Analyzing the Impact of Car Features on Price and Profitability

FINAL PROJECT- 3 | BY YUGASHINI

Project Description

This project aims to analyze the relationship between car features, market categories, and pricing to help car manufacturers optimize their pricing and product development strategies. By leveraging data analysis techniques such as regression analysis and market segmentation, the project will identify the most popular and profitable features and market categories among consumers. The insights gained will enable manufacturers to develop a pricing strategy that balances consumer demand with profitability and make informed decisions on future product development to enhance market competitiveness and increase profitability.

Approach

Before starting the analysis, I Preprocessed the data by handling any blanks and (N/A) by either deleting them or filling them in with the median value and convert the data type of model as text. Then, I used Excel functions and regression to complete the tasks. To visualize the insights, I created charts in Tableau and developed a dashboard. This dashboard helps analyze how car features affect price and profitability.

Tech-stack used

- Microsoft excel version 2021
- Tableau

Insights

Analysis :

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

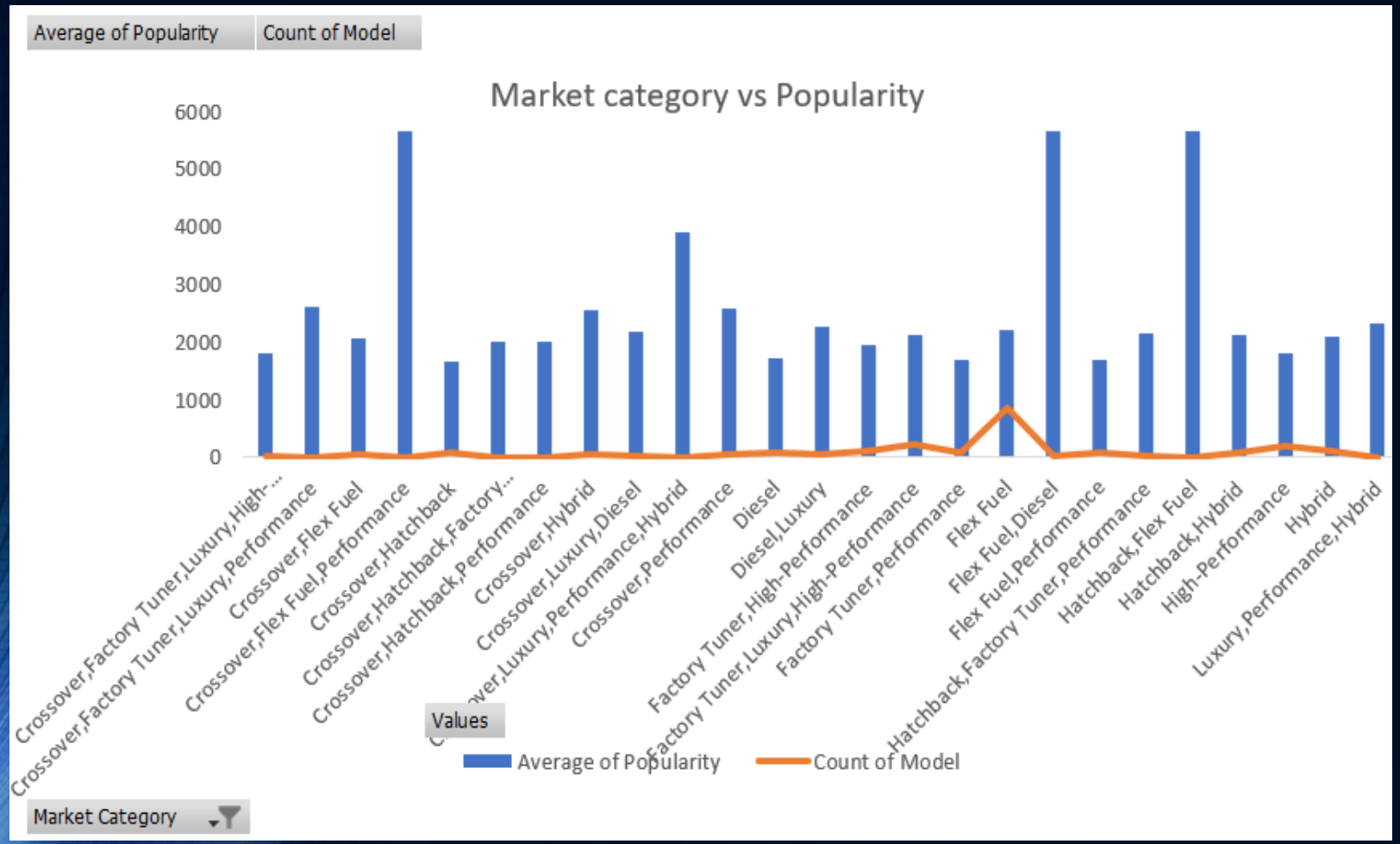
- ✓ I have created a pivot table that shows the number of car models in each market category and their corresponding popularity scores and created a combo chart that visualizes the relationship between market category and popularity.

Task 1A

Row Labels	Average of Popularity	Count of Model
Crossover,Factory Tuner,Luxury,High-Performance	1823	26
Crossover,Factory Tuner,Luxury,Performance	2607	5
Crossover,Flex Fuel	2074	64
Crossover,Flex Fuel,Performance	5657	6
Crossover,Hatchback	1676	72
Crossover,Hatchback,Factory Tuner,Performance	2009	6
Crossover,Hatchback,Performance	2009	6
Crossover,Hybrid	2563	42
Crossover,Luxury,Diesel	2196	33
Crossover,Luxury,Performance,Hybrid	3916	2
Crossover,Performance	2586	69
Diesel	1731	84
Diesel,Luxury	2275	51
Factory Tuner,High-Performance	1941	106
Factory Tuner,Luxury,High-Performance	2133	215
Factory Tuner,Performance	1696	92
Flex Fuel	2217	872
Flex Fuel,Diesel	5657	16
Flex Fuel,Performance	1702	81
Hatchback,Factory Tuner,Performance	2159	22
Hatchback,Flex Fuel	5657	7
Hatchback,Hybrid	2121	72
High-Performance	1821	199
Hybrid	2106	123
Luxury,Performance,Hybrid	2333	11
Grand Total	**2134**	**2282**

