IMPACT

OF

CAR FEATURES

PROJECT DESCRIPTION

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.

APPROACH

In this project, I used Excel and Power BI to visualize the data. After reading the data, I did some cleaning and replaced certain values. I chose Power BI and Excel because Power BI allows me to build attractive dashboards with a variety of charts to clearly see trends, patterns, and analysis. The modeling techniques I have used are pivot tables, Power Query, and data visualizations. However, I faced challenges with regression analysis as it is not familiar to me.

TECK STACK USED

I have used Excel and Power BI because Excel is a popular spreadsheet software widely used for data analysis, modeling, and visualization. Power BI is a business analytics service that provides interactive visualizations and business intelligence capabilities, and integrates with a wide range of data sources. It allows users to create customized dashboards and reports.

RESULTS AND INSIGHTS

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.

Ans 1.

Market Category	Count of Model	Sum of Popularity
Crossover	4433	7222094
Flex Fuel	855	1902985
Luxury	815	883633
Luxury,Performance	659	852128
Performance	503	725947
Hatchback	547	699675
Luxury,High-Performance	334	557118
Factory Tuner,Luxury,High-Performance	215	458674
High-Performance	198	361029
Crossover,Luxury	406	361021
Exotic,High-Performance	246	314004
Hybrid	121	256107
Hatchback,Performance	198	212585
Factory Tuner,High-Performance	104	204510
Crossover,Performance	69	178431
Crossover,Luxury,Performance	112	151098
Factory Tuner,Performance	81	147262

Market Category	Count of Model	Sum of Popularity
Diesel	84	145396
Flex Fuel,Performance	81	137891
Hatchback,Hybrid	64	135114
Crossover,Flex Fuel	64	132720
Crossover,Hatchback	72	120650
Diesel,Luxury	47	113557
Crossover,Hybrid	42	107662
Flex Fuel,Diesel	16	90512
Crossover,Luxury,Diesel	33	72463
Hatchback,Luxury	45	59541
Hatchback,Luxury,Performance	36	58761
Crossover,Factory Tuner,Luxury,High-Performance	26	47410
Hatchback,Factory Tuner,Performance	21	45648
Factory Tuner,Luxury,Performance	31	43816
Hatchback,Flex Fuel	7	39599
Flex Fuel,Luxury,Performance	28	38642
Exotic,Luxury,High-Performance	77	36423
Luxury,Hybrid	48	34785

Market Category	Count of Model	Sum of Popularity
Crossover,Flex Fuel,Performance	6	33942
Flex Fuel,Luxury	39	29115
Flex Fuel,Luxury,High-Performance	32	28746
Exotic,Factory Tuner,Luxury,High-Performance	51	26674
Luxury,Performance,Hybrid	11	25665
Exotic,Factory Tuner,High-Performance	21	21974
Hatchback,Factory Tuner,High-Performance	13	15667
Crossover,Luxury,Hybrid	24	15142
Crossover,Factory Tuner,Luxury,Performance	5	13037
Hatchback,Diesel	14	12222
Crossover,Hatchback,Factory Tuner,Performance	6	12054
Crossover,Hatchback,Performance	6	12054
Crossover,Flex Fuel,Luxury	10	11732
Crossover,Flex Fuel,Luxury,Performance	6	9744
Crossover,Luxury,High-Performance	9	9335
Hatchback,Factory Tuner,Luxury,Performance	9	7982
Crossover,Luxury,Performance,Hybrid	2	7832

| Market Category	Count of Model	Sum of Popularity
Crossover,Luxury,Performance,Hybrid	2	7832
Exotic,Luxury,Performance	36	7813
Luxury,High-Performance,Hybrid	12	6826
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Performance	13	6760
Crossover,Diesel	7	6111
Exotic,Flex Fuel,Luxury,High-Performance	11	5720
Exotic,Factory Tuner,Luxury,Performance	3	1560
Crossover,Hatchback,Luxury	7	1428
Hatchback,Luxury,Hybrid	3	1362
Exotic,Luxury	12	1352
Factory Tuner,Luxury	2	1234
Crossover,Factory Tuner,Performance	4	840
Flex Fuel,Hybrid	2	310
Flex Fuel,Performance,Hybrid	2	310
Flex Fuel,Factory Tuner,Luxury,High-Performance	1	258
Crossover,Exotic,Luxury,High-Performance	1	238
Crossover,Exotic,Luxury,Performance	1	238
Exotic,Luxury,High-Performance,Hybrid	1	204
Performance,Hybrid	1	155
Total	11101	17284527

The crossover market category has the highest popularity among customers.

Task 1.B: Create a stacked column chart that visualizes the relationship between market category and popularity.

Market Category v/s Popularity

Market Category v/s 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.

