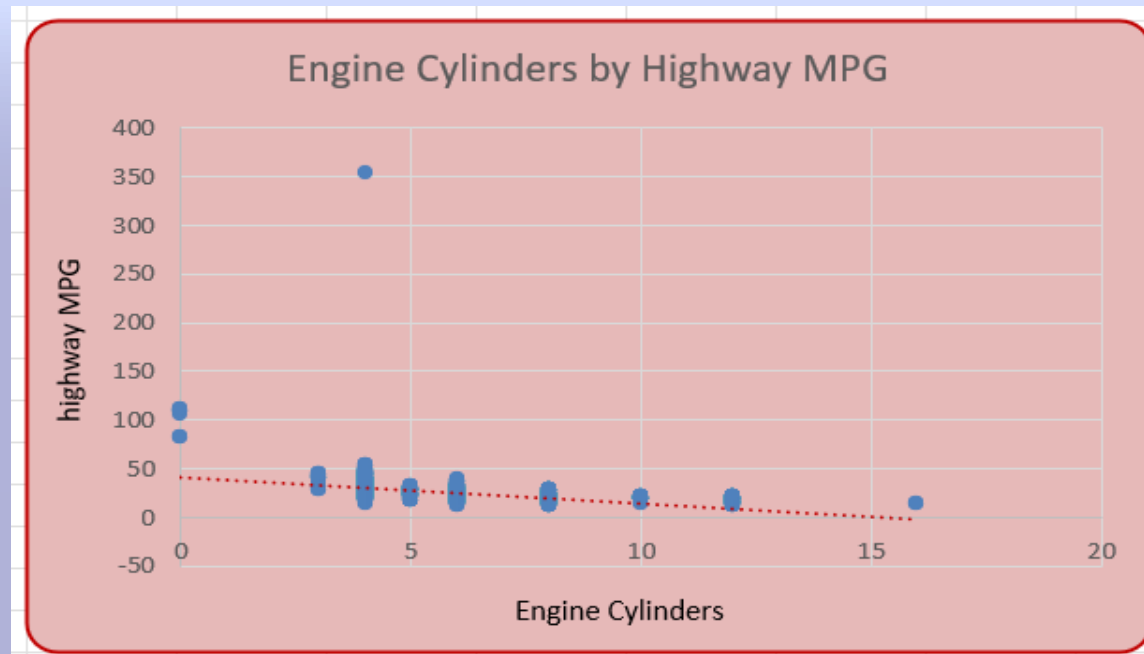
Average Price by Manufacturers

- A bar chart that visualizes the relationship between manufacturer and average price of car



Fuel Efficiency and Number of Cylinders

- A scatter plot with the number of cylinders on the x-axis and highway MPG on the y-axis
- A trendline on the scatter plot to visually estimate the slope of the relationship



Fuel Efficiency and Number of Cylinders

- The correlation coefficient between the number of cylinders and highway MPG to quantify the strength and direction of the relationship

	<i>Engine Cylinders</i>	<i>highway MPG</i>
Engine Cylinders	1	
highway MPG	-0.620600238	1

Insights after Data Analysis

- The following market categories are most popular
 - Flex Fuel,Diesel
 - Hatchback,Flex Fuel
 - Crossover,Flex Fuel,Performance
- The average of popularity is not positively related to the count of models
- When the power of the engine increases, the price of the car also increases
 - There is a positive correlation between engine power and price
- Engine cylinders and transmission type are most important in determining the car's price