- ✓ The pivot table shows the top 25 market category according to their popularity and also shows the number of car model for each category

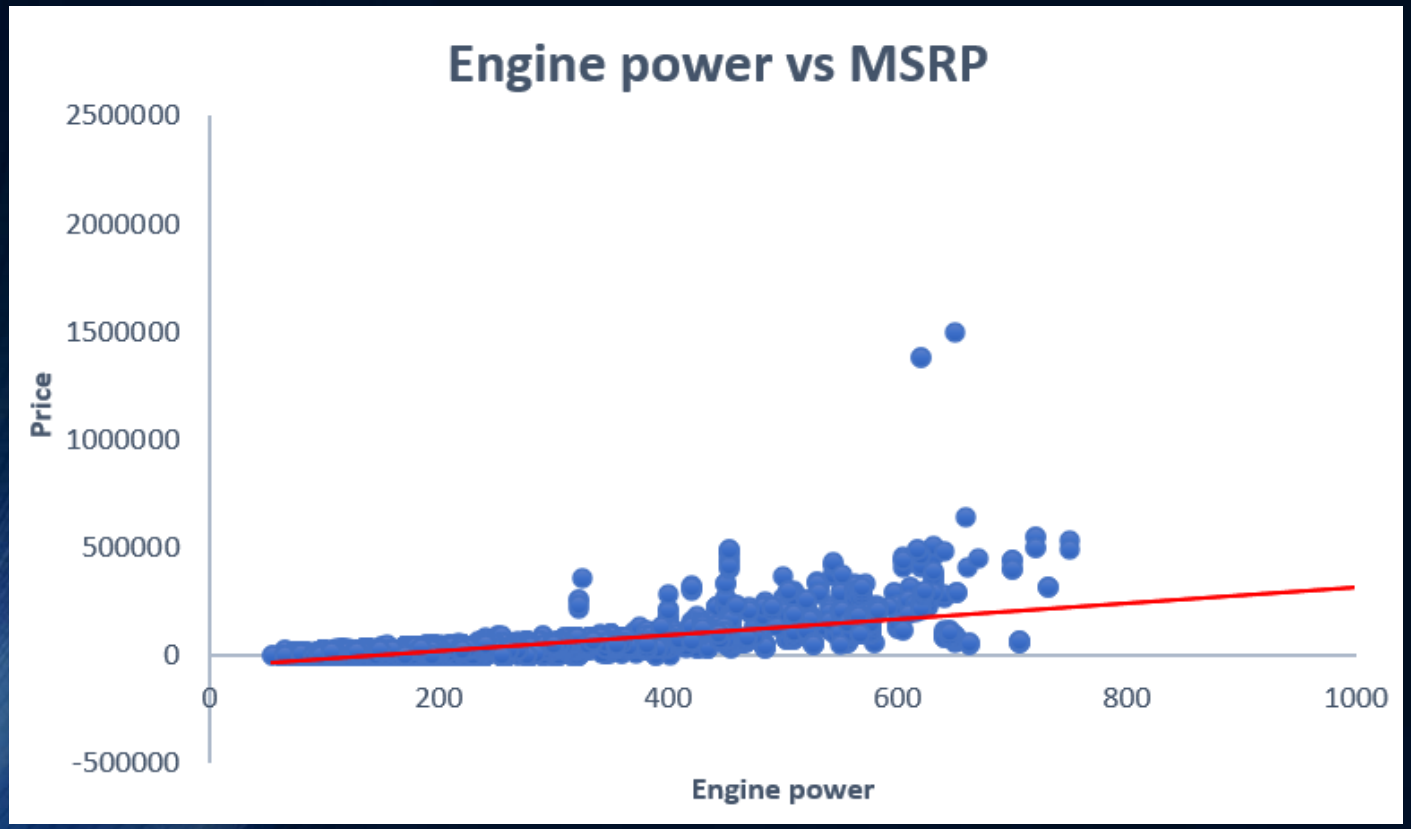
Task 1B



- ✓ Certain categories (Crossover,Flex fuel,Performance & Flex fuel,diesel & Hatchback,Flex fuel) seem to have high popularity despite having a relatively low model count.
- ✓ Some categories (Flex fuel) with more models do not necessarily have higher popularity.
- ✓ This means that a few famous cars can make an entire category look popular, even if there aren't many models in it.

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

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.



- ✓ The upward trendline shows a positive correlation, indicating that an increase in engine power corresponds to higher car prices.