Ans 2.
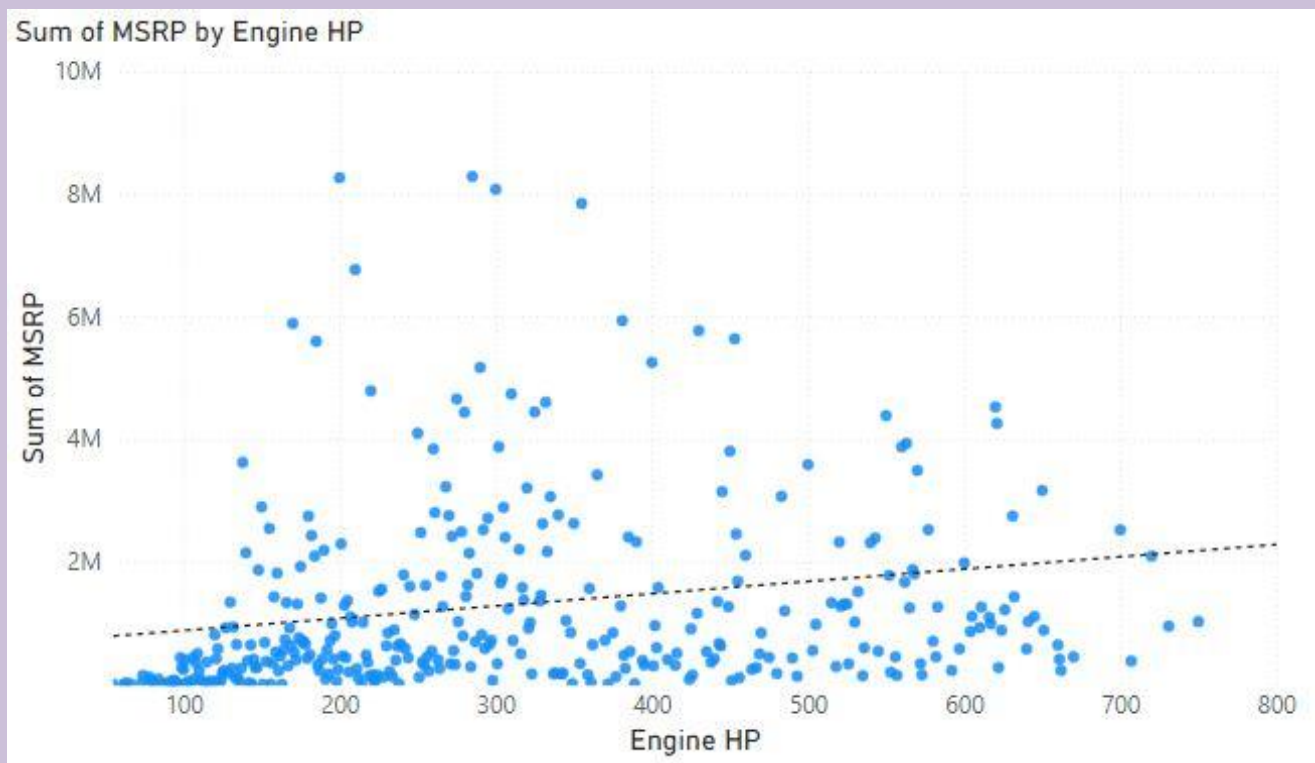
- There is a direct relationship between a car's engine power and its price, where the price increases as the engine power increases.

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.

Ans 3.
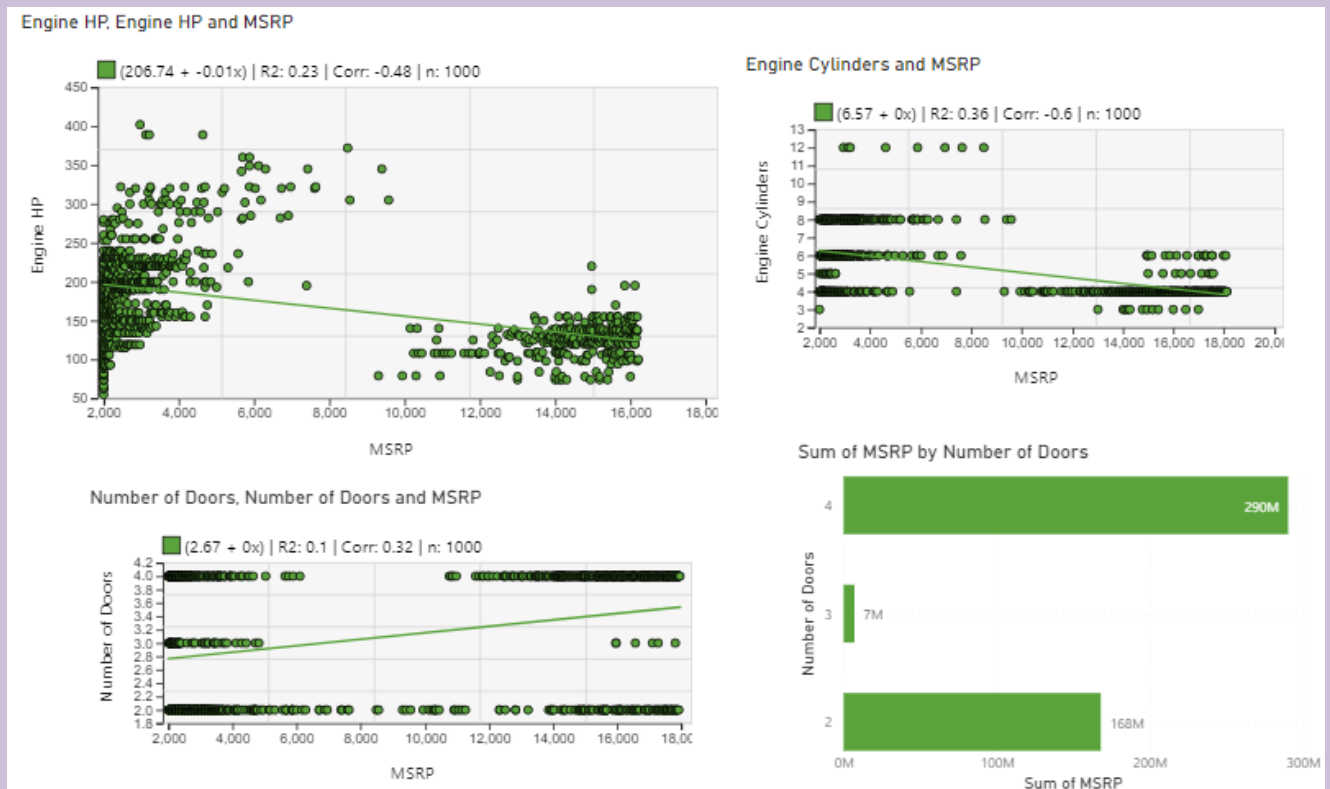
🍂 As we have to perform regression analysis with the dependent variable 'price', we cannot perform regression analysis on categorical values. Therefore, we performed regression analysis based on numerical values, and found that the number of doors has the strongest relationship with price. We plotted a bar graph of number of doors vs price, and found that it is a car feature that we can include to make the car more appealing.

