Car Features Analysis

Analyzing the Impact of Car features on Price and Profitability

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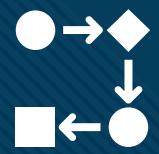
Table of Content

Project Description

- In the past few decades, he automotive industry has shown a tremendous growth , be if fuel efficiency, environmental sustainability and technological innovation.
- We are even observing some evolving trends and hence it has become important to understand the factors that are driving the consumers demand for cars.
- In this project, I have analyzed the relationship between car's features, market category and pricing to identify features and categories that are popular among consumer and also profitable to the manufacturer.
- Using various DATA ANALYSIS techniques, I have determined the product features to focus for the future development efforts and helped the manufacturer to increase its competitiveness and profitability.

Approach



- Understanding the dataset.
- Removing duplicate and removing blank cells.
- Drawing pivots, some new tables and charts to draw the insights.
- Regression analysis techniques were used to determine the features impacting consumer demands.
- Visualization used for better understanding of all the factors influencing the sales.
- Building Dashboard.

Tech-Stack Used

Excel

- To perform data analysis using EDA and regression analysis methods.

Power BI

- To create Visualization Dashboard for the insights asked.

PowerPoint

- To prepare the documentation of the project.

Loom.com

- To prepare the Video Presentation.

Data Set Description

Before Cleaning the dataset -

- Total number of Rows = 11915
- Total number of Columns = 16

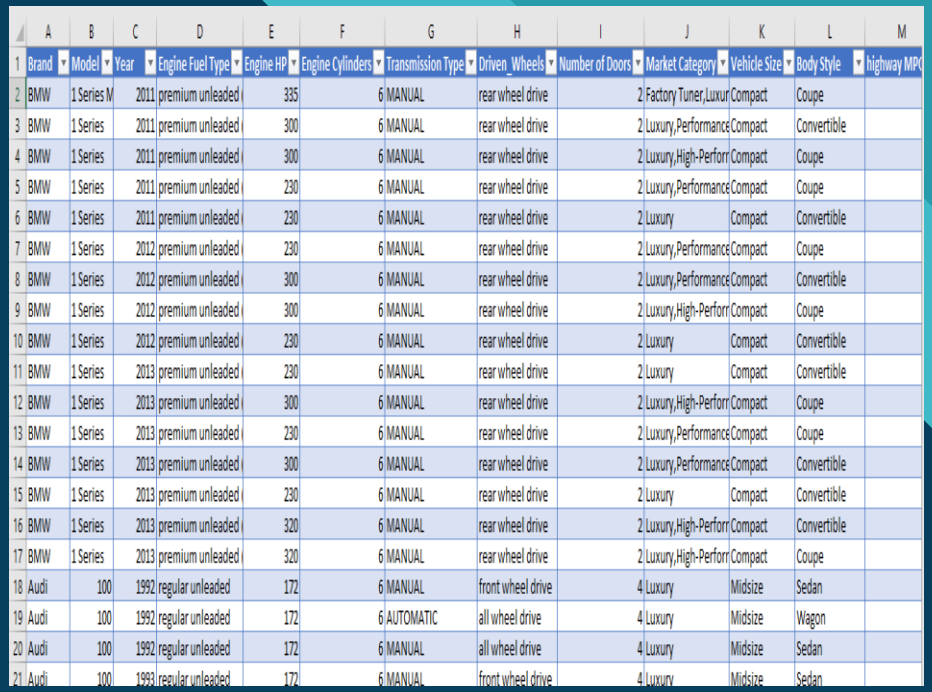
After Cleaning the dataset –

- Removing Duplicates -715 duplicates removed and 11199 rows retained.
- Removing Blank columns – 11098 rows retained.

Renamed Columns –

- Make – Brands
- Vehicle style – Body Style

New Column – Fuel efficiency (Average of MPGs)



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Brand	Model	Year	Engine Fuel Type	Engine HP	Engine Cylinders	Transmission Type	Driven_Wheels	Number of Doors	Market Category	Vehicle Size	Body Style	highway MPG
2	BMW	1 Series M	2011	premium unleaded (	335	6	MANUAL	rear wheel drive	2	Factory Tuner,Luxur	Compact	Coupe	
3	BMW	1 Series	2011	premium unleaded (	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible	
4	BMW	1 Series	2011	premium unleaded (	300	6	MANUAL	rear wheel drive	2	Luxury,High-Perforr	Compact	Coupe	
5	BMW	1 Series	2011	premium unleaded (	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe	
6	BMW	1 Series	2011	premium unleaded (	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	
7	BMW	1 Series	2012	premium unleaded (	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe	
8	BMW	1 Series	2012	premium unleaded (	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible	
9	BMW	1 Series	2012	premium unleaded (	300	6	MANUAL	rear wheel drive	2	Luxury,High-Perforr	Compact	Coupe	
10	BMW	1 Series	2012	premium unleaded (	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	
11	BMW	1 Series	2013	premium unleaded (	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	
12	BMW	1 Series	2013	premium unleaded (	300	6	MANUAL	rear wheel drive	2	Luxury,High-Perforr	Compact	Coupe	
13	BMW	1 Series	2013	premium unleaded (	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe	
14	BMW	1 Series	2013	premium unleaded (	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible	
15	BMW	1 Series	2013	premium unleaded (	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	
16	BMW	1 Series	2013	premium unleaded (	320	6	MANUAL	rear wheel drive	2	Luxury,High-Perforr	Compact	Convertible	
17	BMW	1 Series	2013	premium unleaded (	320	6	MANUAL	rear wheel drive	2	Luxury,High-Perforr	Compact	Coupe	
18	Audi	100	1992	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	
19	Audi	100	1992	regular unleaded	172	6	AUTOMATIC	all wheel drive	4	Luxury	Midsize	Wagon	
20	Audi	100	1992	regular unleaded	172	6	MANUAL	all wheel drive	4	Luxury	Midsize	Sedan	
21	Audi	100	1993	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	

Insights

Various Pivots and tables were created draw the Insights and charts were drawn for the better understanding of the data.