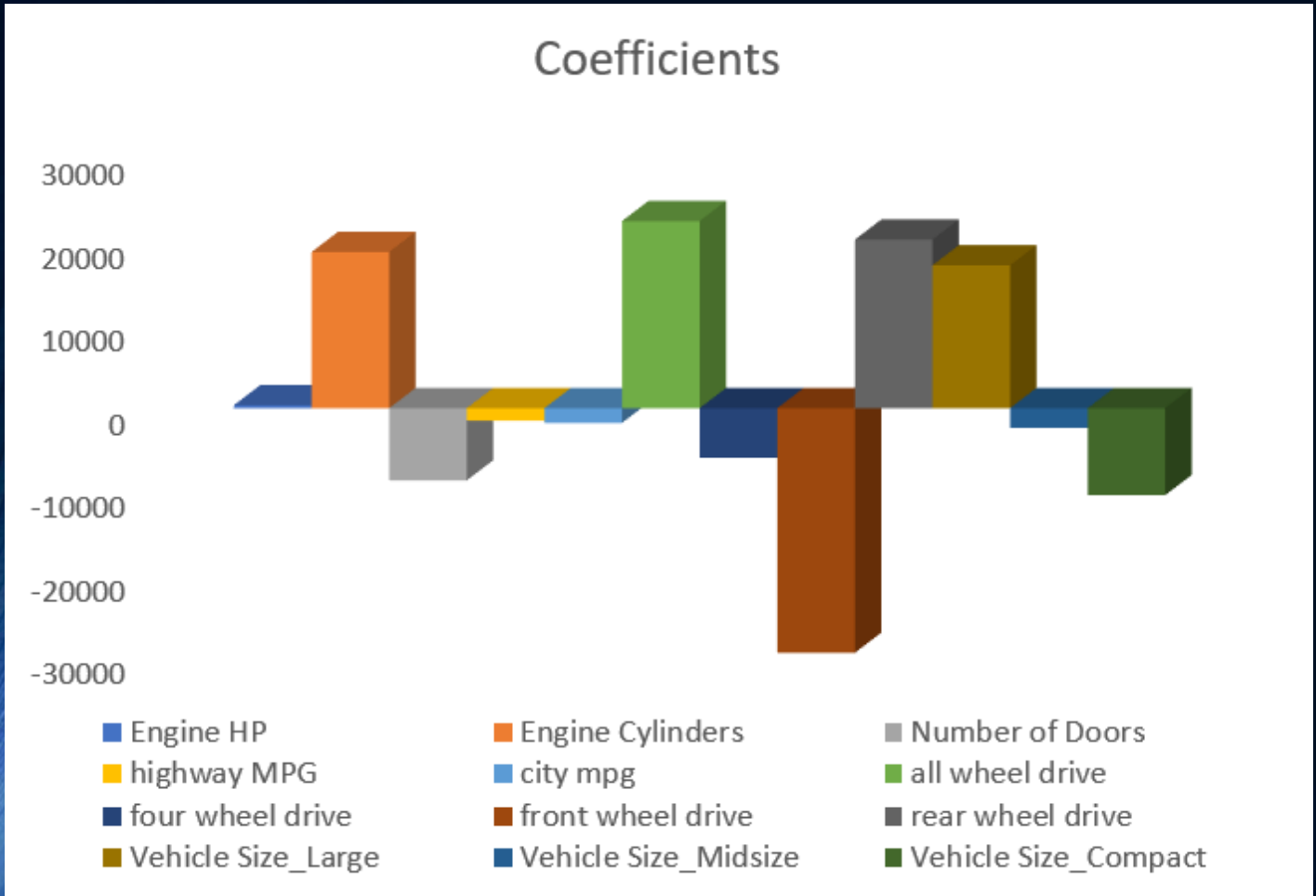
Task 3: Which car features are most important in determining a car's price?

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.

Car features	Coefficients
Engine HP	365.3135588
Engine Cylinders	18740.81713
Number of Doors	-8663.09497
highway MPG	-1500.774854
city mpg	-1764.537221
all wheel drive	22448.91963
four wheel drive	-5945.057796
front wheel drive	-29354.57553
rear wheel drive	20218.09948
Vehicle Size_Large	17133.87207
Vehicle Size_Midsize	-2364.03154
Vehicle Size_Compact	-10435.40788

- ✓ **Regression analysis** was performed to find the strongest variables affecting car prices for both numerical and specific categorical column.
- ✓ I encoded the categorical columns(Vehicle size and driven wheels) with 0’s and 1’s.
- ✓ Steps : Data tab > Data analysis > Regression.

Column chart



I have created a chart to show which features (e.g., horsepower, fuel efficiency, transmission type) **affect price the most**.

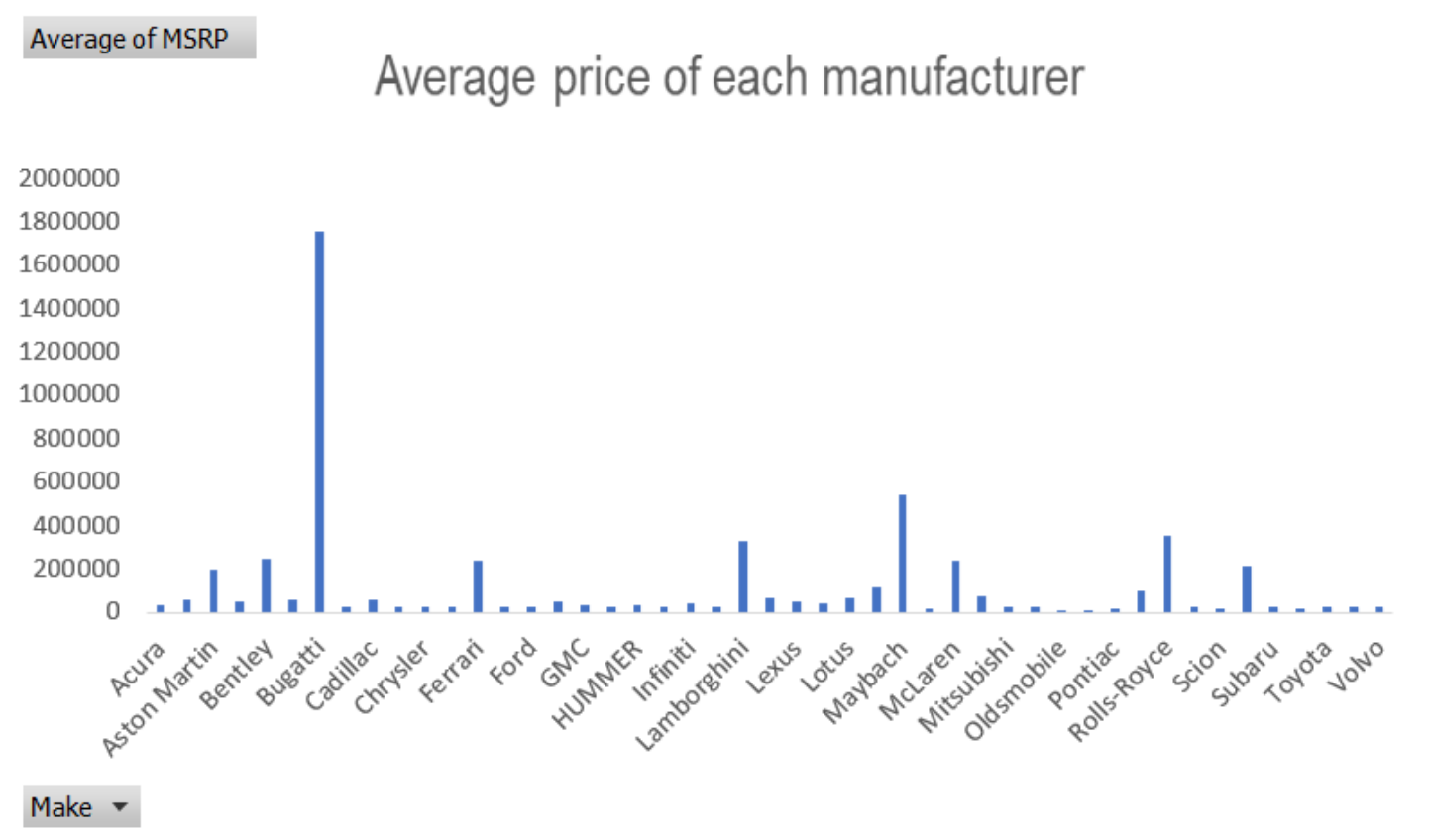
- ✓ Engine Cylinders & All-Wheel Drive have the highest positive impact on car price.
- ✓ Vehicle Size_Large & Rear wheel drive tend to have higher prices.
- ✓ Front Wheel Drive has Strong negative impact, meaning cars with this feature are generally cheaper.

