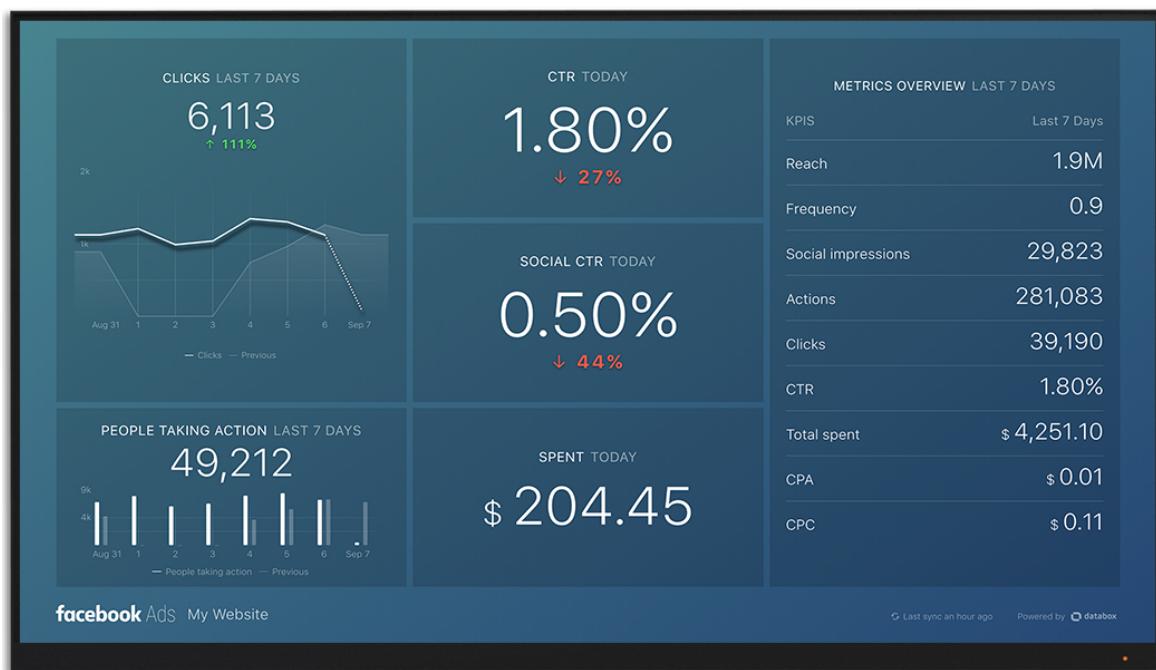


Impact of Car Features on Price & Profitability

Trainity Final Project 3

By Mishree Bagdai



Project Description –

- Overview:

The automotive industry is undergoing significant changes with the rise of fuel efficiency, environmental concerns, and technological advancements. To stay competitive and maximize profitability, car manufacturers need to understand consumer demand and make informed pricing and product development decisions. This project aims to analyse a comprehensive dataset of car models, their specifications, and pricing information to provide insights and recommendations for optimizing pricing strategies and product development efforts.

- Business Problem:

The main objective of this project is to assist a car manufacturer in optimizing pricing and product development decisions. The manufacturer wants to identify the factors that drive consumer demand for cars and determine how to set prices and develop products that maximize profitability while meeting consumer expectations.

- Data Sources:

The project utilizes a dataset containing information on over 11,000 car models, including their make, model, year, fuel type, engine power, transmission, market category, size, style, estimated miles per gallon, popularity, and manufacturer's suggested retail price (MSRP). The dataset is obtained from reliable sources such as automotive industry databases and market research reports.

- Data Cleaning and Pre-processing:

Before analysing the dataset, thorough data cleaning and pre-processing are performed to ensure the accuracy and reliability of the results. This includes handling missing data, removing duplicates, standardizing variable formats, and addressing any inconsistencies. The cleaned dataset is then used for further analysis.

- Assumptions:

During the project, certain assumptions were made based on available data and industry knowledge. These assumptions include considering MSRP as the indicative price for analysis, assuming linear relationships between variables in regression analysis, and assuming the dataset is representative of the broader automotive market.

Tech-Stack used –

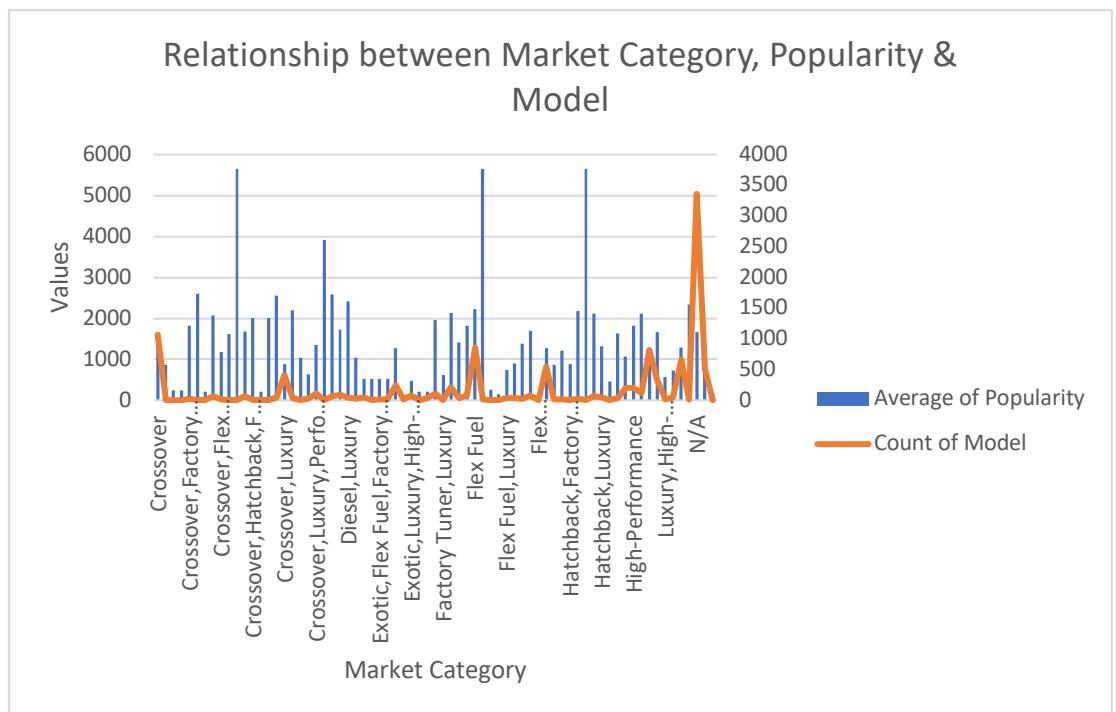
For the following project I have used Excel 2019 to analyse the dataset and create the required charts. Along with that I have also used Tableau to create an interactive dashboard for the same dataset.