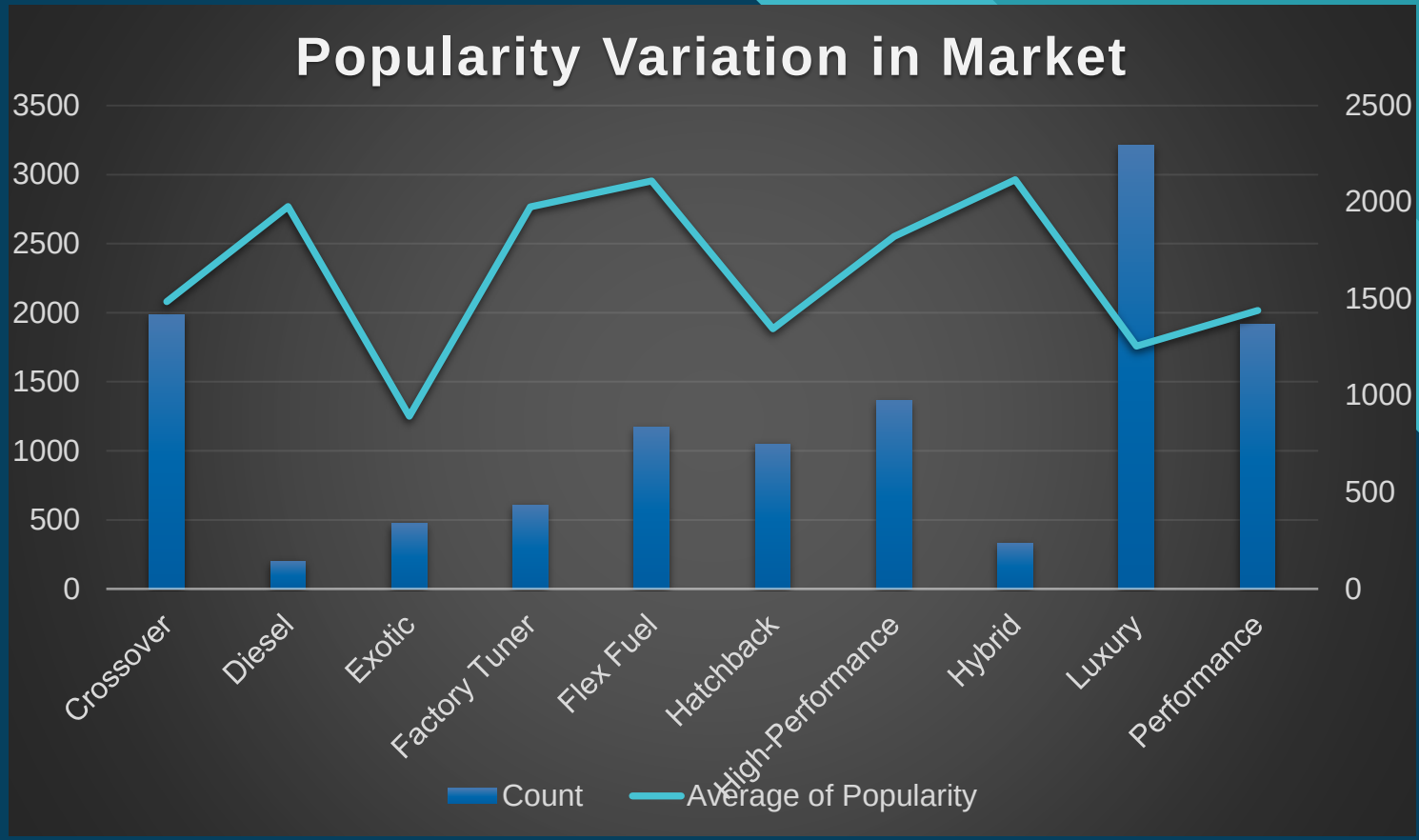
This task were performed in two parts

1. Analysis
2. Dashboard

Analysis -

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

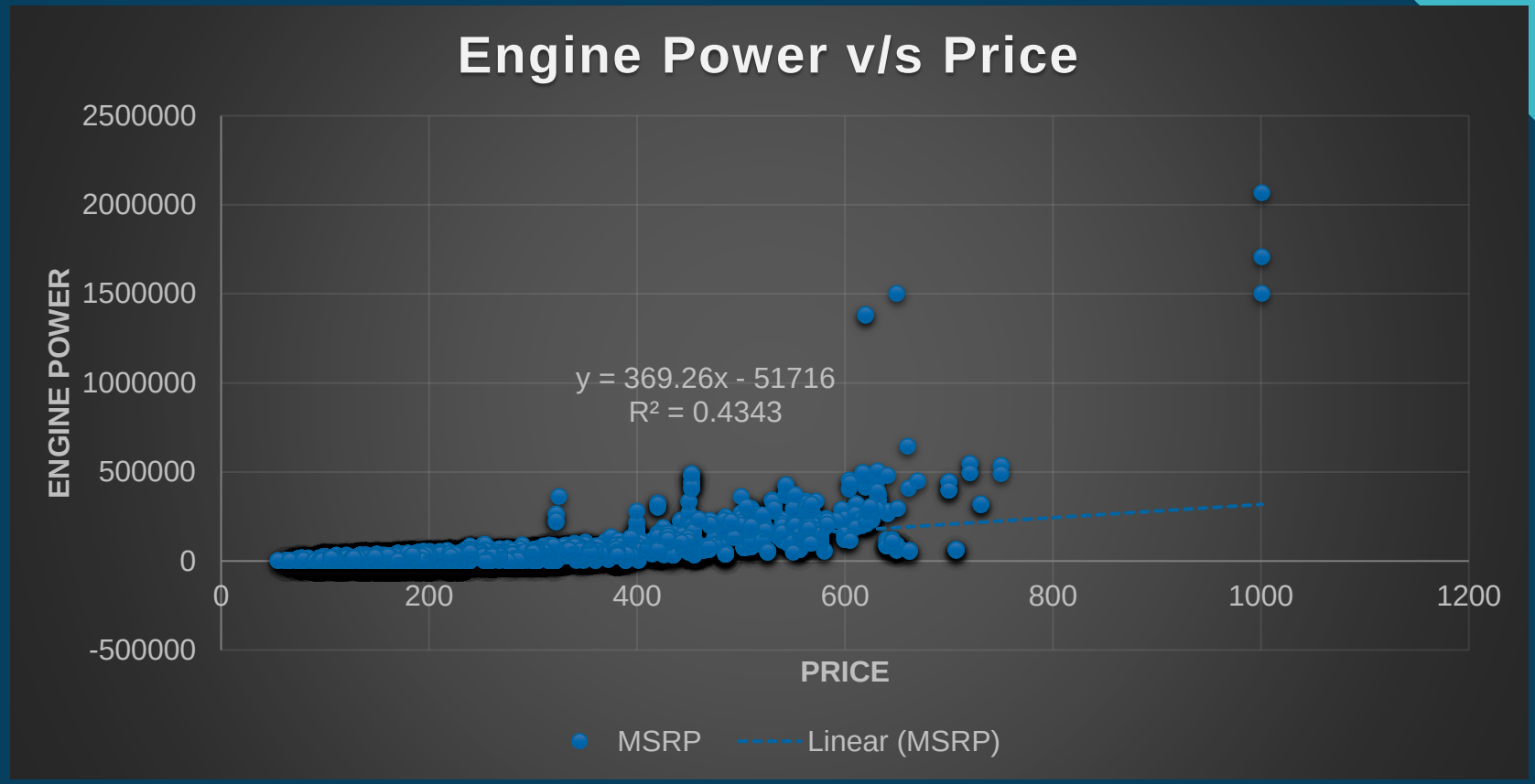
Row Labels	Average of Popularity
Crossover	1485
Diesel	1977
Exotic	893
Factory Tuner	1976
Flex Fuel	2111
Hatchback	1346
High-Performance	1823
Hybrid	2117
Luxury	1256
Performance	1441
Grand Total	1513