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.

Ans 4.

Make	Average of MSRP
Acura	35087.49
Alfa Romeo	61600.00
Aston Martin	198123.46
Audi	54574.12
Bentley	247169.32
BMW	62162.56
Bugatti	1757223.67
Buick	29034.19
Cadillac	56368.27
Chevrolet	29000.22
Chrysler	26722.96
Dodge	24857.05
Ferrari	238218.84
FIAT	22206.02
Ford	28522.86
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

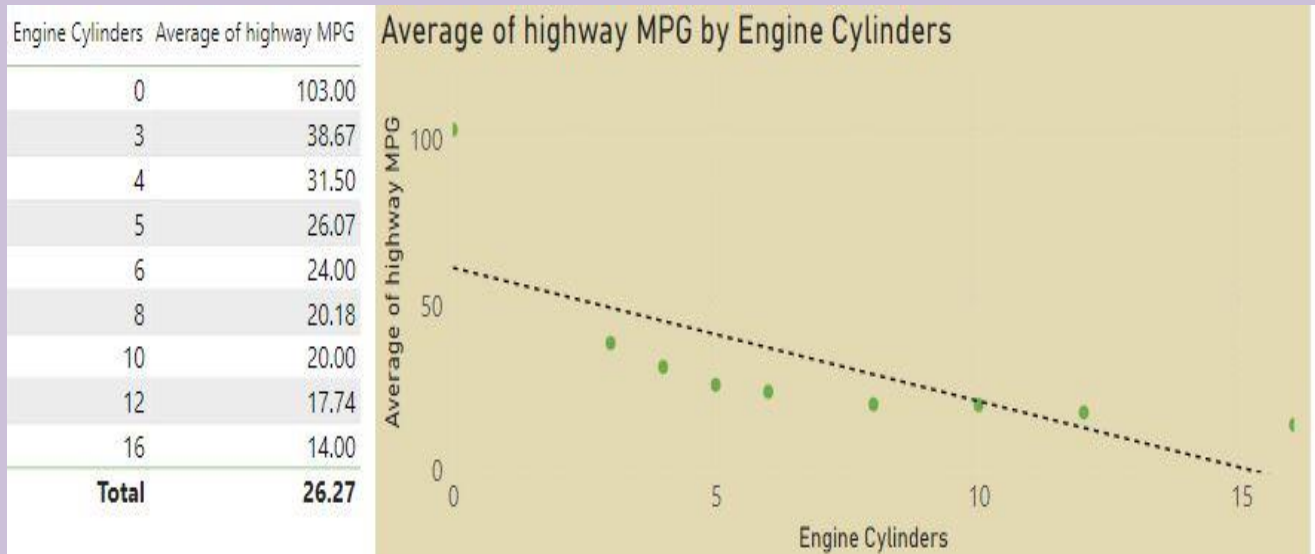| Make	Average of MSRP
Land Rover	68067.09
Lexus	47549.07
Lincoln	43560.01
Lotus	68377.14
Maserati	113684.49
Maybach	546221.88
Mazda	20106.56
McLaren	239805.00
Mercedes-Benz	72135.03
Mitsubishi	21316.35
Nissan	28856.42
Oldsmobile	12843.80
Plymouth	3296.87
Pontiac	19800.04
Porsche	101622.40
Rolls-Royce	351130.65
Saab	27879.81
Scion	19932.50
Spyker	214990.00
Subaru	24240.67
Suzuki	18026.42
Toyota	28758.77
Volkswagen	28947.37
Volvo	29724.68
Total	**41917.63**

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


Average of MSRP by Make
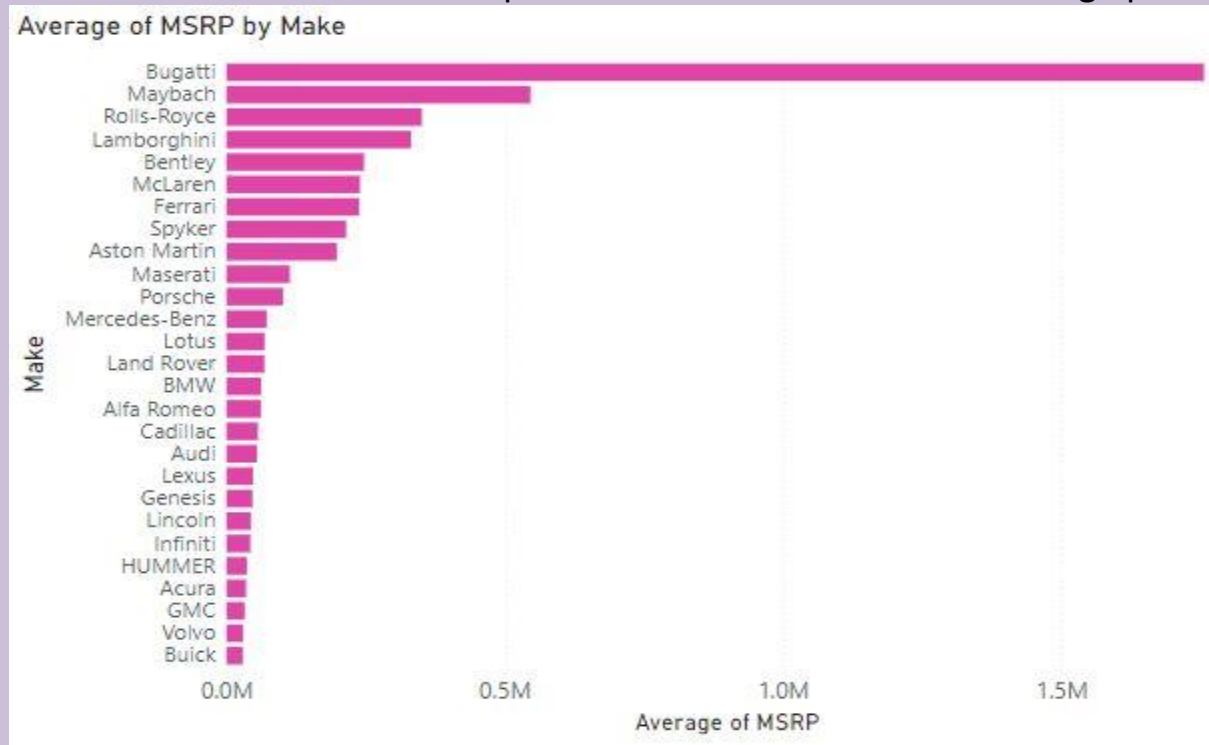
Insight Required: What is the relationship between fuel efficiency and the number of cylinders in a car's engine?