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

4A: Create a pivot table that shows the average price of cars for each manufacturer

Row Labels	Average of MSRP
Acura	34888
Alfa Romeo	61600
Aston Martin	197910
Audi	53452
Bentley	247169
BMW	61547
Bugatti	1757224
Buick	28207
Cadillac	56231
Chevrolet	28292
Chrysler	26723
Dodge	22390
Ferrari	238219
FIAT	22206
Ford	27393
Genesis	46617
GMC	30493
Honda	26630
HUMMER	36464
Hyundai	24597
Infiniti	42394
Kia	25112
Lamborghini	331567
Land Rover	67823
Lexus	47549
Lincoln	42494
Lotus	69188
Maserati	114208
Maybach	546222
Mazda	20039
McLaren	239805
Mercedes-Benz	71538
Mitsubishi	21232
Nissan	28513
Oldsmobile	11543
Plymouth	3123
Pontiac	19322
Porsche	101622
Rolls-Royce	351131
Saab	27414
Scion	19933
Spyker	213323
Subaru	24828
Suzuki	17901
Toyota	28974
Volkswagen	28102
Volvo	28541
Grand Total	**40553**

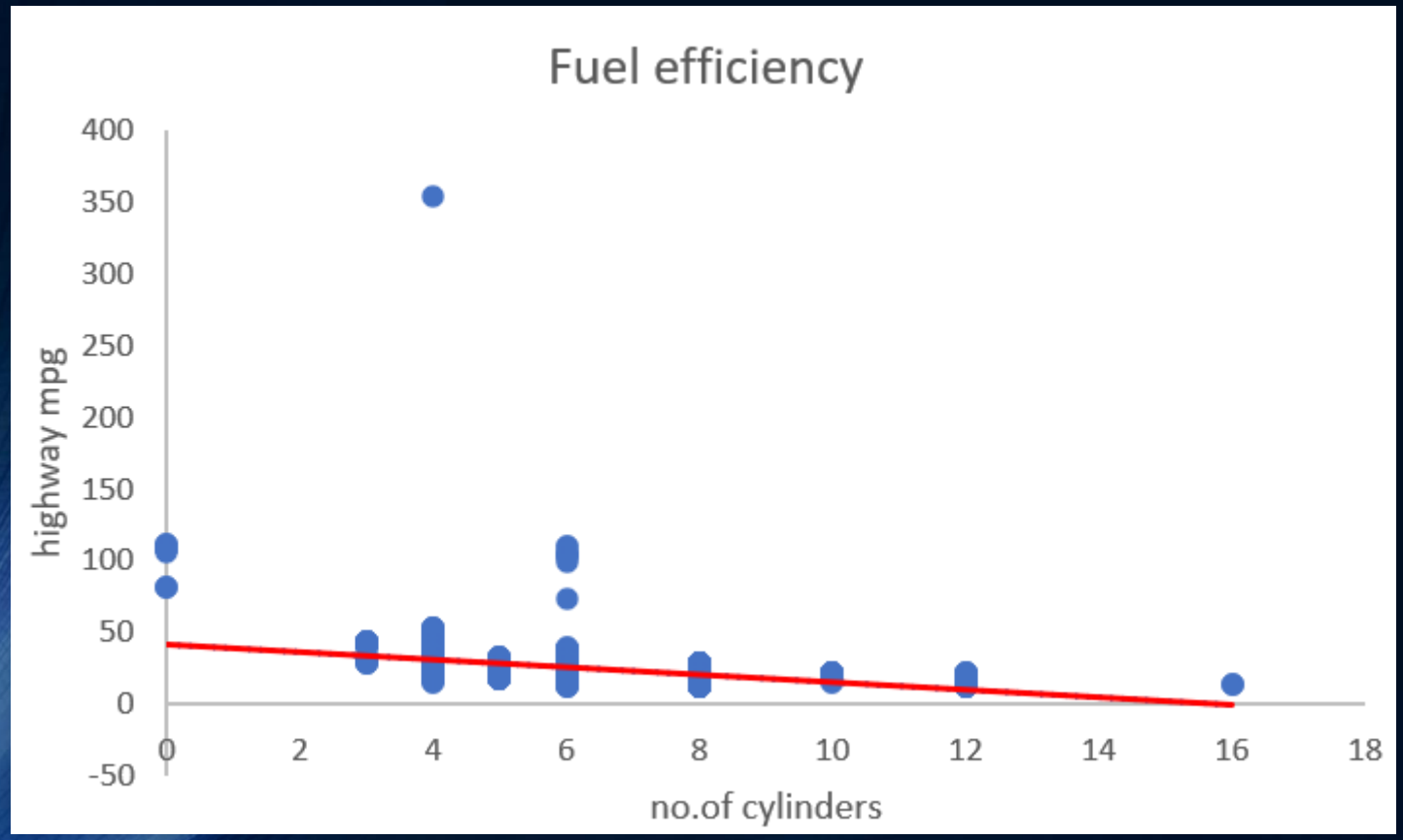
4.B: Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.