Luxury car category was most popular in the market

Analysis -

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



Relationship between Cars engine power and its price was determined.

Analysis -

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

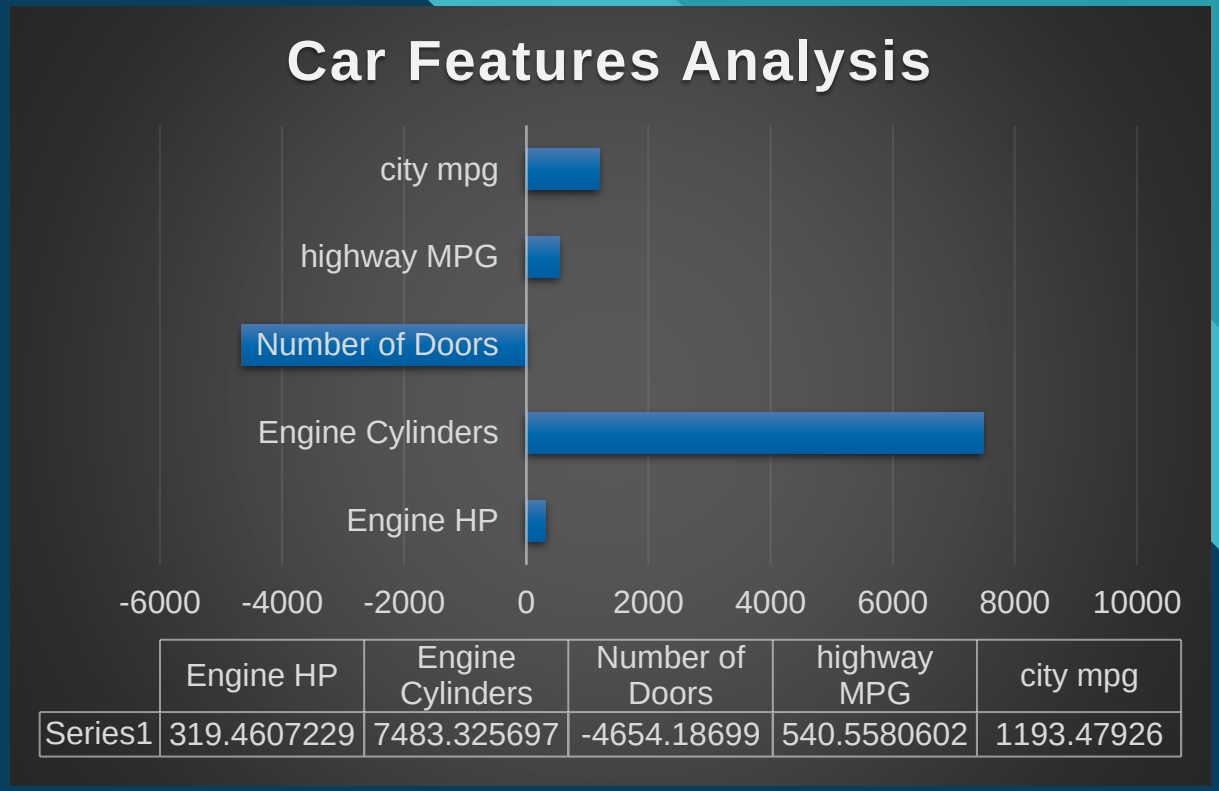
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.6783475
R Square	0.4601553
Adjusted R Square	0.4599119
Standard Error	45366.26
Observations	11097

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.94568E+13	3.89137E+12	1890.759285	0
Residual	11091	2.28264E+13	2058097531		
Total	11096	4.22832E+13			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	-102834.75	3893.782161	-26.4099912	4.0456E-149	-110467.26	-95202.2	-110467	-95202.2
Engine HP	319.46072	6.417508778	49.77955371	0	306.88126	332.0402	306.8813	332.0402
Engine Cylinders	7483.3257	464.1300157	16.12333925	7.9289E-58	6573.5483	8393.103	6573.548	8393.103
Number of Doors	-4654.187	498.8130353	-9.330523986	1.25351E-20	-5631.9493	-3676.42	-5631.95	-3676.42
highway MPG	540.55806	109.9295838	4.917311986	8.89983E-07	325.07652	756.0396	325.0765	756.0396
city mpg	1193.4793	126.3627723	9.444864481	4.27071E-21	945.78575	1441.173	945.7857	1441.173