- **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.

Ans 5.

Engine Cylinders	Average of highway MPG
0	103.00
3	38.67
4	31.50
5	26.07
6	24.00
8	20.18
10	20.00
12	17.74
16	14.00
Total	**26.27**

Average of highway MPG by Engine Cylinders

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

Measure: −0.61 (−1.23 to 0.00)
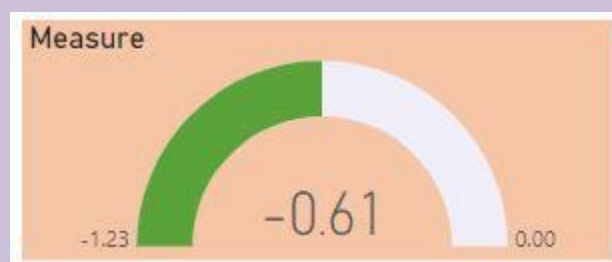
- We can see that there is an indirect relationship between these two variables. As the number of cylinders increases, the highway miles per gallon decreases. This means that as fuel efficiency increases, the number of cylinders decreases.
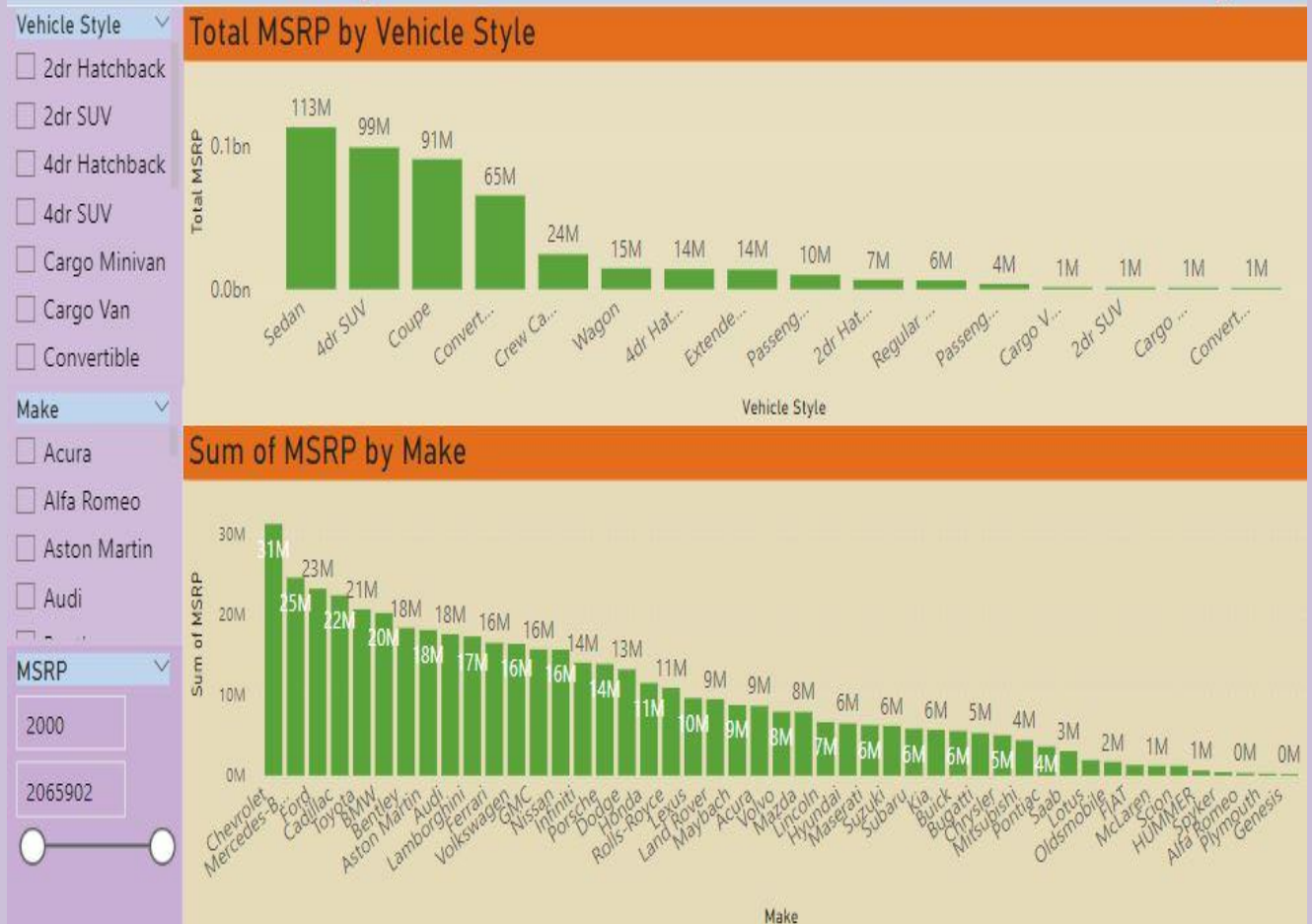
DASHBOARD TASK

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

Hints: Stacked column chart to show the distribution of car prices by brand and body style. Use filters and slicers to make the chart interactive. Calculate the total MSRP for each brand and body style using SUMIF or Pivot Tables.