Results & Insights –

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

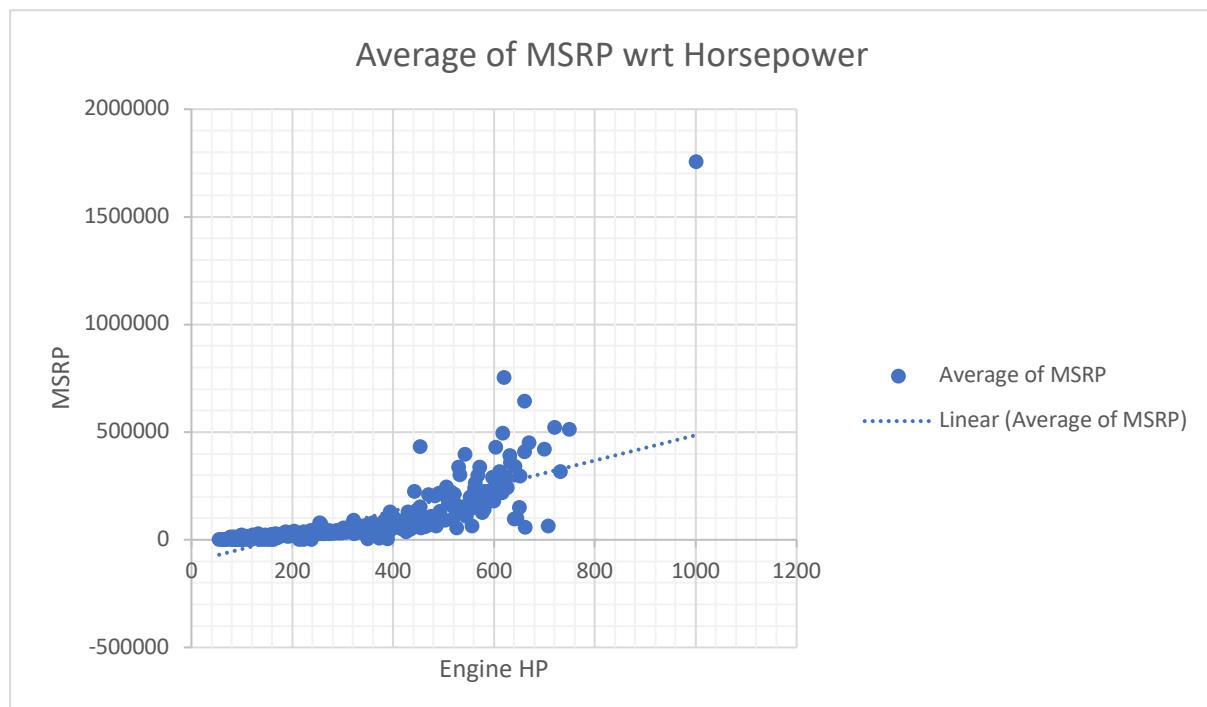
- **Task 1.A: Create a pivot table that shows the number of car models in each market category and their corresponding popularity scores.**
- **Task 1.B: Create a combo chart that visualizes the relationship between market category and popularity.**

Row Labels	Average of Popularity	Count of Model
Crossover	1539.475655	1068
Crossover,Diesel	873	7
Crossover,Exotic,Luxury,High-Performance	238	1
Crossover,Exotic,Luxury,Performance	238	1
Crossover,Factory Tuner,Luxury,High-Performance	1823.461538	26
Crossover,Factory Tuner,Luxury,Performance	2607.4	5
Crossover,Factory Tuner,Performance	210	4
Crossover,Flex Fuel	2073.75	64
Crossover,Flex Fuel,Luxury	1173.2	10
Crossover,Flex Fuel,Luxury,Performance	1624	6
Crossover,Flex Fuel,Performance	5657	6
Crossover,Hatchback	1675.694444	72
Crossover,Hatchback,Factory Tuner,Performance	2009	6
Crossover,Hatchback,Luxury	204	7
Crossover,Hatchback,Performance	2009	6