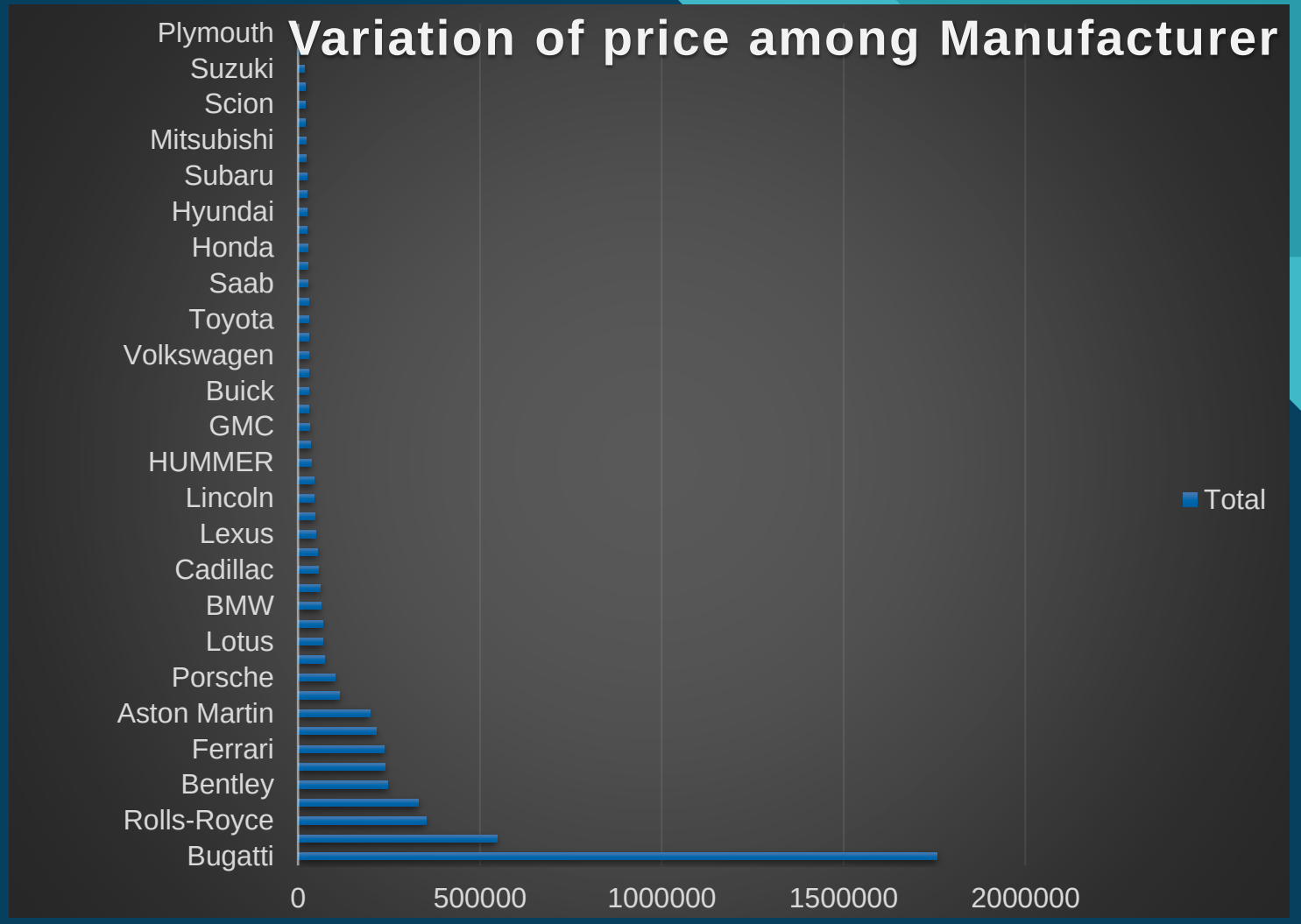


Engine cylinder was most important feature in determining the car's price.

Analysis -

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

Row Labels	Average of MSRP
Bugatti	1757224
Maybach	546222
Rolls-Royce	351131
Lamborghini	331567
Bentley	247169
McLaren	239805
Ferrari	237384
Spyker	214990
Aston Martin	198123
Maserati	113684
Porsche	101622
Mercedes-Benz	72135
Lotus	68377
Land Rover	68067
BMW	62163
Alfa Romeo	61600
Cadillac	56368
Audi	54574
Lexus	47549
Genesis	46617

