Analyzing the Impact of Car Features on Price and Profitability

Problem Statement:

The automotive industry has been rapidly evolving over the past few decades, with a growing focus on fuel efficiency, environmental sustainability, and technological innovation. With increasing competition among manufacturers and a changing consumer landscape, it has become more important than ever to understand the factors that drive consumer demand for cars.

In recent years, there has been a growing trend towards electric and hybrid vehicles and increased interest in alternative fuel sources such as hydrogen and natural gas. At the same time, traditional gasoline-powered cars remain dominant in the market, with varying fuel types and grades available to consumers.

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?

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.

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.

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

This dataset could be useful for a variety of data analysis tasks, 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

However, it's important to note that the dataset was last updated in 2017, so it may not reflect current trends or prices in the automotive industry.

Tasks: Analysis

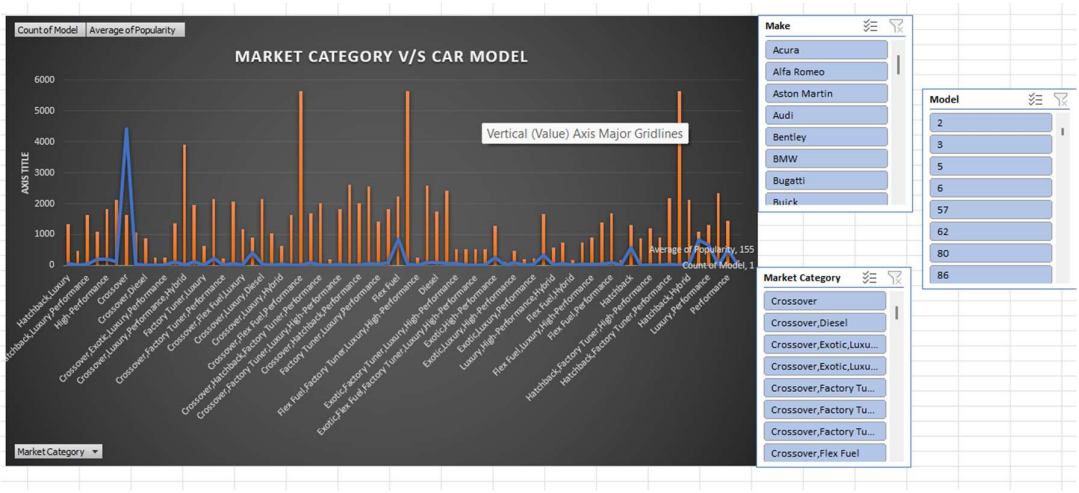
Before diving into the analysis of the given dataset, it is important to perform thorough data cleaning to ensure accurate and reliable results. You need to build an interactive dashboard in Excel from the tasks given below:

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.