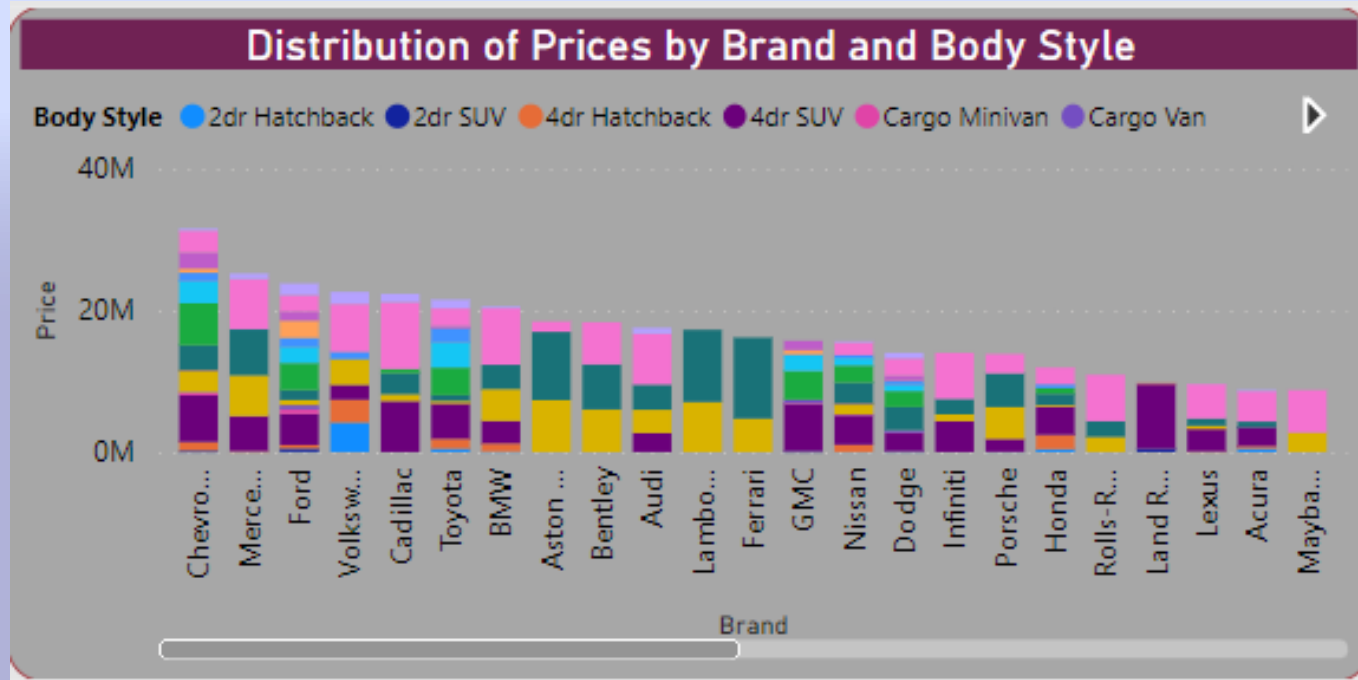
Insights after Data Analysis

- Vehicle size is the least important factor in determining the car's price
- Bugatti is the manufacture whose average price of the car is the highest
- Plymouth is the manufacturer with the lowest average price
- There is a negative relationship between the variables – Number of cylinders and highway MPG
- The correlation coefficient between number of cylinders and highway MPG is -0.62
- The value is close to -1 which indicates that there is a negative relationship between them