Ans 1.

Make	Sum of MSRP
Chevrolet	31175238
Mercedes-Benz	24525909
Ford	23160564
Cadillac	22321833
Toyota	20591277
BMW	20140669
Bentley	18290530
Aston Martin	18029235
Audi	17518293
Lamborghini	17241500
Ferrari	16437100
Volkswagen	16326316
GMC	15638049
Nissan	15611325
Infiniti	13986009
Porsche	13820646
Dodge	13149377
Honda	11468429
Rolls-Royce	10885050
Lexus	9604912
Land Rover	9461325
Total	**465327614**

Vehicle Style	Sum of MSRP
Sedan	112867148
4dr SUV	98826386
Coupe	90644584
Convertible	65368643
Crew Cab Pickup	24354938
Wagon	14528950
4dr Hatchback	14097183
Extended Cab Pickup	13755938
Passenger Minivan	10042408
2dr Hatchback	6569829
Regular Cab Pickup	6159854
Passenger Van	3699946
Cargo Van	1429621
2dr SUV	1301896
Cargo Minivan	1176990
Convertible SUV	503300
Total	**465327614**

Total Price by Manufacturer And Vehicle Style

Total MSRP by Vehicle Style

Sum of MSRP by Make

Vehicle Style slicer options: 2dr Hatchback, 2dr SUV, 4dr Hatchback, 4dr SUV, Cargo Minivan, Cargo Van, Convertible

Make slicer options: Acura, Alfa Romeo, Aston Martin, Audi

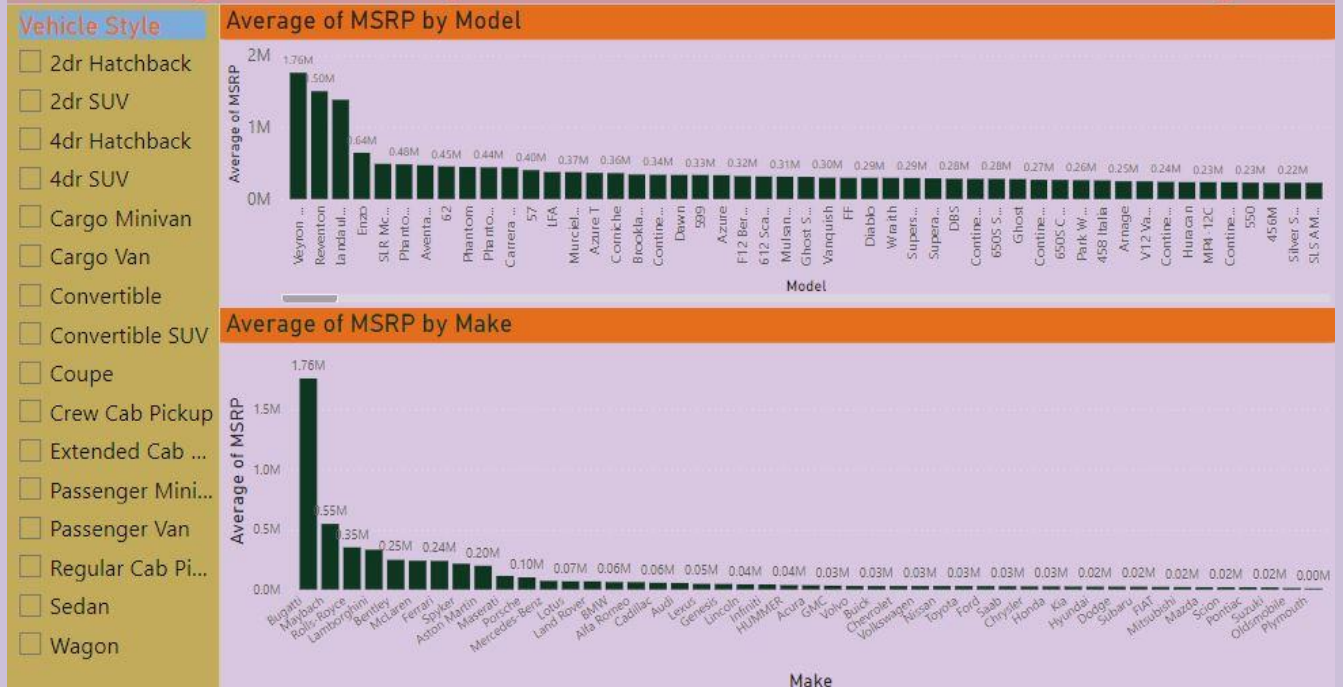MSRP slicer: 2000 to 2065902

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

- **Hints:** Clustered column chart to compare the average MSRPs across different car brands and body styles. Calculate the average MSRP for each brand and body style using AVERAGEIF or Pivot Tables
- **<u>Ans 2.</u>**

Make	Average of MSRP
Bugatti	1757223.67
Maybach	546221.88
Rolls-Royce	351130.65
Lamborghini	331567.31
Bentley	247169.32
McLaren	239805.00
Ferrari	238218.84
Spyker	214990.00
Aston Martin	198123.46
Maserati	113684.49
Porsche	101622.40
Mercedes-Benz	72135.03
Lotus	68377.14
Land Rover	68067.09
BMW	62162.56
Alfa Romeo	61600.00
Cadillac	56368.27
Audi	54574.12
Lexus	47549.07
Genesis	46616.67
Lincoln	43560.01
Total	**41917.63**