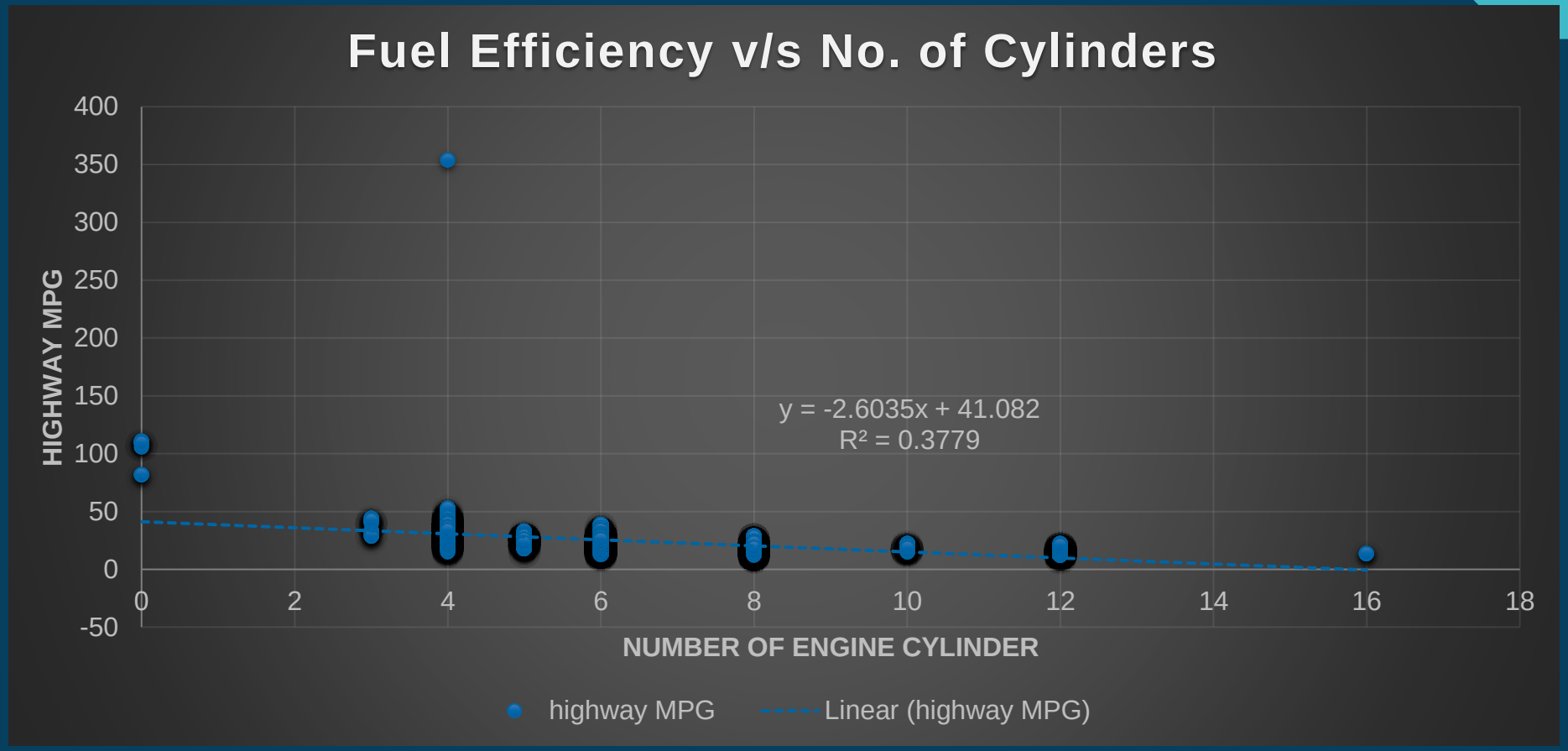


Bugatti manufacturer had highest average MSRP while Plymouth had the least.

Analysis -

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

	Correlation Matrix	
	Engine Cylinders	*highway MPG*
Engine Cylinders	1	
highway MPG	-0.614703148	1

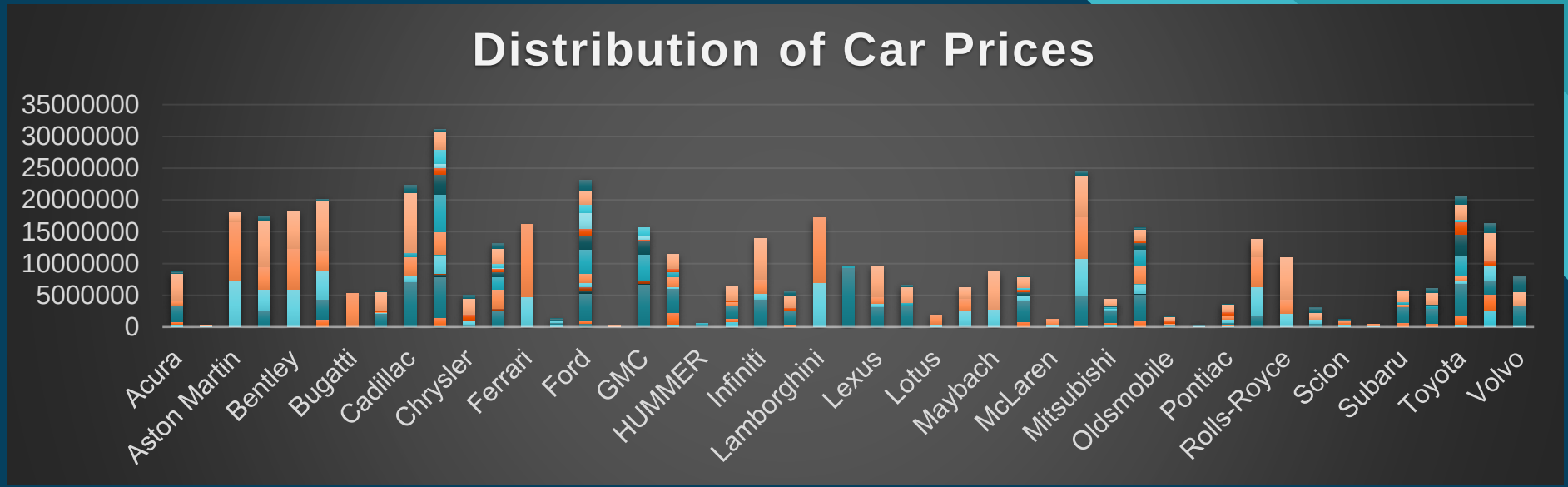


Strong Irreversible relation was found between Fuel Efficiency and number of Cylinders.