- ✓ **Bugatti** has the highest average MSRP, reaching close to $2,000,000, indicating its status as a luxury supercar brand.
- ✓ It depicts that brand reputation influences pricing significantly.
- ✓ **Maybach**, **Rolls-Royce**, **Lamborghini** also have relatively high prices, reinforcing their luxury or high-performance market positioning.

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

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.



- ✓ The trend line indicates a downward slope, suggesting that as the number of cylinders increases, highway fuel efficiency (mpg) decreases.

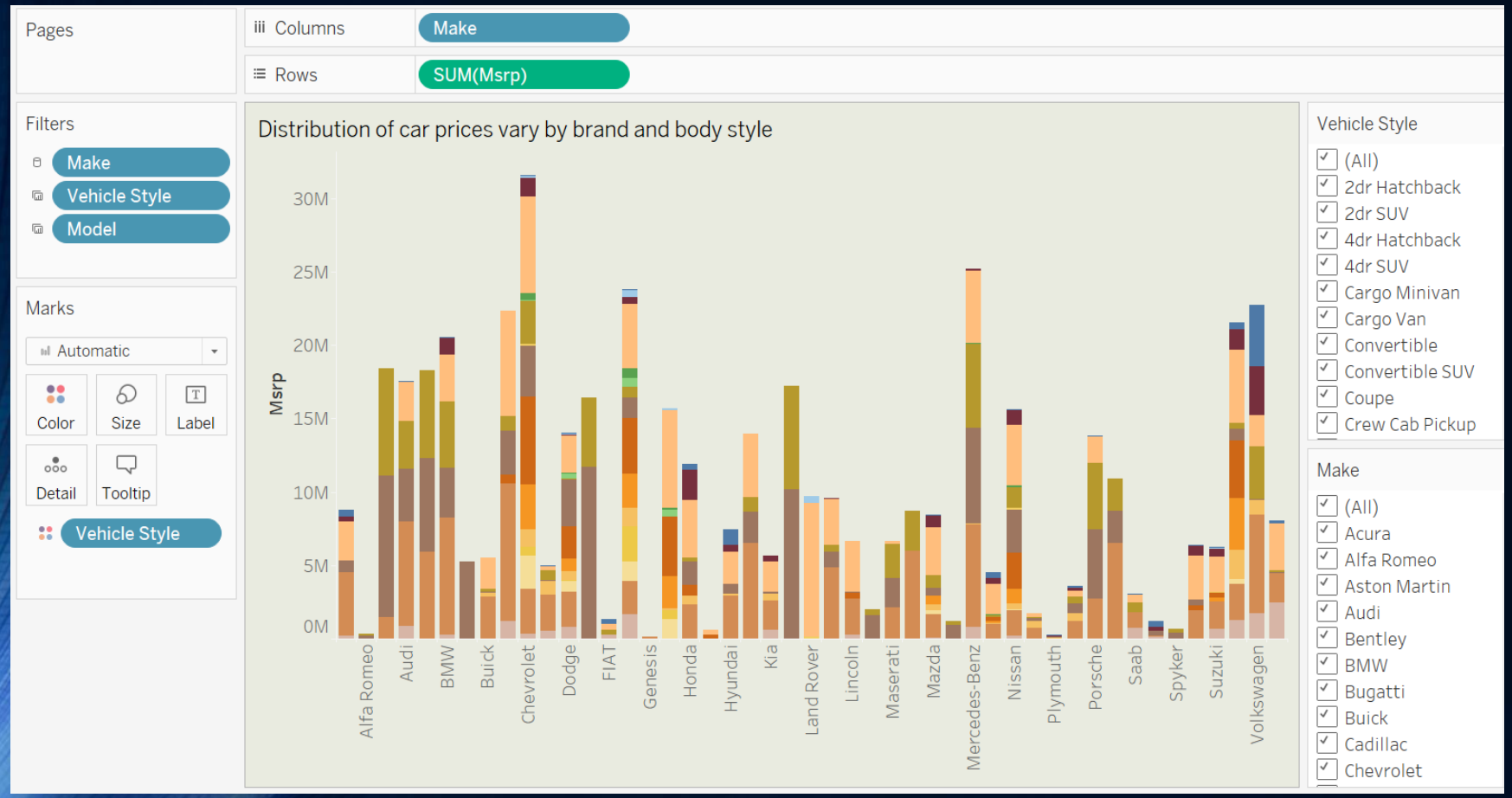
5.B: Calculate the correlation coefficient between the number of cylinders and highway MPG to quantify the strength and direction of the relationship.

Correlation coefficient
-0.595602857

- ✓ The **correlation coefficient depicts the relationship between the number of cylinders and highway MPG** (fuel efficiency) is likely **negative** (-0.595602857 < 0).
- ✓ This means **negative correlation:** As the number of cylinders increases, fuel efficiency (highway MPG) decreases.
- ✓ Choosing a engine with fewer cylinders, such as a 4-cylinder engine instead of a V8, can improve fuel efficiency.