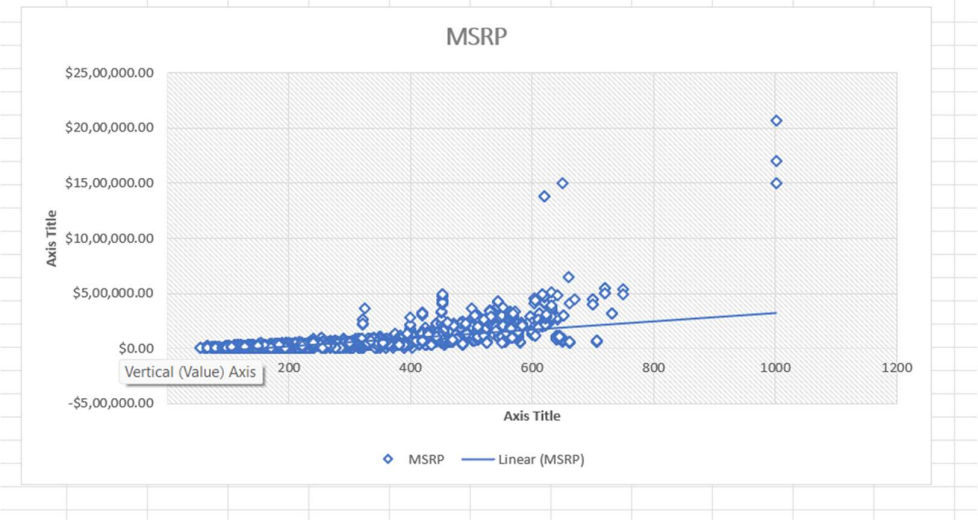
Row Labels	Count of Model	Average of Popularity
Hatchback,Luxury	45	1323
Hatchback,Luxury,Hybrid	3	454
Hatchback,Luxury,Performance	36	1632
Hatchback,Performance	198	1074
High-Performance	198	1823
Hybrid	121	2117
Crossover	4435	1634
Exotic,Factory Tuner,High-Performance	21	1046
Crossover,Diesel	7	873
Crossover,Exotic,Luxury,High-Performance	1	238
Crossover,Exotic,Luxury,Performance	1	238
Crossover,Luxury,Performance	112	1349
Crossover,Luxury,Performance,Hybrid	2	3916
Factory Tuner,High-Performance	104	1966
Factory Tuner,Luxury	2	617
Factory Tuner,Luxury,High-Performance	215	2133
Crossover,Factory Tuner,Performance	4	210
Crossover,Flex Fuel	64	2074
Crossover,Flex Fuel,Luxury	10	1173
Crossover,Luxury	406	889
Crossover,Luxury,Diesel	34	2149
Crossover,Luxury,High-Performance	9	1037
Crossover,Luxury,Hybrid	24	631
Crossover,Flex Fuel,Luxury,Performance	6	1624
Crossover,Flex Fuel,Performance	6	5657
Crossover,Hatchback	72	1676
Crossover,Hatchback,Factory Tuner,Performance	6	2009
Crossover,Hatchback,Luxury	7	204
Crossover,Factory Tuner,Luxury,High-Performance	26	1823
Crossover,Factory Tuner,Luxury,Performance	5	2607
Crossover,Hatchback,Performance	6	2009
Crossover,Hybrid	42	2563
Factory Tuner,Luxury,Performance	31	1413
Factory Tuner,Performance	81	1818
Flex Fuel	855	2226
Flex Fuel,Diesel	16	5657
Flex Fuel,Factory Tuner,Luxury,High-Performance	1	258
Crossover,Performance	69	2586
Diesel	84	1731
Diesel,Luxury	47	2416
Exotic,Factory Tuner,Luxury,High-Performance	51	523
Exotic,Factory Tuner,Luxury,Performance	3	520
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Performance	13	520
Exotic,Flex Fuel,Luxury,High-Performance	11	520
Exotic,High-Performance	246	1276
Exotic,Luxury	12	113
Exotic,Luxury,High-Performance	77	473
Exotic,Luxury,High-Performance,Hybrid	1	204
Exotic,Luxury,Performance	36	217
Luxury,High-Performance	334	1668
Luxury,High-Performance,Hybrid	12	569
Luxury,Hybrid	48	725
Flex Fuel,Hybrid	2	155
Flex Fuel,Luxury	39	747
Flex Fuel,Luxury,High-Performance	32	898
Flex Fuel,Luxury,Performance	28	1380
Flex Fuel,Performance	85	1687
Flex Fuel,Performance,Hybrid	2	155
Hatchback	558	1297
Hatchback,Diesel	14	873
Hatchback,Factory Tuner,High-Performance	13	1205
Hatchback,Factory Tuner,Luxury,Performance	9	887
Hatchback,Factory Tuner,Performance	21	2174
Hatchback,Flex Fuel	7	5657
Hatchback,Hybrid	64	2111
Luxury	818	1077
Luxury,Performance	659	1293
Luxury,Performance,Hybrid	11	2333
Performance	503	1443
Performance,Hybrid	1	155
Grand Total	11122	1559

- **Task 1.B:** Create a combo chart that visualizes the relationship between market category and popularity.