Dashboard -

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

Body Style	(All)
Row Labels	**Sum of MSRP**
Acura	8631522
Alfa Romeo	308000
Aston Martin	18029235
Audi	17518293
Bentley	18290530
BMW	20140669
Bugatti	5271671
Buick	5516496
Cadillac	22321833
Chevrolet	31175238
Chrysler	4997194
Dodge	13149377
Ferrari	16142100
FIAT	1310155
Ford	23160564
Genesis	139850
GMC	15638049
Honda	11468429

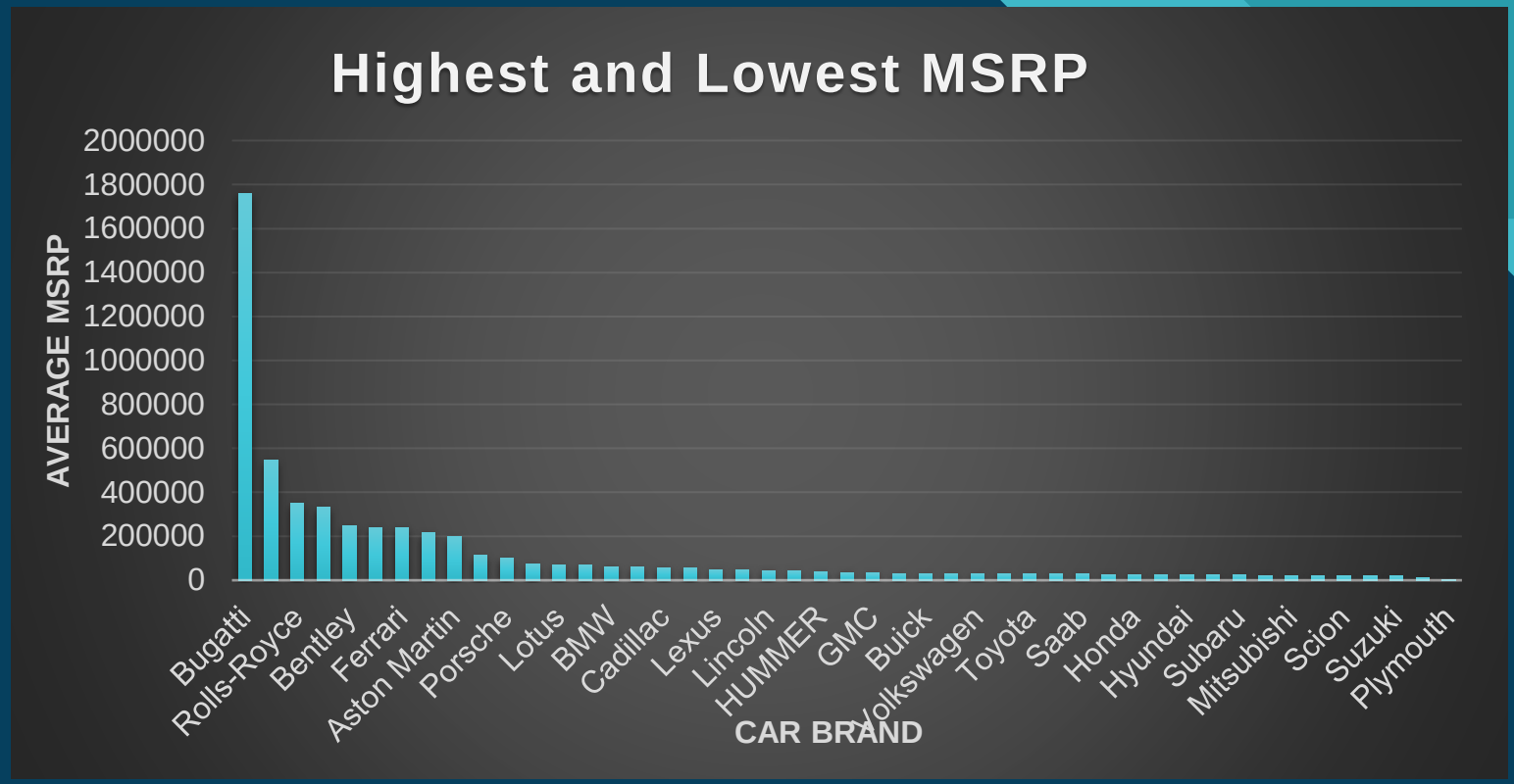


We can clearly see how the distribution of car prices is varying with different brands and their body style.

Dashboard -

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

Body Style	(All)
Row Labels	Average of MSRP
Bugatti	1757223.667
Maybach	546221.875
Rolls-Royce	351130.6452
Lamborghini	331567.3077
Bentley	247169.3243
McLaren	239805
Ferrari	237383.8235
Spyker	214990
Aston Martin	198123.4615
Maserati	113684.4909
Porsche	101622.3971
Mercedes-Benz	72135.02647
Lotus	68377.14286
Land Rover	68067.08633
BMW	62162.55864
Alfa Romeo	61600
Cadillac	56368.26515
Audi	54574.1215