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

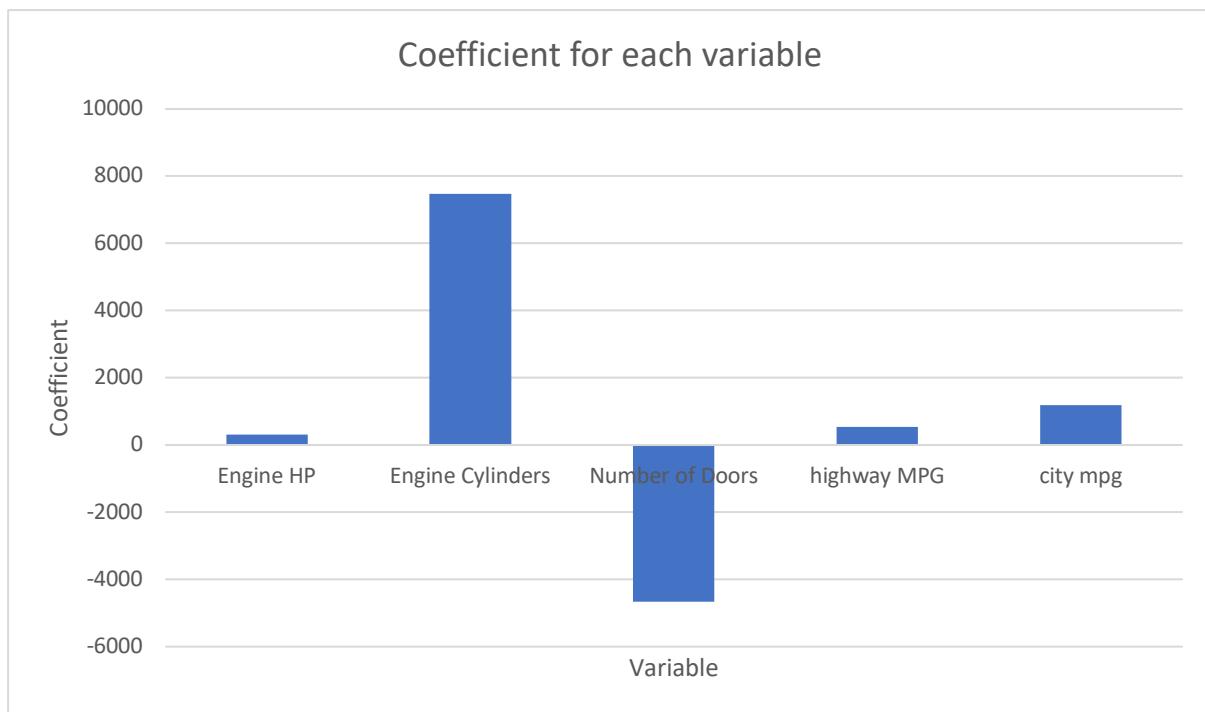
- **Task 2:** Create a scatter chart that plots engine power on the x-axis and price on the y-axis. Add a trendline to the chart to visualize the relationship between these variables.



Insights – we can infer from the graph that there is a positive correlation between the engine HP and the MSRP; i.e. for a greater Horse Power the MSRP tends to increase.

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.

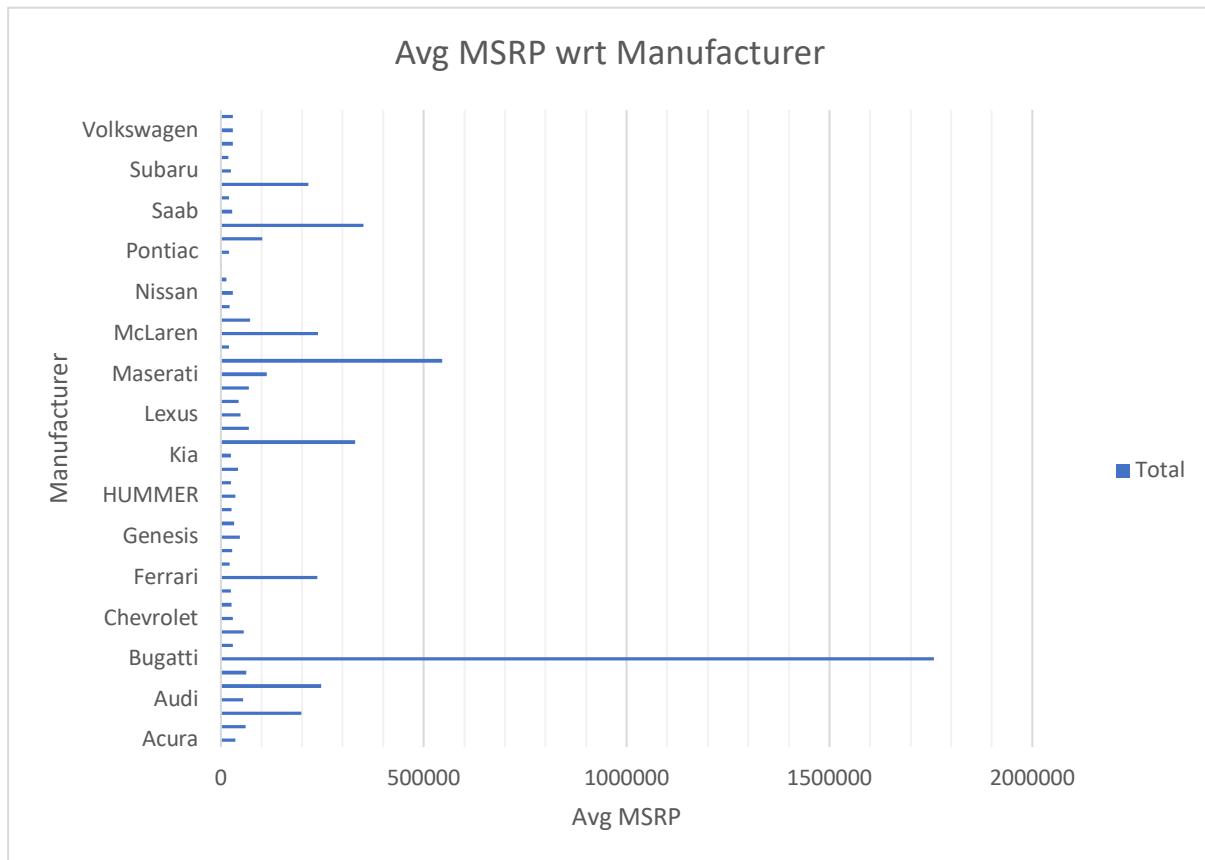
SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.67834746							
R Square	0.46015527							
Adjusted R S	0.4599119							
Standard Err	45366.2598							
Observations	11097							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	5	1.9457E+13	3.8914E+12	1890.75929	0			
Residual	11091	2.2826E+13	2058097531					
Total	11096	4.2283E+13						
	Coefficients	standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-102834.75	3893.78216	-26.409991	4.046E-149	-110467.26	-95202.247	-110467.26	-95202.247
Engine HP	319.460723	6.41750878	49.7795537	0	306.881264	332.040182	306.881264	332.040182
Engine Cylind	7483.3257	464.130016	16.1233392	7.9289E-58	6573.5483	8393.1031	6573.5483	8393.1031
Number of D	-4654.187	498.813035	-9.330524	1.2535E-20	-5631.9493	-3676.4247	-5631.9493	-3676.4247
highway MPG	540.55806	109.929584	4.91731199	8.8998E-07	325.076519	756.039601	325.076519	756.039601
city mpg	1193.47926	126.362772	9.44486448	4.2707E-21	945.785746	1441.17277	945.785746	1441.17277