Building Interactive Dashboard

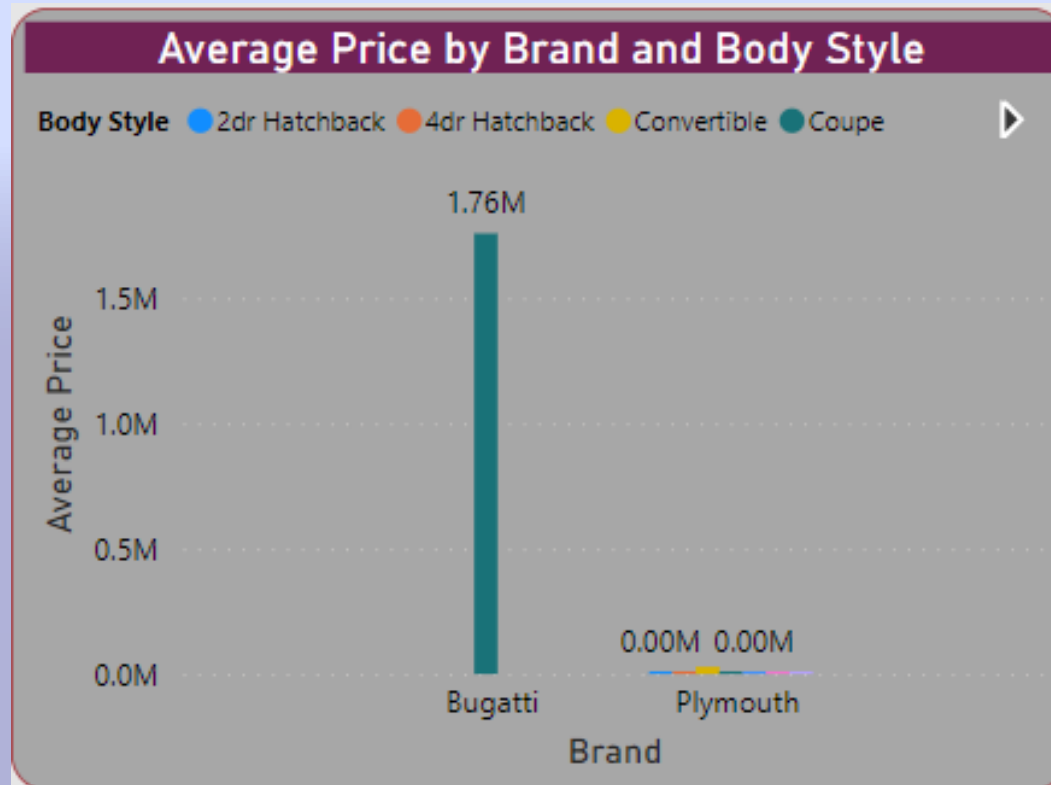
Distribution of Car Prices

- The distribution of car prices vary by brand (make) and body (vehicle) style



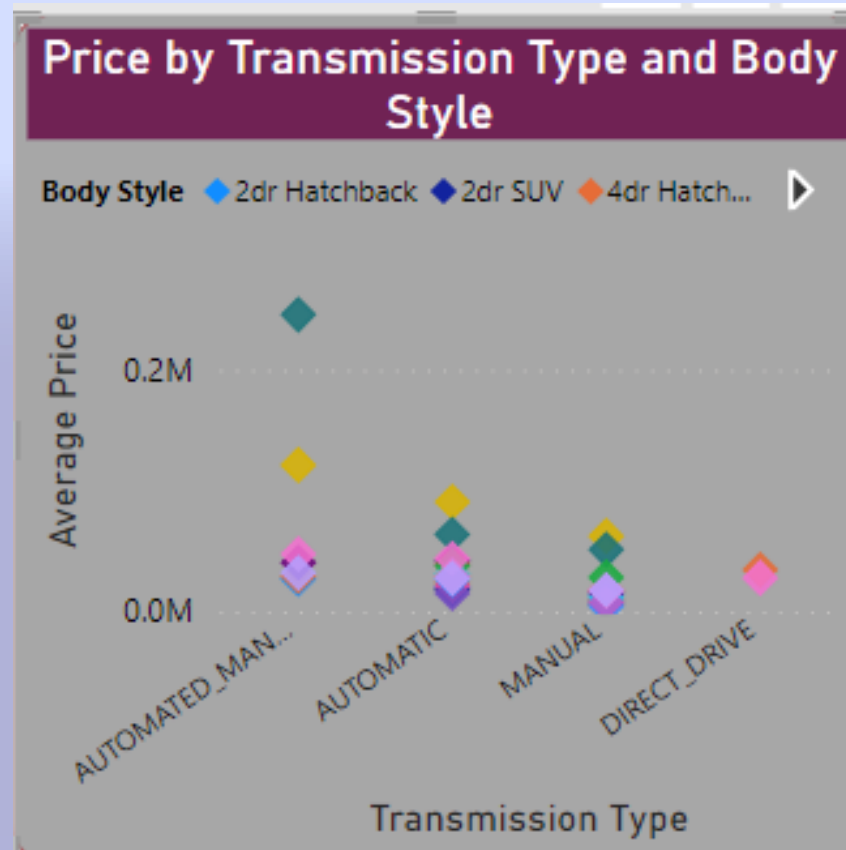
Highest and Lowest Average MSRPs

- Car brands that have the highest and lowest average MSRP
- Price vary by body style