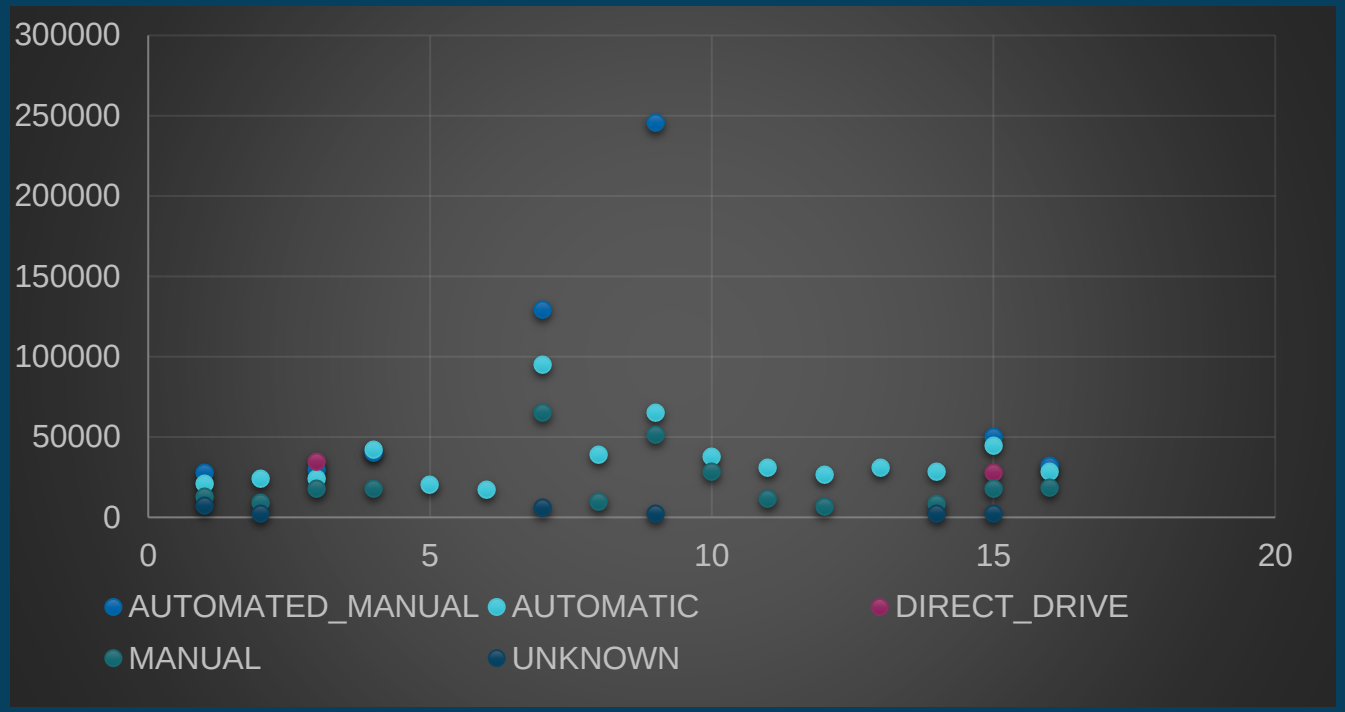


Bugatti has the highest has the highest average MSRP while Plymouth has the lowest.

Dashboard -

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	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger V
AUTOMATED_MANUAL	27470.41667		29347.04545	40451.15385			129082.2339		245588.3571				
AUTOMATIC	20784.09901	24153.60606	23888.73529	41658.40017	20292.93103	17019.29762	95153.3131	38925.5	65031.18595	37718.95307	30711.45251	26570.02128	30578.066
DIRECT_DRIVE			34511.92308										
MANUAL	12840.65556	9173.018519	17500.36364	17422.08791			64794.34437	9594.8	51524.64391	28233.10811	11553.29707	6510	
UNKNOWN	7361.5	2371					5783.5		2000				
Grand Total	16063.15159	14306.54945	22061.31925	40736.35037	20292.93103	17019.29762	88216.79217	17975	78292.5338	37183.11145	23041.77219	26152.10417	30578.066

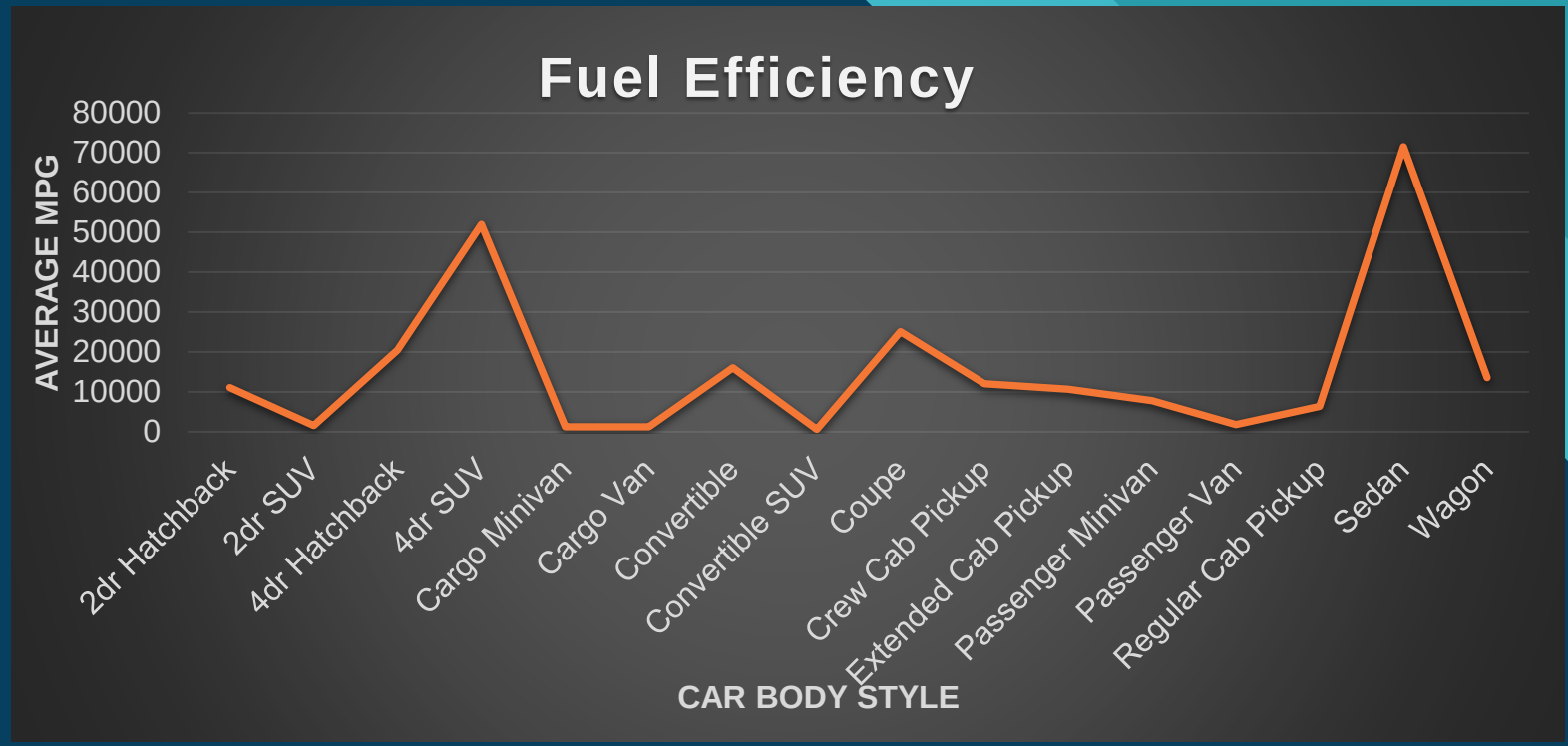


Based on transmission type the prices vary for different body styles.