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

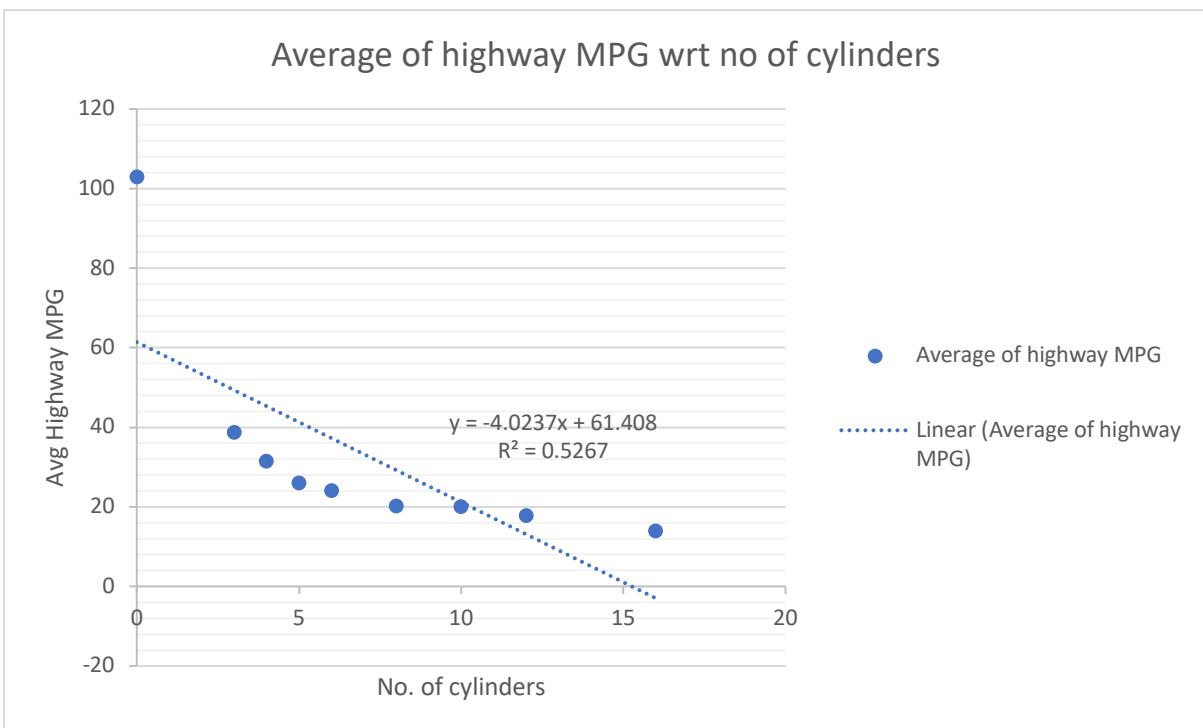
Task 4.B: Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.

Row Labels	Average of MSRP
Acura	35087.4878
Alfa Romeo	61600
Aston Martin	198123.4615
Audi	54574.1215
Bentley	247169.3243
BMW	62162.55864
Bugatti	1757223.667
Buick	29034.18947
Cadillac	56368.26515
Chevrolet	29000.2214
Chrysler	26722.96257
Dodge	24857.04537
Ferrari	237383.8235
FIAT	22206.01695
Ford	28522.86207
Genesis	46616.66667
GMC	32444.08506
Honda	26608.88399
HUMMER	36464.41176
Hyundai	24926.26255
Infiniti	42640.27134
Kia	25318.75
Lamborghini	331567.3077
Land Rover	68067.08633
Lexus	47549.06931
Lincoln	43560.01316
Lotus	68377.14286
Maserati	113684.4909
Maybach	546221.875
Mazda	20106.55612



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.