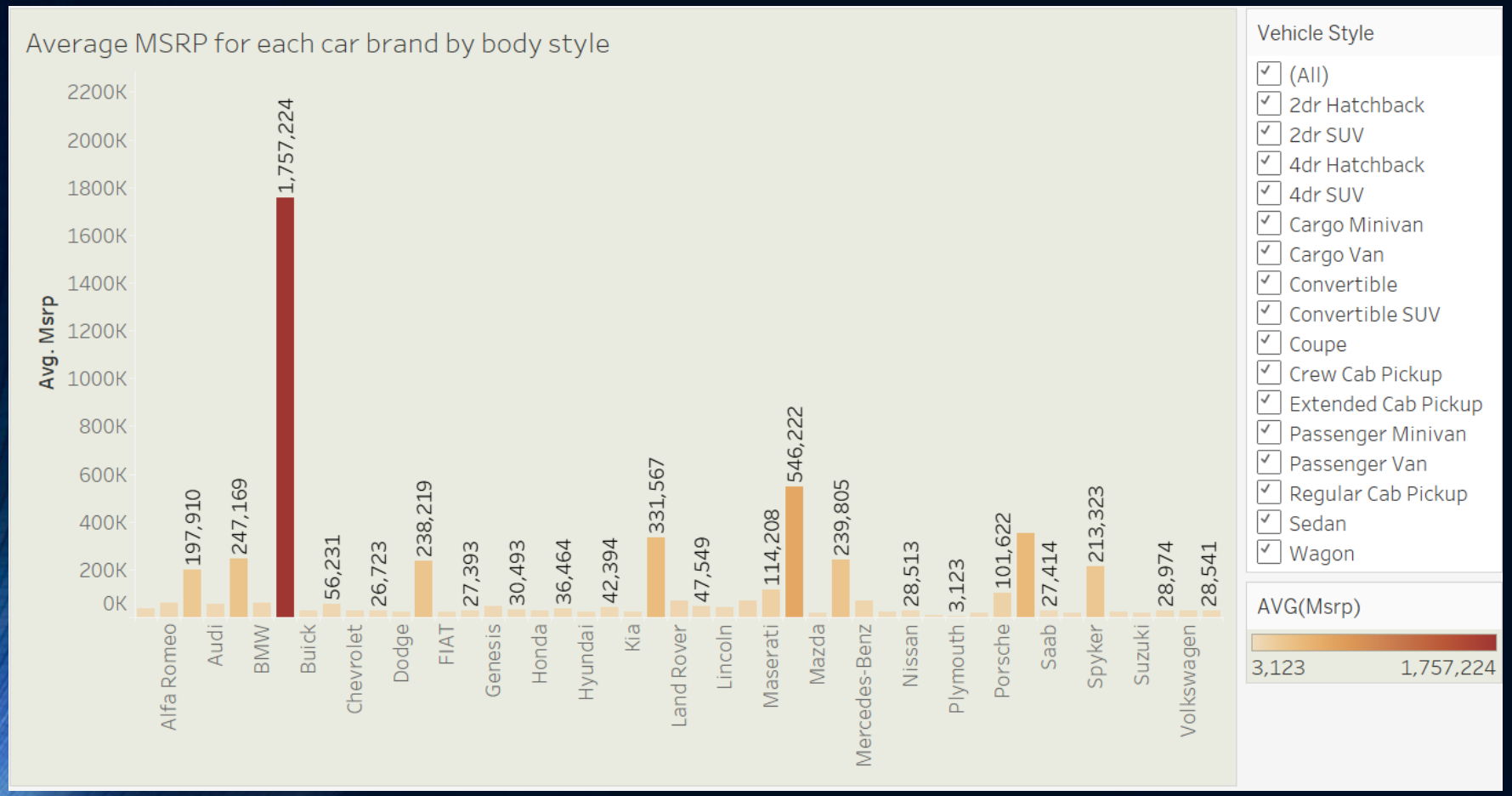
Building the Dashboard

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



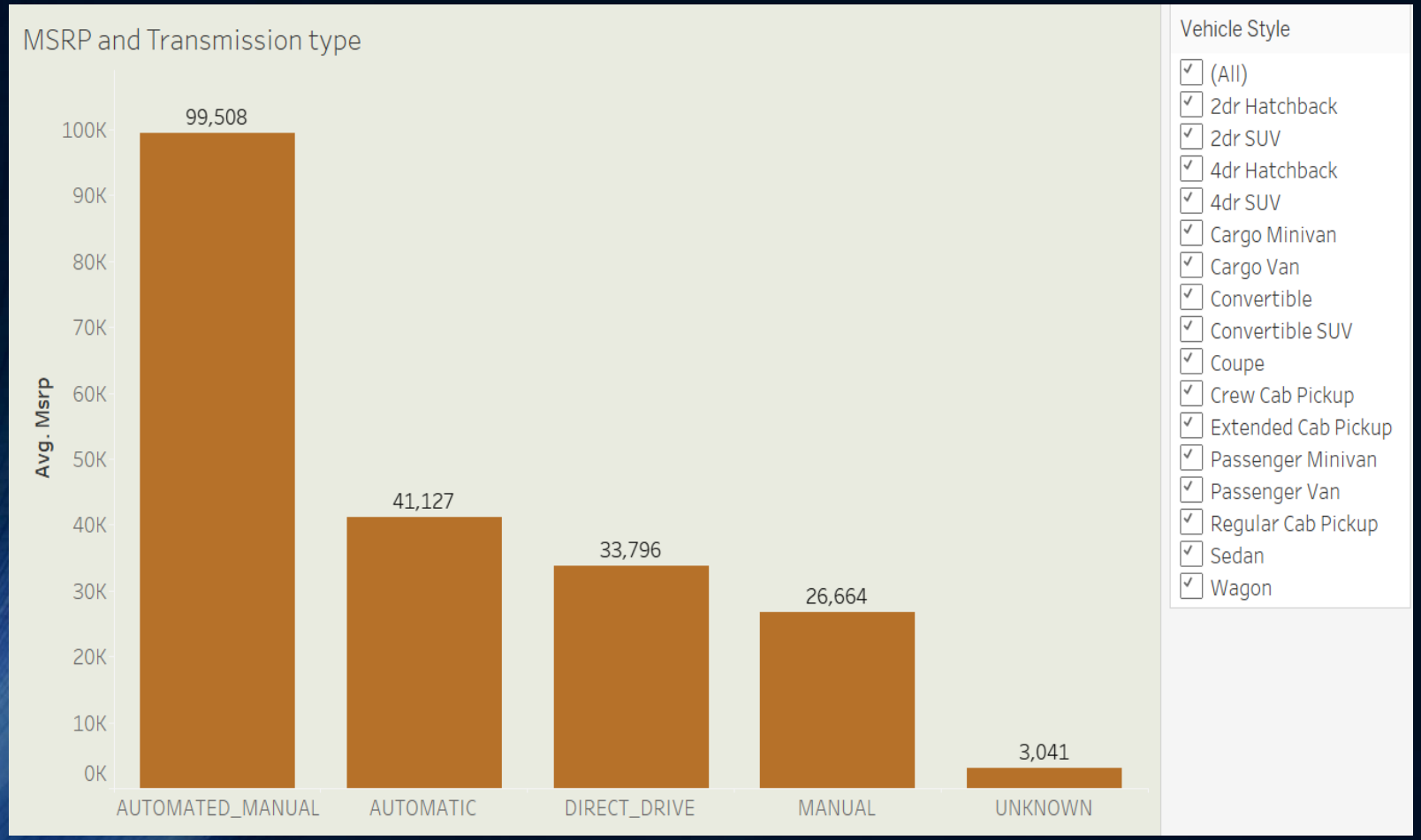
- ✓ Luxury brands like Chevrolet, Mercedes-Benz, and Volkswagen have higher MSRP values, indicating expensive cars.
- ✓ The distribution varies widely across brands, with some having a broader spread of vehicle prices while others are concentrated within a certain range.