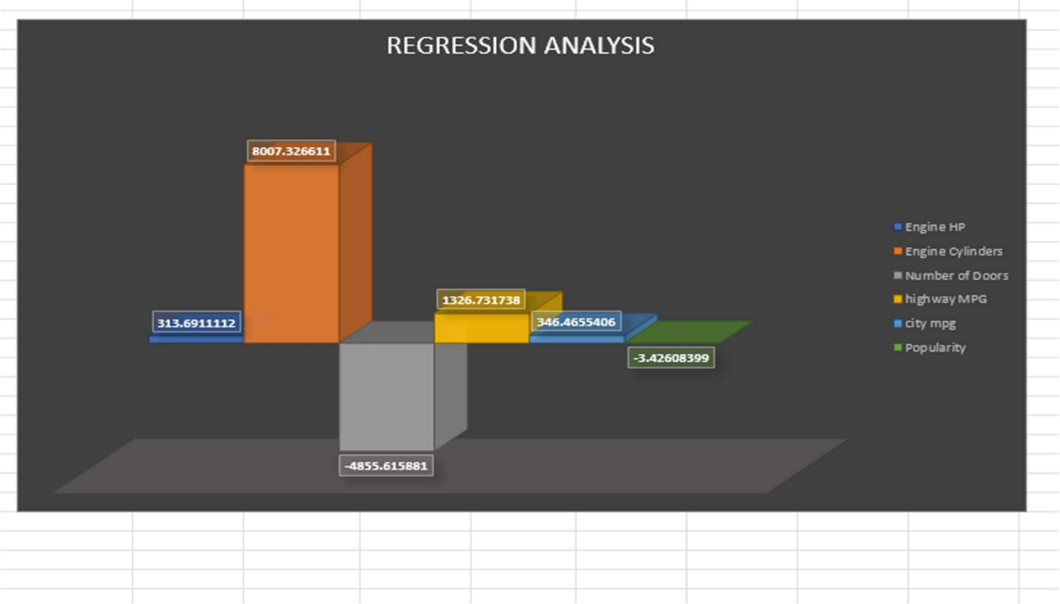
Insight Required: What is the relationship between a car's engine power and its price?

- **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.



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.

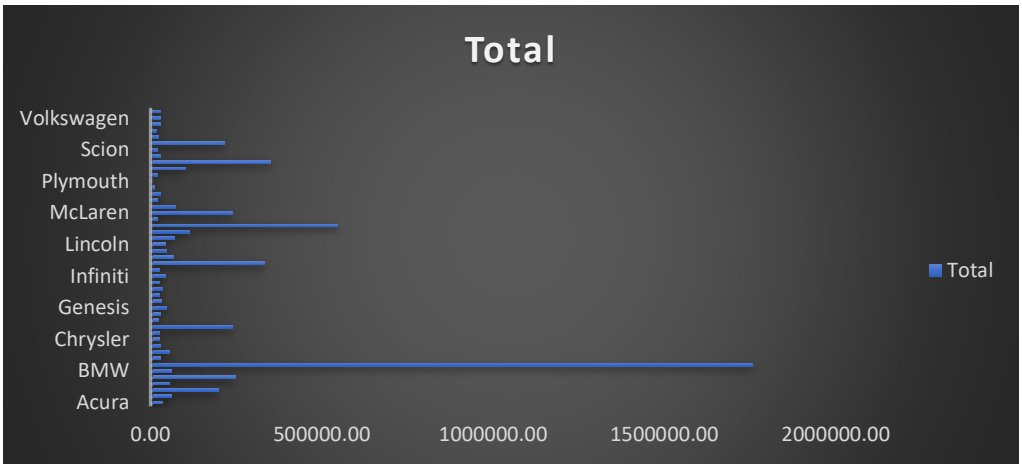


Insight Required: How does the average price of a car vary across different manufacturers?