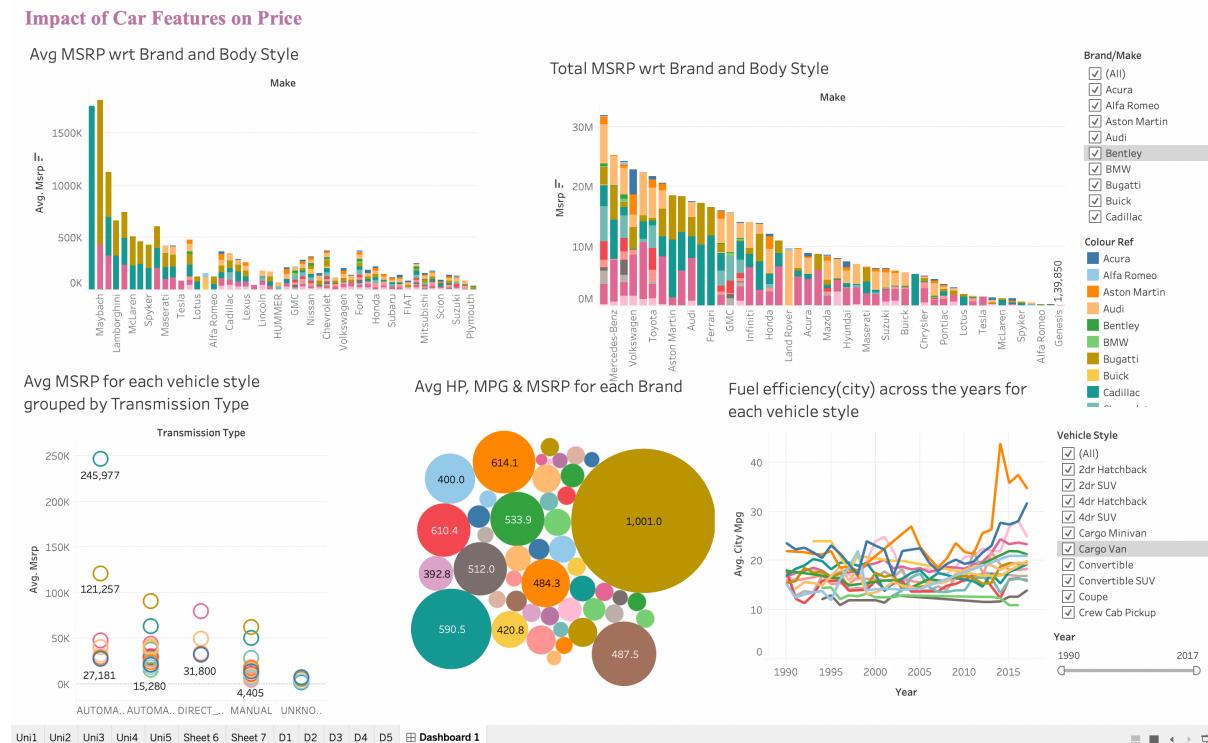


	Row Labels	Average of highway MPG
Row Labels	1	
Average of h	-0.725773653	1

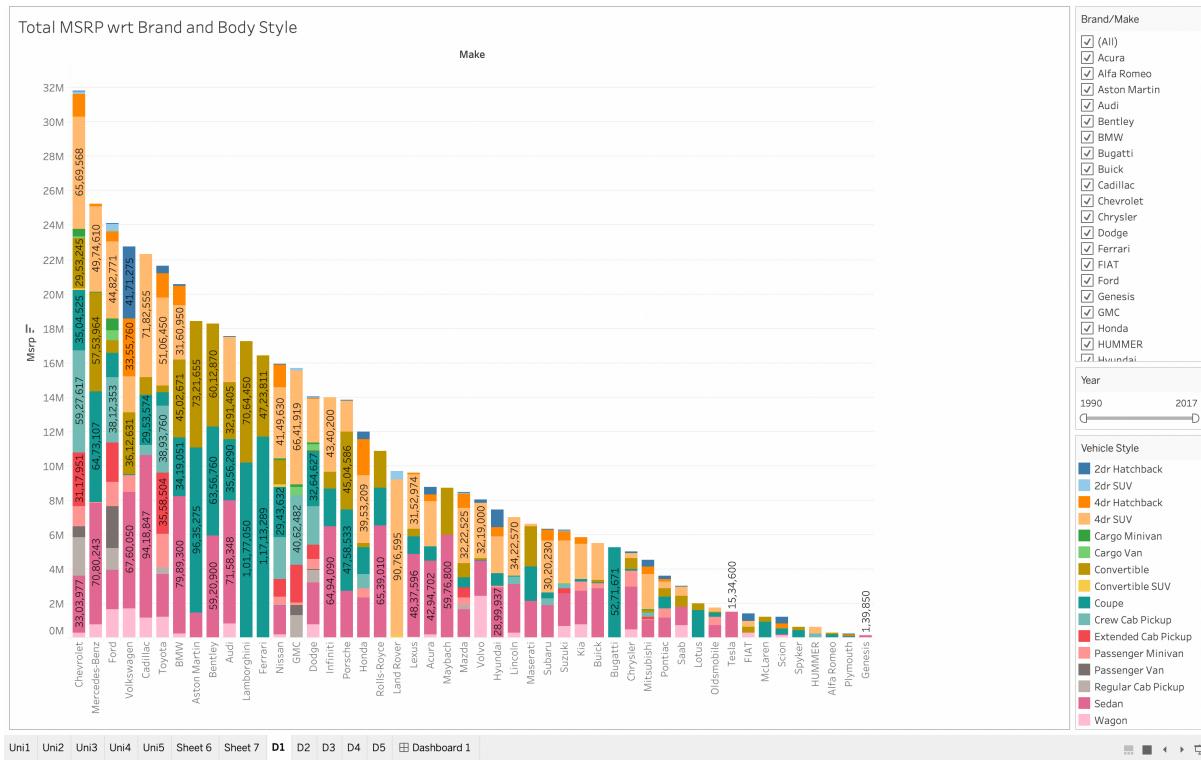
Insights – We can see that there is a negative correlation between the number of cylinders in a car and the highway MPG.

Dashboard Building –

To build and interactive dashboard for this task I have used Tableau and managed to build and interactive dashboard that is user friendly and provides the car manufacturers understand their customers in a better way. This task has helped me to hone my skills and understanding of the dataset.