Vehicle Style	Average of MSRP
2dr Hatchback	16063.15
2dr SUV	14306.55
4dr Hatchback	22061.32
4dr SUV	40736.35
Cargo Minivan	20292.93
Cargo Van	17019.30
Convertible	88216.79
Convertible SUV	17975.00
Coupe	78480.16
Crew Cab Pickup	37183.11
Extended Cab Pickup	23041.77
Passenger Minivan	26152.10
Passenger Van	30578.07
Regular Cab Pickup	17854.65
Sedan	40151.96
Wagon	26084.29
Total	**41917.63**

Average Price by Manufacturer And Model Style

Vehicle Style

- [ ] 2dr Hatchback
- [ ] 2dr SUV
- [ ] 4dr Hatchback
- [ ] 4dr SUV
- [ ] Cargo Minivan
- [ ] Cargo Van
- [ ] Convertible
- [ ] Convertible SUV
- [ ] Coupe
- [ ] Crew Cab Pickup
- [ ] Extended Cab ...
- [ ] Passenger Mini...
- [ ] Passenger Van
- [ ] Regular Cab Pi...
- [ ] Sedan
- [ ] Wagon

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

- **Hints:** Scatter plot chart to visualize the relationship between MSRP and transmission type, with different symbols for each body style. Calculate the average MSRP for each combination of transmission type and body style using AVERAGEIFS or Pivot Tables.

Ans 3.

Vehicle Style	Average of MSRP
2dr Hatchback	16063.15
2dr SUV	14306.55
4dr Hatchback	22061.32
4dr SUV	40736.35
Cargo Minivan	20292.93
Cargo Van	17019.30
Convertible	88216.79
Convertible SUV	17975.00
Coupe	78480.16
Crew Cab Pickup	37183.11
Extended Cab Pickup	23041.77
Passenger Minivan	26152.10
Passenger Van	30578.07
Regular Cab Pickup	17854.65
Sedan	40151.96
Wagon	26084.29
Total	**41917.63**
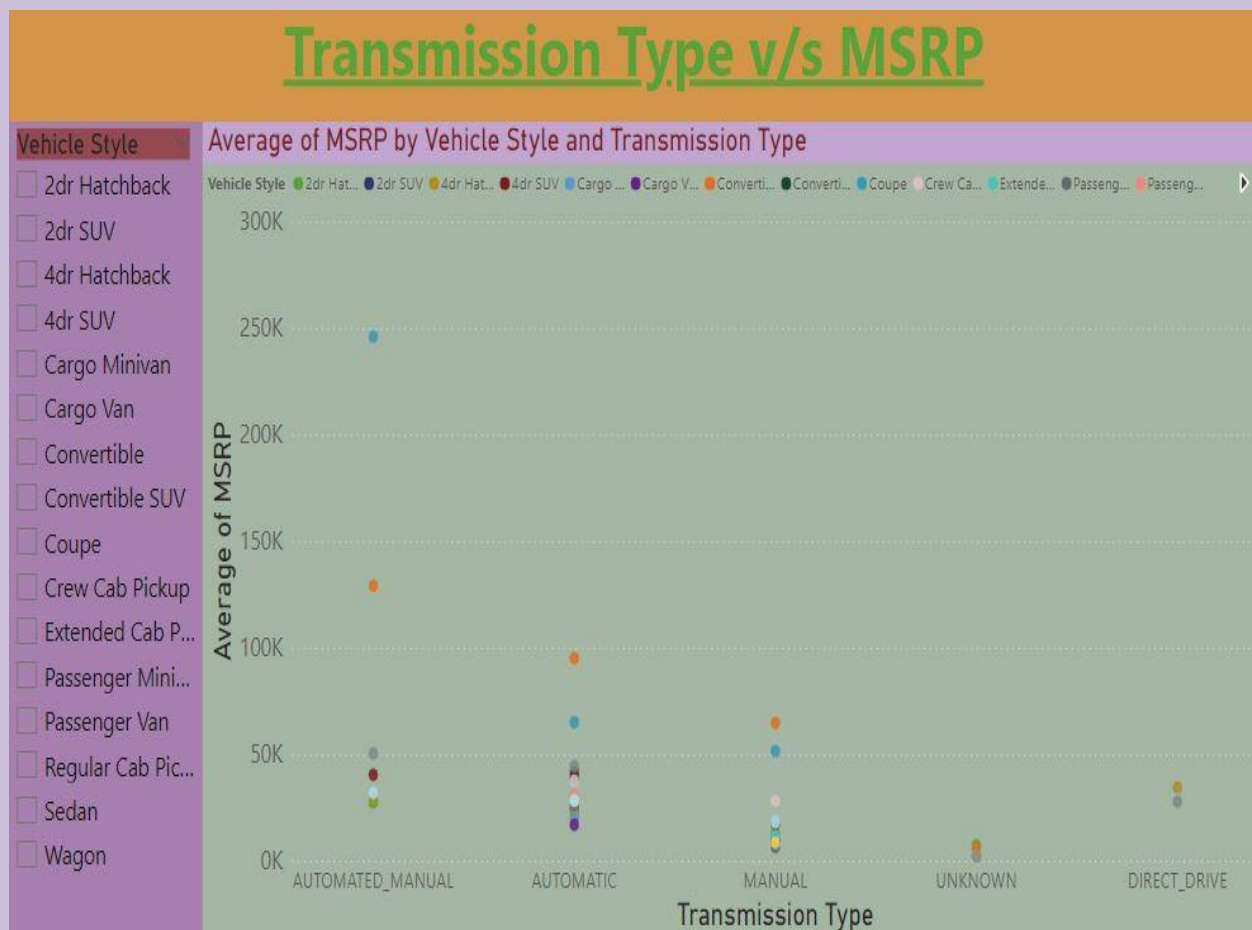
Transmission Type	Average of MSRP
AUTOMATED_MANUAL	108718.99
AUTOMATIC	41838.51
DIRECT_DRIVE	33620.00
MANUAL	28284.52
UNKNOWN	3647.83
Total	**41917.63**

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

Hints: Line chart to show the trend of fuel efficiency (MPG) over time for each body style. Calculate the average MPG for each combination of body style and model year using AVERAGEIFS or Pivot Tables.
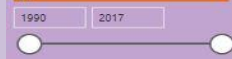
Ans 4.