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

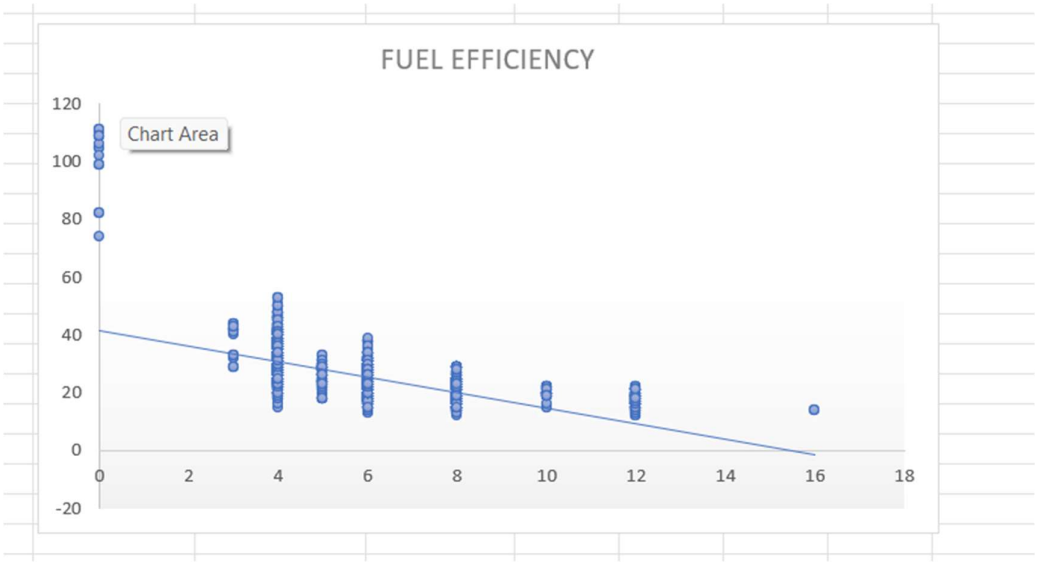
Row Labe	Average of MSRP
Acura	35087.43
Alfa Romeo	61600.00
Aston Martin	198123.46
Audi	54583.42
Bentley	247169.32
BMW	62162.56
Bugatti	1757223.67
Buick	29034.19
Cadillac	56368.27
Chevrolet	29056.01
Chrysler	26722.96
Dodge	24857.05
Ferrari	238218.84
FIAT	22206.02
Ford	28522.50
Genesis	46616.67
GMC	32444.09
Honda	26608.88
HUMMER	36464.41
Hyundai	24926.26
Infiniti	42640.27
Kia	25318.75
Lamborghini	331567.31
Land Rover	68067.09
Lexus	47549.07
Lincoln	43966.55
Lotus	68377.14
Maserati	113684.43
Maybach	546221.88
Mazda	20106.56
McLaren	239805.00
Mercedes-Ber	72069.53
Mitsubishi	21332.57
Nissan	28856.42
Oldsmobile	12843.80
Plymouth	3296.87
Pontiac	19800.04
Porsche	101622.40
Rolls-Royce	351130.65
Saab	27879.81
Scion	19932.50
Spyker	214990.00
Subaru	24240.67
Suzuki	18021.05
Toyota	28788.11
Volkswagen	28978.52

- **Task 4.B:** Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and 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.

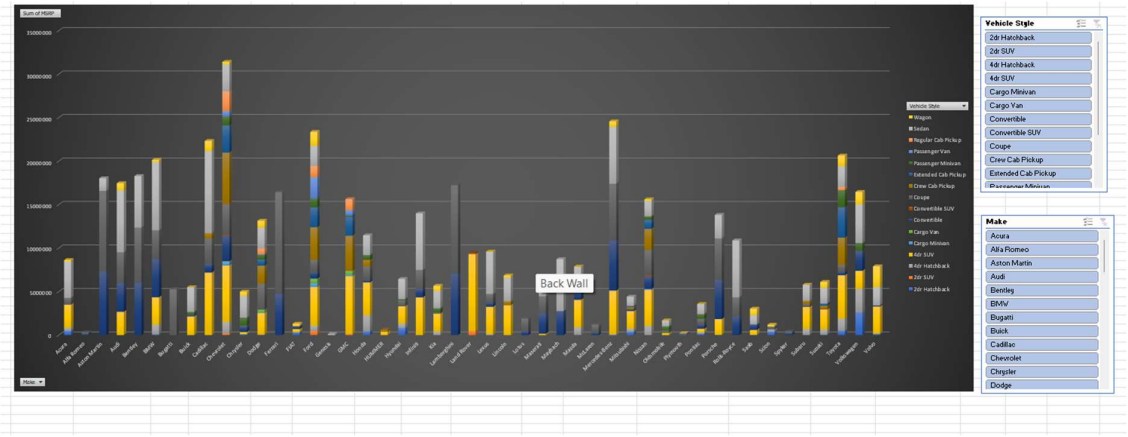
	Engine Cylinders	*highway MPG*
Engine Cylinders	1	
highway MPG	-0.663587792	1

Building the Dashboard:

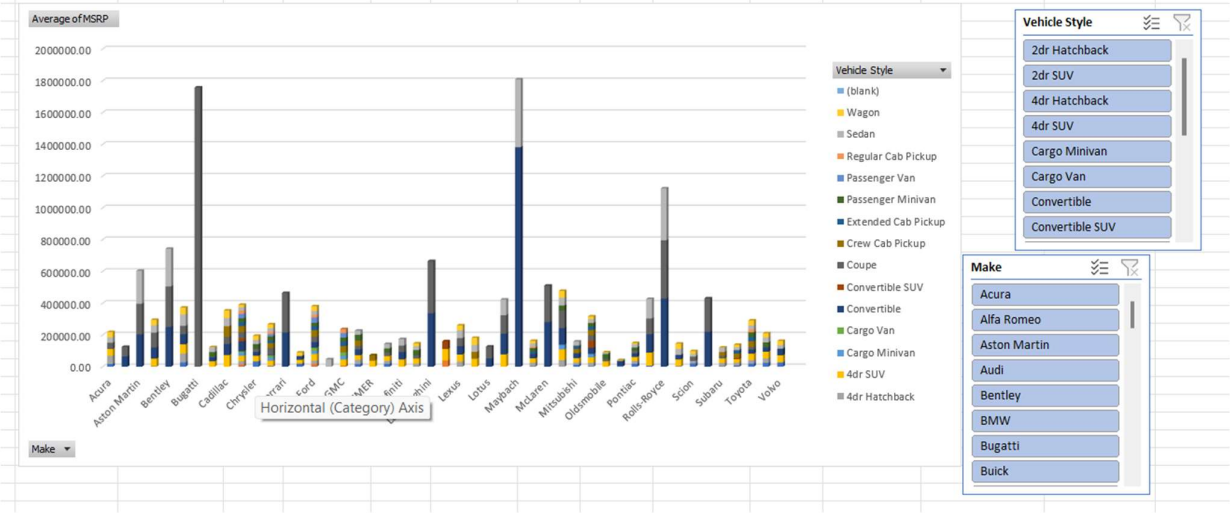
Now for the Next portion of the Project, you need to create the Interactive Dashboard.

Use filters and slicers to make the chart interactive. The client has requested these questions given below:

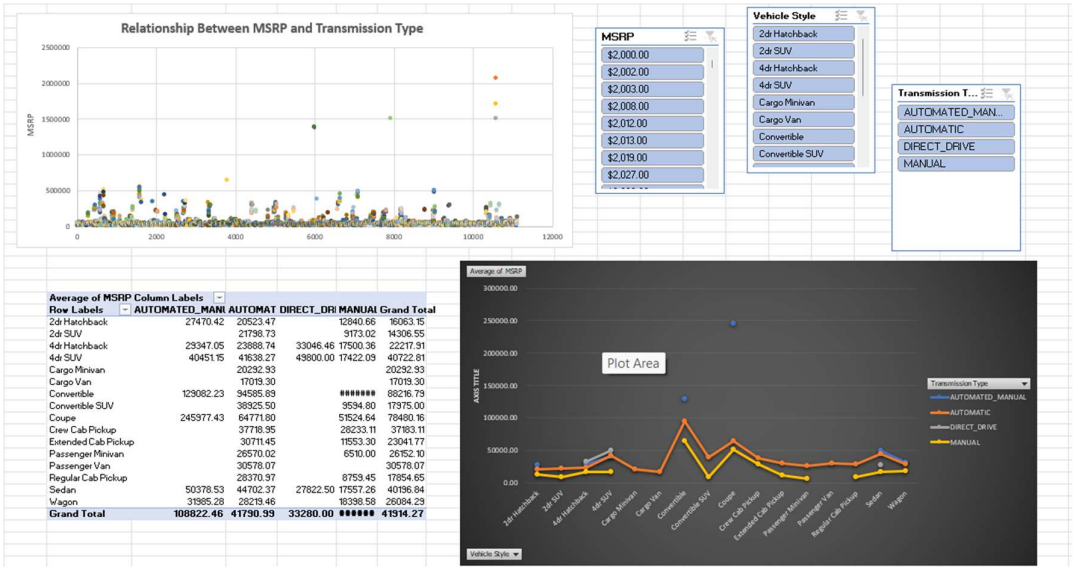
Task 1: How does the distribution of car prices vary by brand and body style?