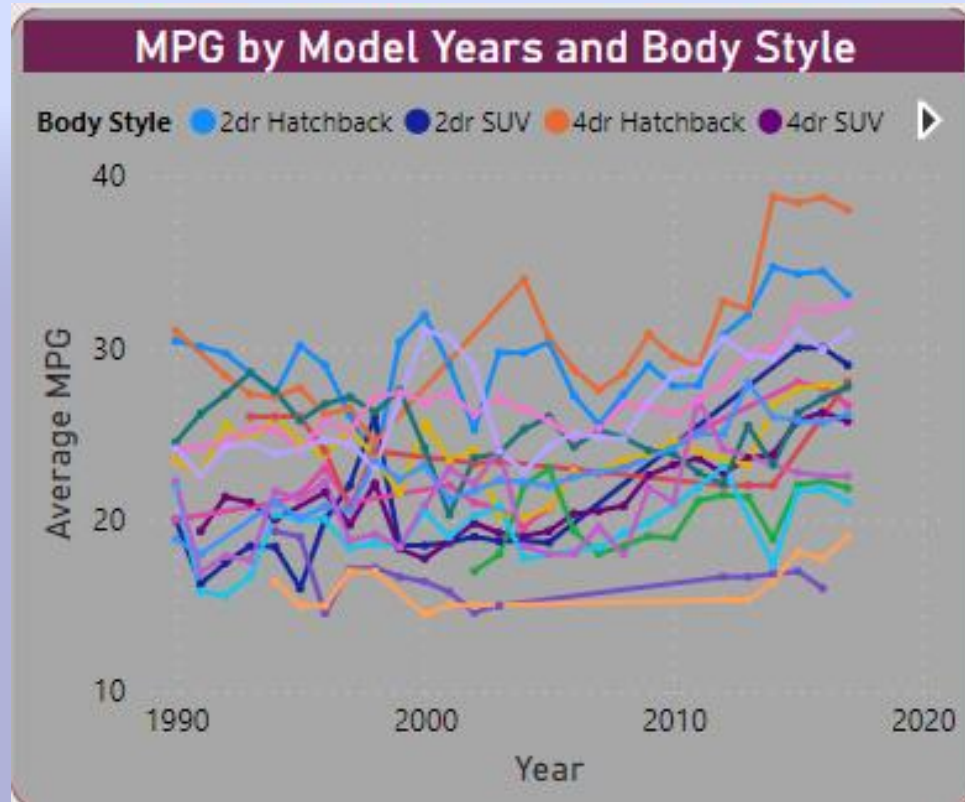
Transmission Type and Body Style Affect the MSRP

- Scatter plot chart to visualize the relationship between MSRP and transmission type, with different symbols for each body style