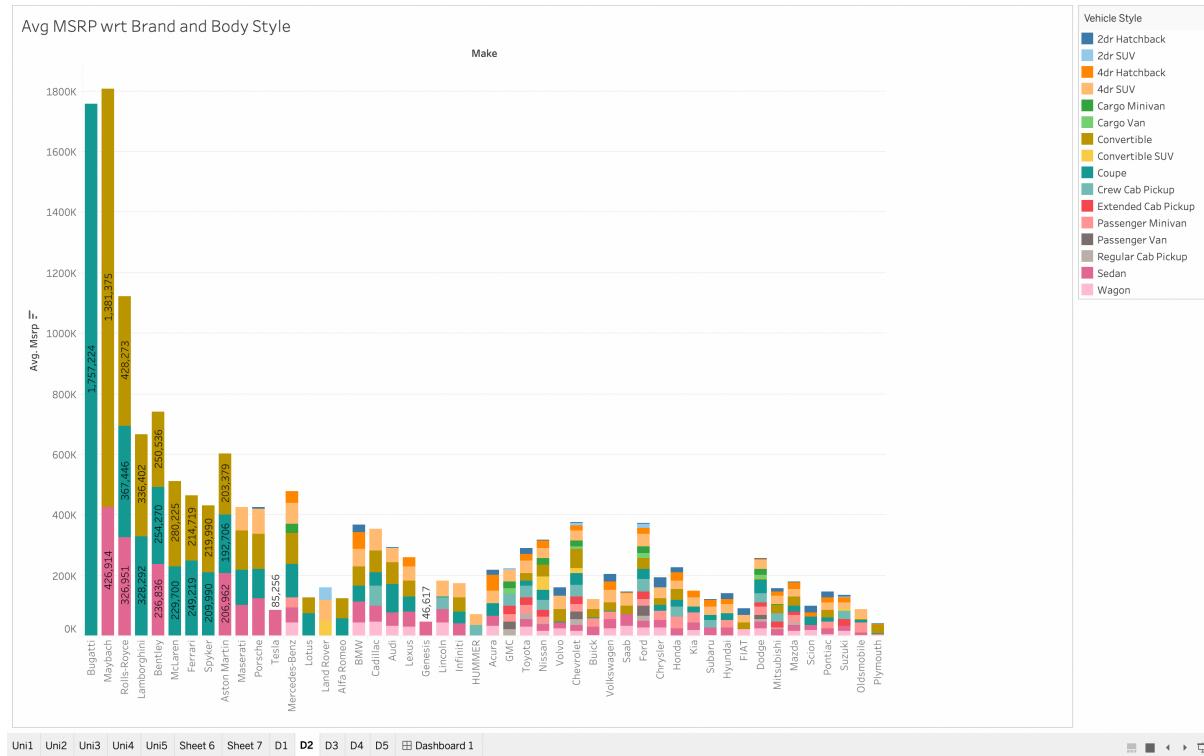
Task 1: How does the distribution of car prices vary by brand and body style?



we can see Ferrari, Coupe has the highest total MSRP of 11,713,289.

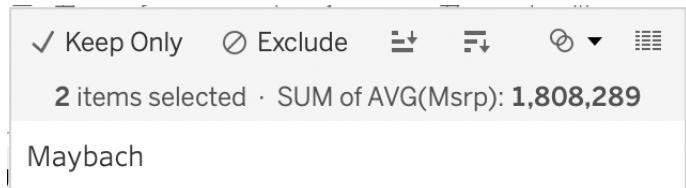
Abc	Abc	#
Car_data	Car_data	Car_data
Make	Vehicle Style	Msrp
Ferrari	Coupe	11,713,289
Lamborg...	Coupe	10,177,050
Aston Ma...	Coupe	9,635,275
Cadillac	Sedan	9,418,847
Land Rover	4dr SUV	9,076,595
BMW	Sedan	7,989,300
Aston Ma...	Convertible	7,321,655
Cadillac	4dr SUV	7,182,555
Audi	Sedan	7,158,348
Mercede...	Sedan	7,080,243
Lamborg...	Convertible	7,064,450
Volkswag...	Sedan	6,760,050
GMC	4dr SUV	6,641,919
Chevrolet	4dr SUV	6,569,568
Rolls-Roy...	Sedan	6,539,010

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



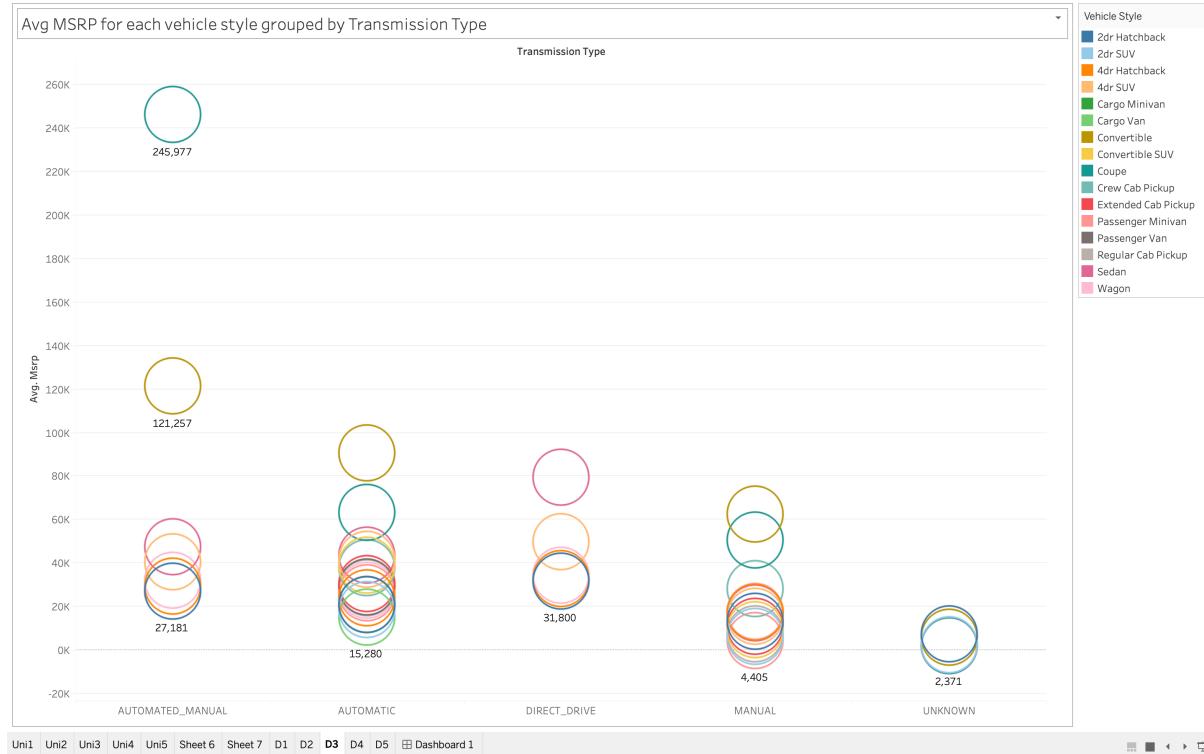
Insights – from the above stacked column chart we can see that ‘Maybach’ has the highest average MSRP of 1,808,289.