Year	Average of MSRP
1990	2032.27
1991	2119.03
1992	2108.35
1993	2211.50
1994	2349.33
1995	2647.21
1996	2566.57
1997	3164.64
1998	3036.15
1999	3153.85
2000	3197.10
2001	41500.67
2002	33744.16
2003	39774.06
2004	36107.34
2005	37029.95
2006	32074.85
2007	35278.40
2008	56753.84
2009	50821.57
Total	**41917.63**

Vehicle Style	Average of MSRP
Wagon	26084.29
Sedan	40151.96
Regular Cab Pickup	17854.65
Passenger Van	30578.07
Passenger Minivan	26152.10
Extended Cab Pickup	23041.77
Crew Cab Pickup	37183.11
Coupe	78480.16
Convertible SUV	17975.00
Convertible	88216.79
Cargo Van	17019.30
Cargo Minivan	20292.93
4dr SUV	40736.35
4dr Hatchback	22061.32
2dr SUV	14306.55
2dr Hatchback	16063.15
Total	**41917.63**

Fuel Efficiency v/s Year

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

Hints: Bubble chart to visualize the relationship between horsepower, MPG, and price across different car brands. Assign different colors to each brand and label the bubbles with the car model name. Calculate the average horsepower, MPG, and MSRP for each car brand using AVERAGEIFS or Pivot Tables.

Relationship Between Horsepower, MPG And Price
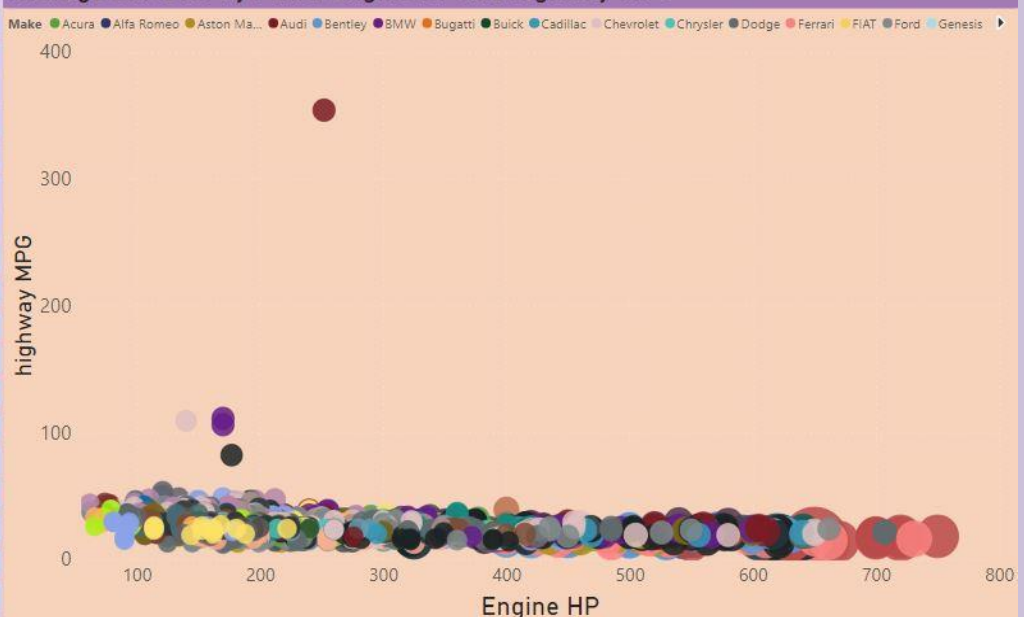
Make	Average of highway MPG		Make	Average of Engine HP		Make	Average of MSRP
Alfa Romeo	34.00		Acura	244.96		Bugatti	1757223.67
FIAT	33.92		Alfa Romeo	237.00		Maybach	546221.88
Scion	32.30		Aston Martin	483.76		Rolls-Royce	351130.65
Honda	32.06		Audi	280.00		Lamborghini	331567.31
Volkswagen	32.02		Bentley	533.85		Bentley	247169.32
Hyundai	29.77		BMW	329.62		McLaren	239805.00
Kia	29.32		Bugatti	1001.00		Ferrari	238218.84
Subaru	29.21		Buick	220.01		Spyker	214990.00
BMW	29.13		Cadillac	332.80		Aston Martin	198123.46
Audi	28.93		Chevrolet	249.58		Maserati	113684.49
Acura	28.22		Chrysler	229.14		Porsche	101622.40
Mazda	28.22		Dodge	254.35		Mercedes-Benz	72135.03
Plymouth	27.41		Ferrari	511.96		Lotus	68377.14
Volvo	27.26		FIAT	143.56		Land Rover	68067.09
Buick	27.01		Ford	249.69		BMW	62162.56
Pontiac	26.96		Genesis	347.33		Alfa Romeo	61600.00
Mitsubishi	26.59		GMC	267.65		Cadillac	56368.27
Toyota	26.43		Honda	196.77		Audi	54574.12
Nissan	26.42		HUMMER	261.24		Lexus	47549.07
Saab	26.38		Hyundai	205.20		Genesis	46616.67
Chrysler	26.37		Infiniti	310.68		Lincoln	43560.01
Total	**26.27**		**Total**	**253.54**		**Total**	**41917.63**