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



- ✓ Bugatti has the highest average MSRP ($1,757,224).
- ✓ Plymouth has the lowest MSRP ($3,123), making it the most budget-friendly brand.
- ✓ If filtered by specific vehicle styles, some brands may show drastic shifts in pricing trends.

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

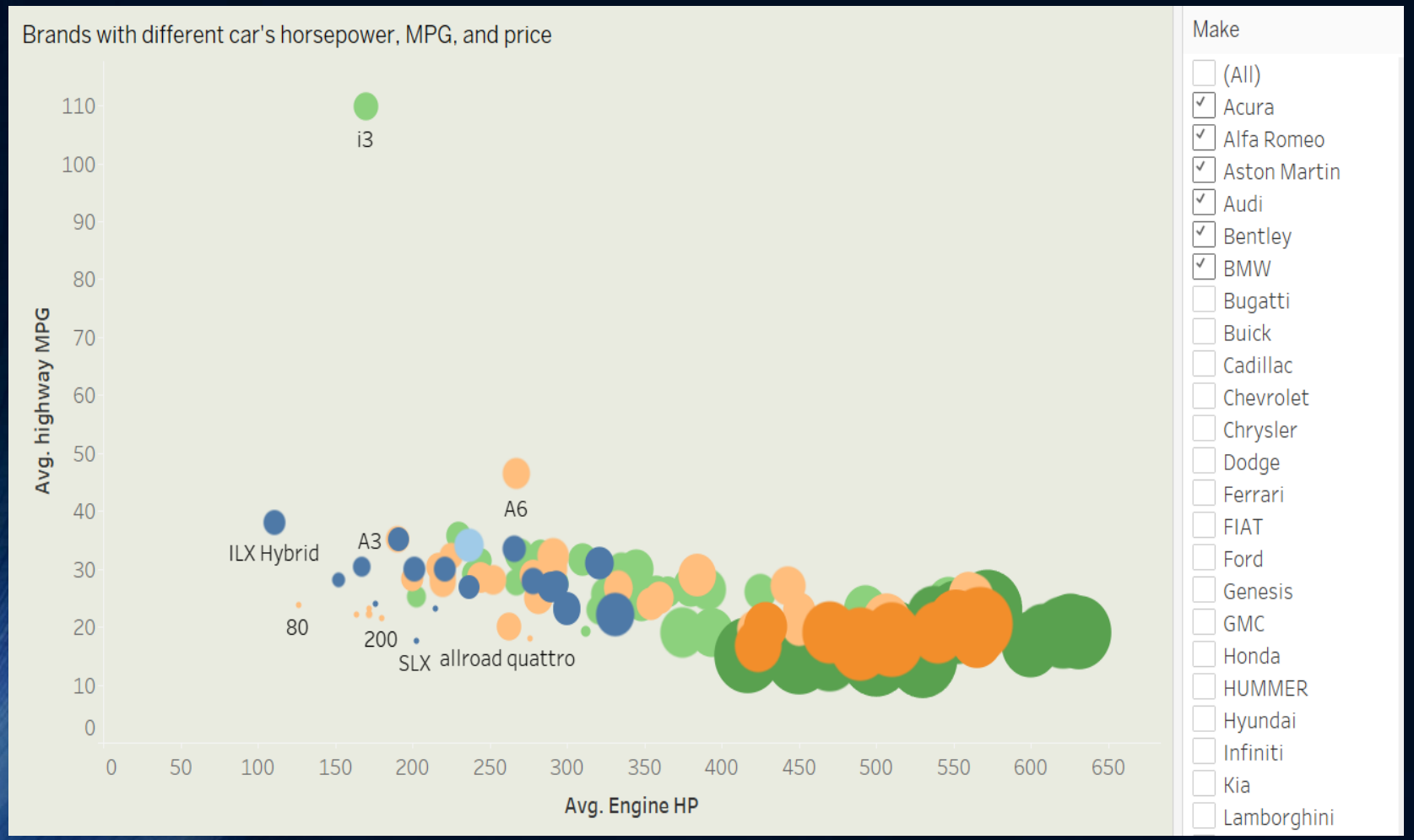


- ✓ Automated Manual transmissions have the highest average MSRP ($99,508) .This is likely because high-end sports cars and luxury vehicles often use automated manual transmissions.
- ✓ the MSRP values for each transmission type is change by vehicle style.