And wrt to body style we Bugatti Coupe has the highest average MSRP of 1,757,224. And Plymouth Wagon has the lowest MSRP of 2,000.



Abc	Abc	#
Car_data	Car_data	Car_data
Make	Vehicle Style	Avg. Msrp 
Bugatti	Coupe	1,757,223.67
Maybach	Convertible	1,381,375.00
Rolls-Roy...	Convertible	428,273.00
Maybach	Sedan	426,914.29
Rolls-Roy...	Coupe	367,445.83
Lamborg...	Convertible	336,402.38
Lamborg...	Coupe	328,291.94
Rolls-Roy...	Sedan	326,950.50
McLaren	Convertible	280,225.00
Bentley	Coupe	254,270.40
Bentley	Convertible	250,536.25
Ferrari	Coupe	249,218.91
Bentley	Sedan	236,836.00
McLaren	Coupe	229,700.00
Spyker	Convertible	219,990.00

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



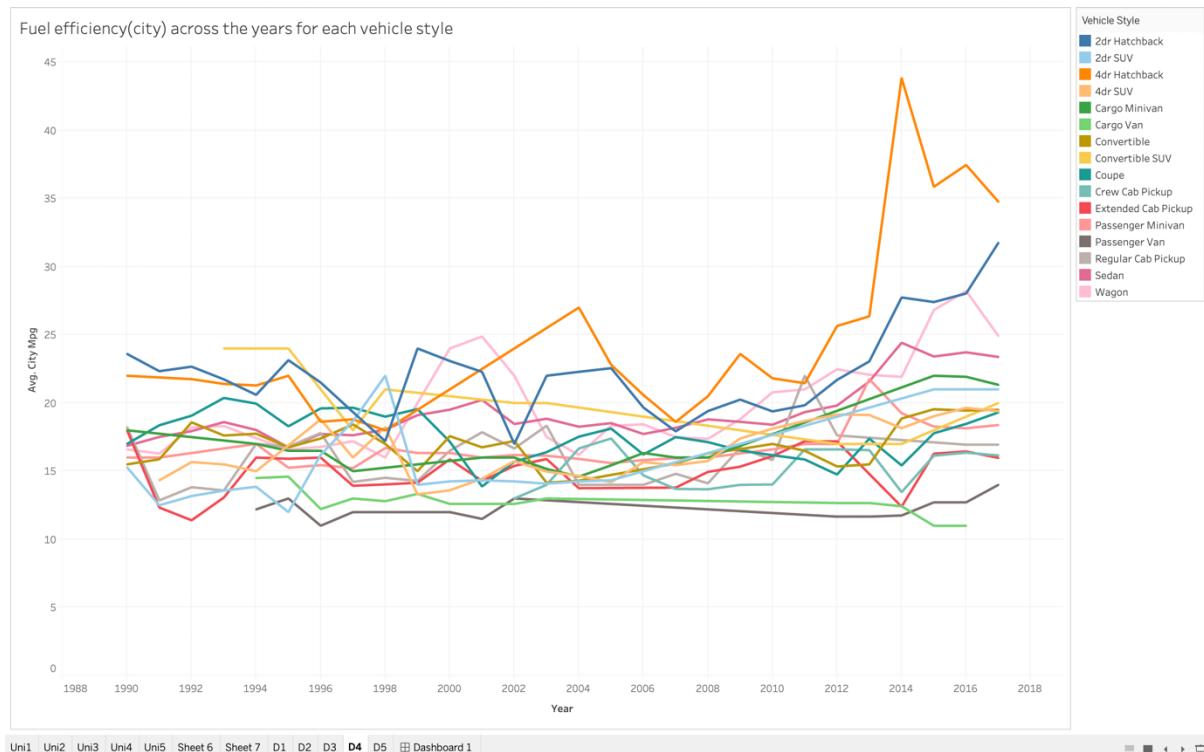
Abc	Abc	#
Car_data	Car_data	Car_data
Vehicle Style	Transmission Type	Avg. Msrp
Wagon	MANUAL	17,844.14
Wagon	DIRECT_DRIVE	34,250.00
Wagon	AUTOMATIC	27,613.19
Wagon	AUTOMATED_MANUAL	31,985.28
Sedan	UNKNOWN	2,000.00
Sedan	MANUAL	17,119.23
Sedan	DIRECT_DRIVE	79,512.25
Sedan	AUTOMATIC	43,769.12
Sedan	AUTOMATED_MANUAL	47,498.71
Regular Cab Pickup	UNKNOWN	2,000.00

Insights – From the above graph we can infer that ‘Automated Manual’ usually have high MSRP and ‘Unknown’ and ‘Manual’ cars are relatively cheaper. In

the automated segment, we can see that the ‘Coupe’ vehicle style has the highest average MSRP of 245,977.