DASHBOARD

OPTIMIZATION OF CAR COST
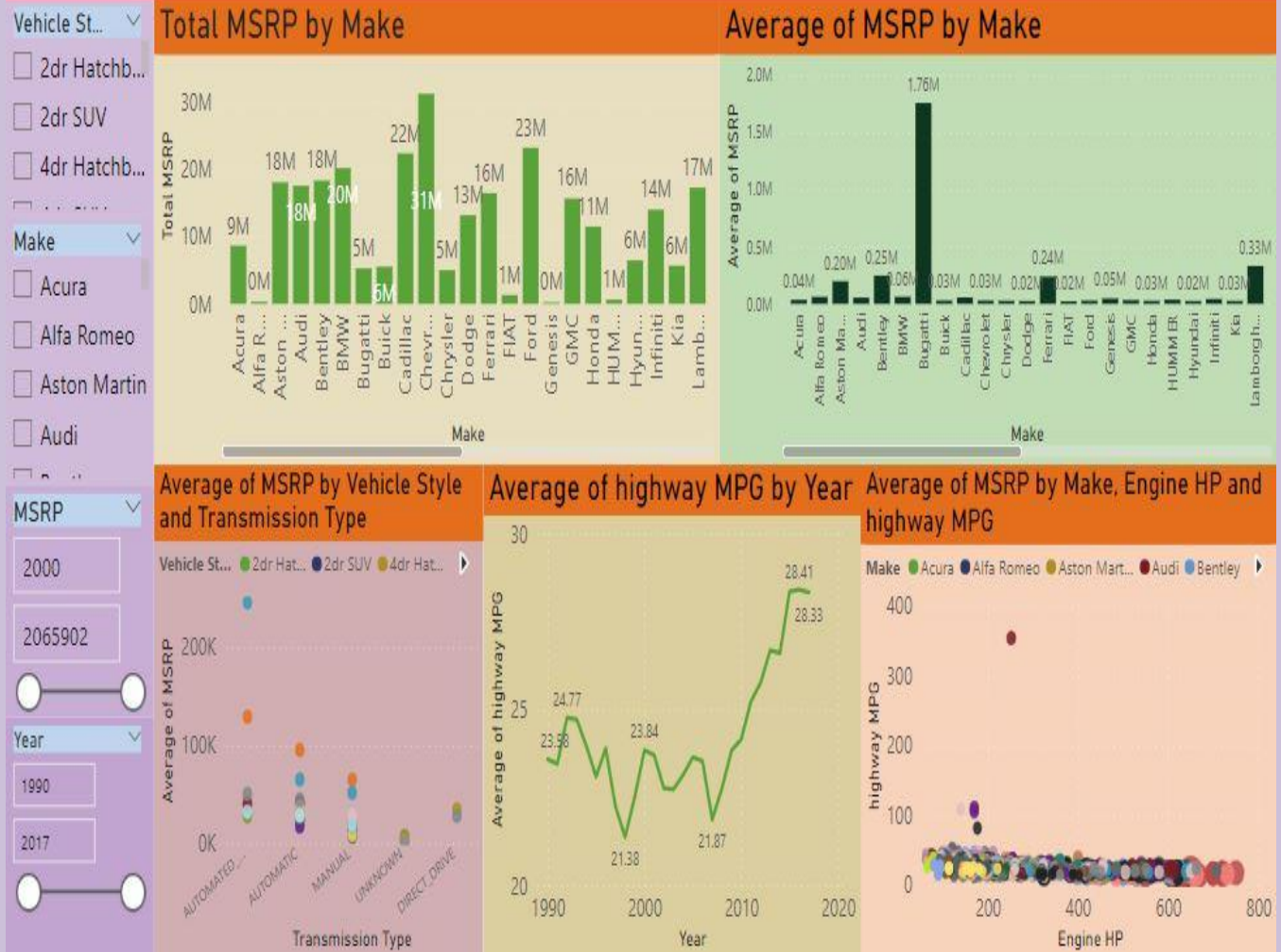
INSIGHTS

• In the crossover market category, a high number of models are built, which means people are liking the crossover category more.

• The F150 model has high popularity amongst customers.

• The Ford manufacturing company has high popularity amongst customers.

• Fewer engine cylinders give more highway MPG, which can attract customers to buy the car.

• Sedan, 4-door SUV, and coupe vehicle styles have high popularity and high MRP, which we can use to make the car profitable.

• Direct drive and automatic manual transmissions are loved by customers and can be priced high. From insights, we can see that people are continuously buying them despite their high price, which can be used to make our cars profitable.

• New models have high MPG due to modifications and improvements made based on customer feedback.

• Sedans and hatchbacks give higher average MPG.

• Engines with 200,250 HP have high popularity, which can help reduce the cost of the car.

• The number of doors has the strongest relationship with the price.

　➕ By utilizing the insights and dashboard provided, we can make data-driven decisions to optimize the cost and profitability of our cars, as well as establish our position in the car market. This will help us create more appealing and competitive models that attract customers and increase sales.

RESULTS

- Based on the analysis, it appears that the Ford company's sedan style vehicles with automatic or manual transmissions and an engine horsepower of 250 are more popular among customers, indicating that more people are buying them at a higher rate.
- By emulating Ford's approach, we can create a car with similar features.
- In the future, as people appreciate vehicles that provide high fuel efficiency at a low cost, electric cars with high mileage and fewer cylinders may be more popular.
- We cannot perform regression analysis on categorical values when the dependent variable is a numerical value such as price.

PROJECT LINK

https://drive.google.com/file/d/1JF2ruS7hPwHrJCwGo0jFGQNpgxel1UuV/view?usp=share_link

THANK YOU