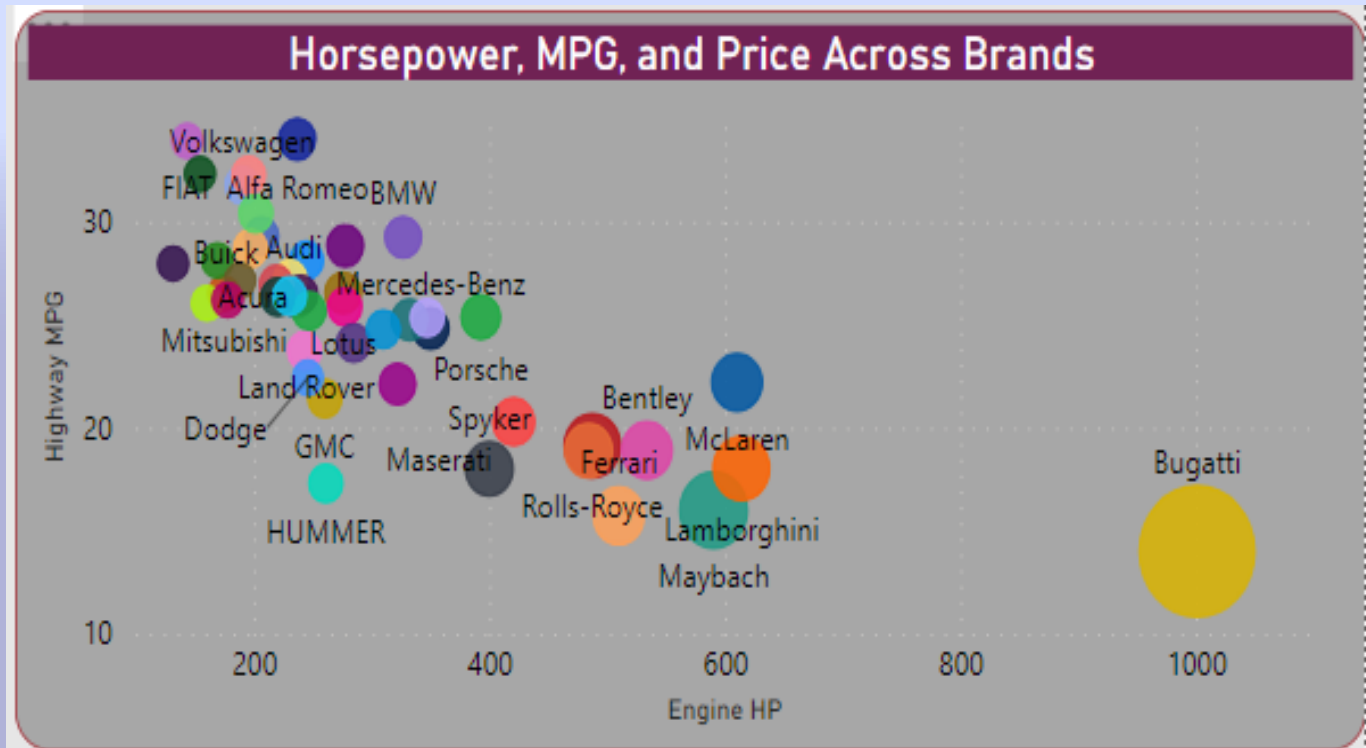
Fuel Efficiency of Cars

- Line chart to show the trend of fuel efficiency (MPG) over time for each body style
- Highway MPG is considered



Car's HP, MPG, and Price across Brands

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



Insights from Dashboard

- Different brands have different prices for the body or vehicle style
- Chevrolet has the highest price distribution
- Bugatti is the car brand with highest MSRPs which consists of only one model style - coupe
- Plymouth is the car brand with highest MSRPs which consists of many model styles
- Although Bugatti is having one model style, they have the highest average price of cars

Insights from Dashboard

- The combination of the Transmission type – Automated Manual and the body style – Coupe has the highest average price
- 4dr Hatchback body style has the highest fuel efficiency
- Although there are some fluctuations, average fuel efficiency increases with respect to years in most of the body styles
- The average price for most of the brands is more when the Engine HP is more
- For the Bugatti brand, Engine HP is high, fuel efficiency in the highway is less, and their average price is very huge

Conclusion

- The project helped to gain some insights about the impact of different features on price of the car
- The dataset consists of 15 independent variables and one dependent variable – MSRP
- Engine HP is one of the main features that affects the price of the car
- Bugatti and Plymouth are the manufactures whose average price of the car is the highest and lowest, respectively
- The fuel efficiency is found to be more in the latest released cars
- Automated manual cars are having more prices compared to other transmission types

LINK For the Project Folder

[click on this link to open the folder](#)



Thank You!!