Abc Car_data Transmission Type	Abc Car_data Vehicle Style	# Car_data Avg. Msrp <input type="text"/>
AUTOMATED_MANUAL	Coupe	245,977.43
AUTOMATED_MANUAL	Convertible	121,256.64
AUTOMATIC	Convertible	90,637.39

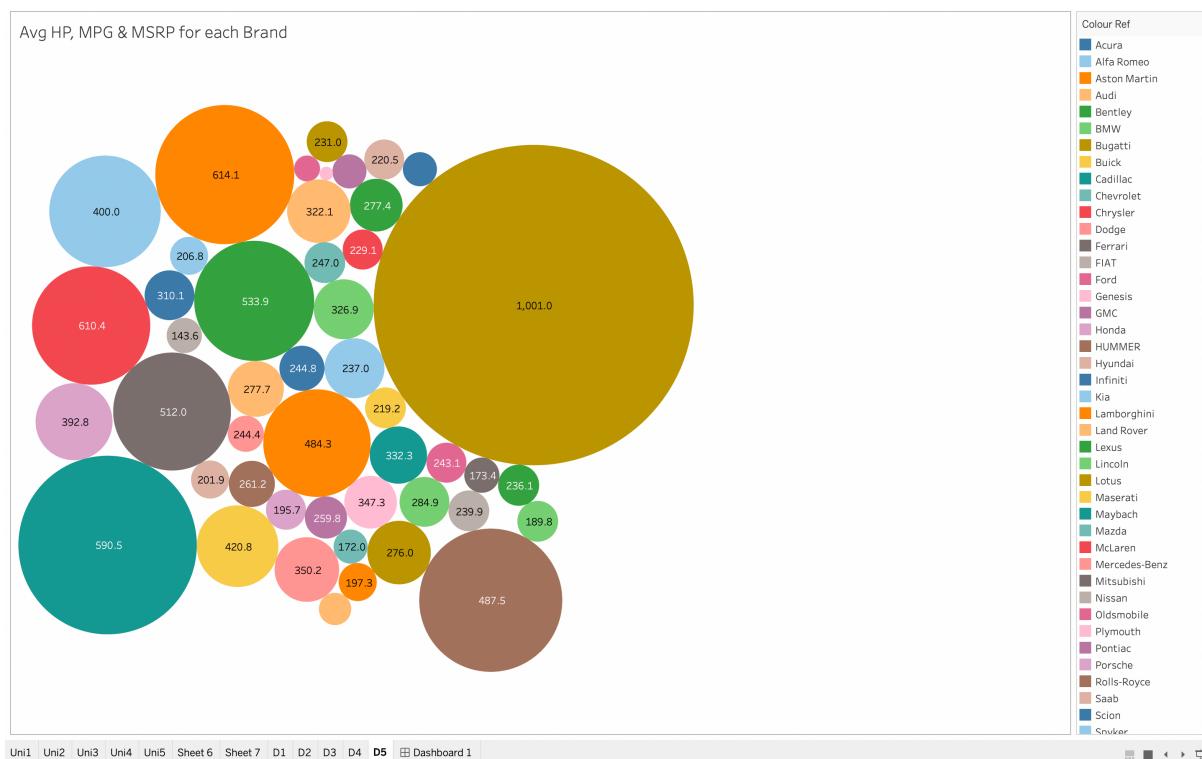
Task 4: How does the fuel efficiency of cars vary across different body styles and model years?



#	Abc Car_data	#
Year	Vehicle Style	Avg. City Mpg
1990	Wagon	16.6000
1991	Wagon	16.2857
1992	Wagon	18.2000
1993	Wagon	18.3077
1994	Wagon	17.4167
1995	Wagon	16.6000
1996	Wagon	16.7778
1997	Wagon	17.2000
1998	Wagon	16.0000
2000	Wagon	24.0000
2001	Wagon	24.8750
2002	Wagon	22.0000
2003	Wagon	17.5000
2004	Wagon	16.2000

Insights – Over the years we can see 4dr Hatchback had high average city MPG, and Cargo Minivan and Passenger van were among the ones with low average MPG. The average MPG of 4dr Hatchback peaked in 2014, when it was at an all-time high of 43.83 MPG.

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



Abc Car_data Make	# Car_data Avg. City Mpg	# Car_data Avg. Engine HP	# Car_data Avg. Msrp 
Bugatti	8.0000	1,001.000	1,757,223.67
Maybach	10.0000	590.500	546,221.88
Rolls-Royce	11.8387	487.548	351,130.65
Lamborg...	11.5192	614.077	331,567.31
Bentley	11.5541	533.851	247,169.32
McLaren	15.6000	610.400	239,805.00
Ferrari	10.5652	511.957	238,218.84
Spyker	13.0000	400.000	213,323.33
Aston Ma...	12.5269	484.323	197,910.38
Maserati	13.3276	420.793	114,207.71

Insights – From the above graph we can infer that:

MSRP: Bugatti has overall highest average MSRP and Plymouth has the lowest MSRP.

Engine HP: Similarly with the engine HP, Bugatti has the highest HP of 1001 HP and Plymouth has the lowest of 131.5 HP.

City MPG: When it comes to the fuel efficiency, FIAT gives the highest average MPG in city of 26mpg and Bugatti, the lowest of 8mpg.

Conclusion –

The project aims to provide actionable insights to the car manufacturer based on the analysis of the dataset. The findings can assist in optimizing pricing strategies, identifying key features to focus on in product development, and understanding consumer preferences within different market categories. By leveraging data-driven decision-making, the car manufacturer can enhance profitability and competitive advantage in the dynamic automotive industry.

Links to the working files –

<https://drive.google.com/drive/folders/1ZJM5oIN0jd2sHzE->

[OeOs8sXf31BOMv7k?usp=drive_link](#)

https://public.tableau.com/app/profile/mishree.bagdai/viz/Book1_16867464124550/Dashboard1?publish=yes