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

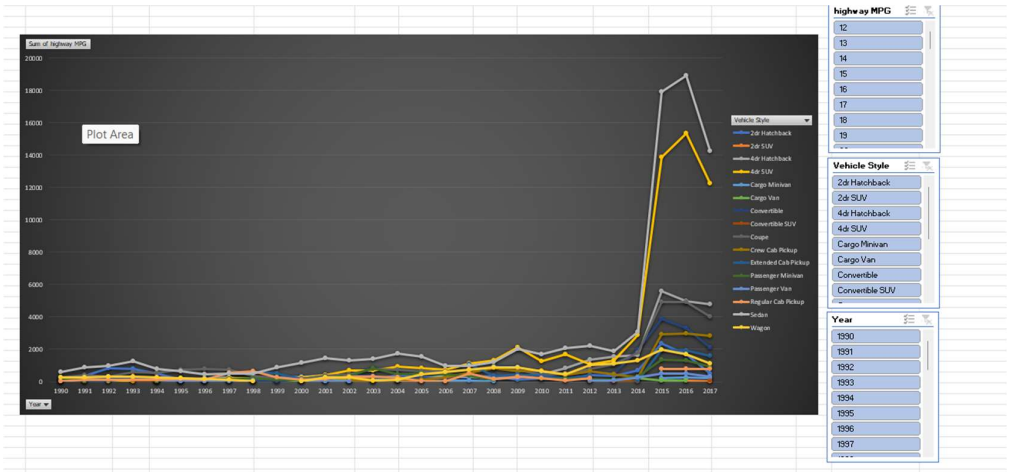


Task 3: How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?

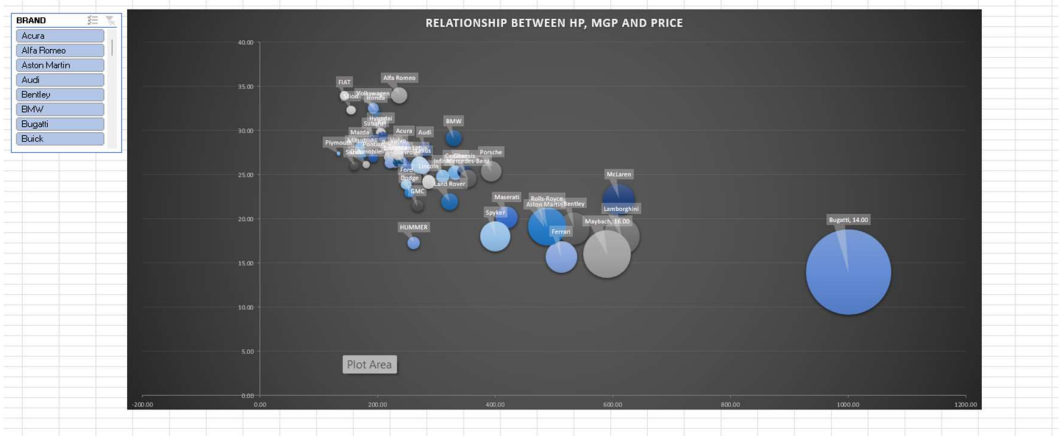


Average of MSRP Column Labels					
Row Labels	AUTOMATED_MANU	AUTOMAT	DIRECT_DRI	MANUAL	Grand Total
2dr Hatchback	27470.42	20523.47		12840.66	16063.15
2dr SUV		21798.73		9173.02	14306.55
4dr Hatchback	23347.05	23888.74	33046.46	17500.36	22217.91
4dr SUV	40451.15	41638.27	49800.00	17422.09	40722.81
Cargo Minivan		20292.93			20292.93
Cargo Van		17019.30			17019.30
Convertible	129082.23	94585.89		########	88216.79
Convertible SUV		38925.50		9594.80	17975.00
Coupe	245977.43	64771.80		51524.64	78480.16
Crew Cab Pickup		37718.95		28233.11	37183.11
Extended Cab Pickup		30711.45		11553.30	23041.77
Passenger Minivan		26570.02		6510.00	26152.10
Passenger Van		30578.07			30578.07
Regular Cab Pickup		28370.97		8753.45	17854.65
Sedan	50378.53	44702.37	27822.50	17557.26	40196.84
Wagon	31385.28	28219.46		18398.58	26084.29
Grand Total	108822.46	41790.99	33280.00	######	41914.27

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



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



THE FINAL DASHBOARD

THE EXCEL SHEET LINKS

https://docs.google.com/spreadsheets/d/1WqU96JakdjLLakIonuny4H_BNN9yIStR/edit?usp=sharing&ouid=102575990916861492148&rtpof=true&sd=true