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

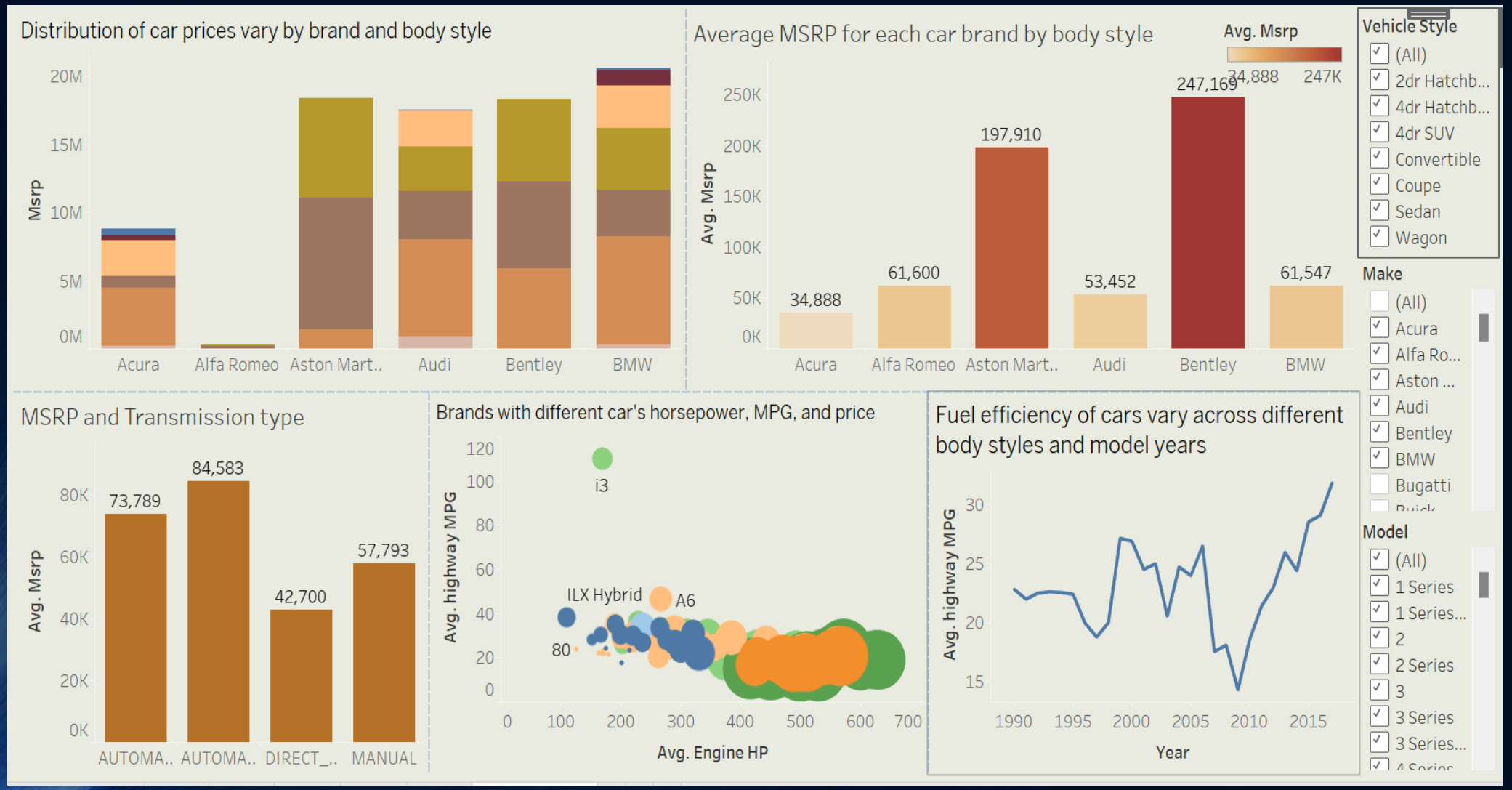
- ✓ Fuel efficiency varied slightly without a clear trend in 1990-early 2000s.
- ✓ Fuel efficiency has improved significantly over time, especially after 2008.
- ✓ The trend may vary by specific vehicle style and model.

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



- ✓ Bubble size represents the price.
- ✓ Different colors indicate different car brands
- ✓ The chart clearly shows that MPG, HP, Price varies significantly by brand.

Dashboard


Distribution of car prices vary by brand and body style
Msrp
20M
15M
10M
5M
0M
Acura
Alfa Romeo
Aston Mart..
Audi
Bentley
BMW
Average MSRP for each car brand by body style
Avg. Msrp
34,888
247K
Avg. Msrp
250K
200K
150K
100K
50K
0K
34,888
61,600
197,910
53,452
247,169
61,547
Acura
Alfa Romeo
Aston Mart..
Audi
Bentley
BMW
Vehicle Style
(All)
2dr Hatchb...
4dr Hatchb...
4dr SUV
Convertible
Coupe
Sedan
Wagon
Make
(All)
Acura
Alfa Ro...
Aston ...
Audi
Bentley
BMW
Bugatti
Model
(All)
1 Series
1 Series...
2
2 Series
3
3 Series
3 Series...
MSRP and Transmission type
Avg. Msrp
80K
60K
40K
20K
0K
73,789
84,583
42,700
57,793
AUTOMA..
AUTOMA..
DIRECT_..
MANUAL
Brands with different car's horsepower, MPG, and price
Avg. highway MPG
120
100
80
60
40
20
0
i3
ILX Hybrid
A6
80
0
100
200
300
400
500
600
700
Avg. Engine HP
Fuel efficiency of cars vary across different body styles and model years
Avg. highway MPG
30
25
20
15
1990
1995
2000
2005
2010
2015
Year

Result

- ✓ This project analyzed the impact of car features on pricing and market trends using data visualization and statistical techniques. Key factors such as engine power, transmission type, fuel efficiency, and brand positioning were examined to understand their influence on MSRP (Manufacturer's Suggested Retail Price).

- ✓ This project deepened my understanding of data analytics skills –Tableau, correlation analysis, and regression modeling to extract meaningful insights from data.

Hyperlink of result dataset

https://docs.google.com/spreadsheets/d/191BCE-ZC9er6dD2TieAt23AqPLwRhcW1/edit?usp=sharing&ouid=114293071387875296860&rtpof=true&sd=true

Hyperlink of the dashboard

https://public.tableau.com/shared/BX5TF8PN9?:display_count=n&:origin=viz_share_link

Thank You