Dashboard -

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

Year	(All)
Row Labels	**Sum of Fuel Efficiency**
2dr Hatchback	**11068**
2dr SUV	**1563**
Blazer	130
Bronco	127.5
Bronco II	35.5
Defender	40
Explorer Sport	297.5
Freelander	52
Jimmy	196.5
Navajo	104.5
Ramcharger	75
Range Rover Evoque	152.5
S-10 Blazer	108
S-15 Jimmy	69.5
Typhoon	30.5
X-90	144
4dr Hatchback	**20452**
4dr SUV	**51986.5**
Cargo Minivan	**1225**
Cargo Van	**1227**
Convertible	**16013**
Convertible SUV	**614.5**
Coupe	**25067**
Crew Cab Pickup	**12045.5**
Extended Cab Pickup	**10630.5**

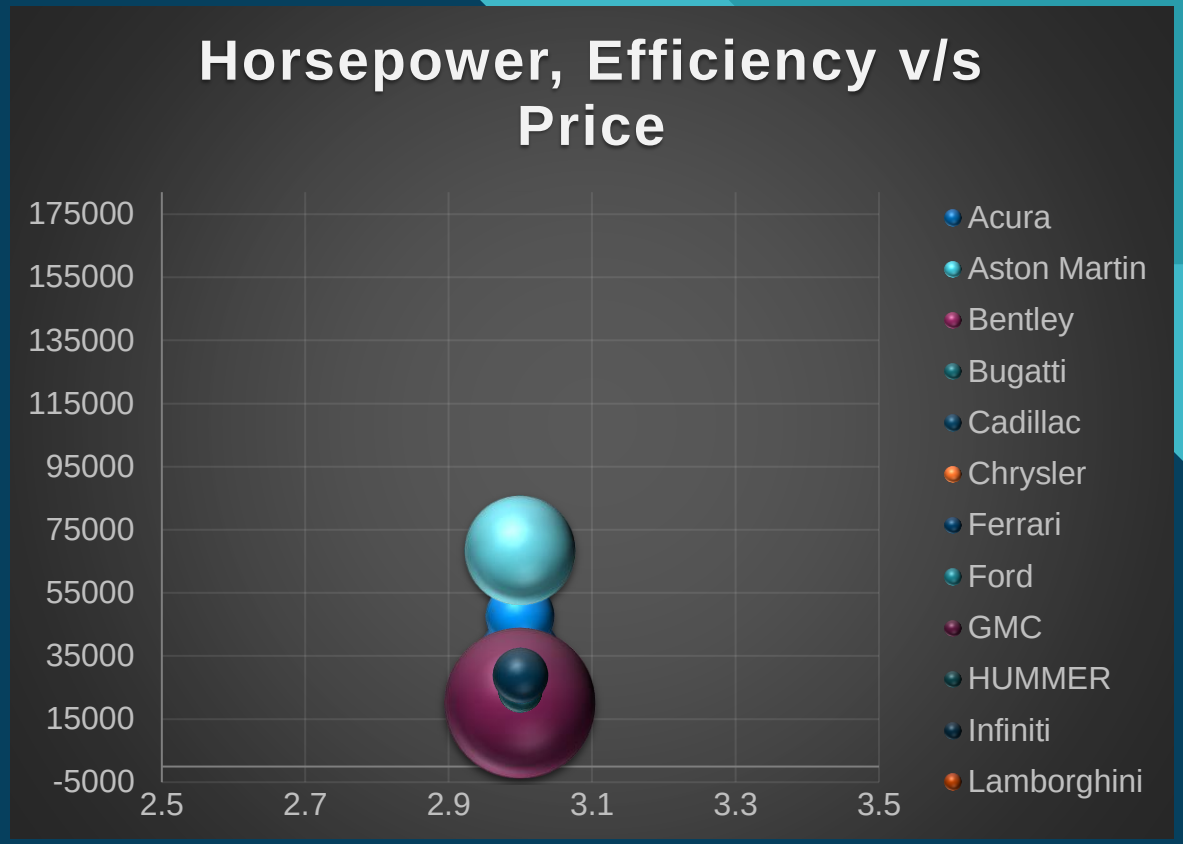


Fuel efficiency is varying for different body styles in different brands. Sedan has the highest average MPG.

Dashboard -

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

Row Labels	Average of Engine HP	Average of Fuel Efficiency	Average of MSRP
Acura	244.9634146	24.11178862	35087.4878
Alfa Romeo	237	29	61600
Aston Martin	483.7582418	15.74725275	198123.4615
Audi	280	24.28193146	54574.1215
Bentley	533.8513514	15.22972973	247169.3243
BMW	329.6203704	24.91358025	62162.55864
Bugatti	1001	11	1757223.667
Buick	220.0105263	22.89736842	29034.18947
Cadillac	332.7954545	21.3030303	56368.26515
Chevrolet	249.575814	22.34697674	29000.2214
Chrysler	229.1390374	22.06417112	26722.96257
Dodge	254.3534972	19.7173913	24857.04537
Ferrari	509.9117647	13.13970588	237383.8235
FIAT	143.559322	29.97457627	22206.01695
Ford	249.6921182	20.57881773	28522.86207
Genesis	347.3333333	20.83333333	46616.66667
GMC	267.6452282	18.62136929	32444.08506
Honda	196.7726218	28.39095128	26608.88399
HUMMER	261.2352941	15.41176471	36464.41176
Hyundai	205.2046332	25.82818533	24926.26255



Variation of Horsepower, efficiency and prices is shown across different Brands.

Results

TASK 1

Luxury car category was most popular in the market.

TASK 2

Relationship between Cars engine power and its price was determined.

TASK 3

Engine cylinder was most important feature in determining the car’s price.

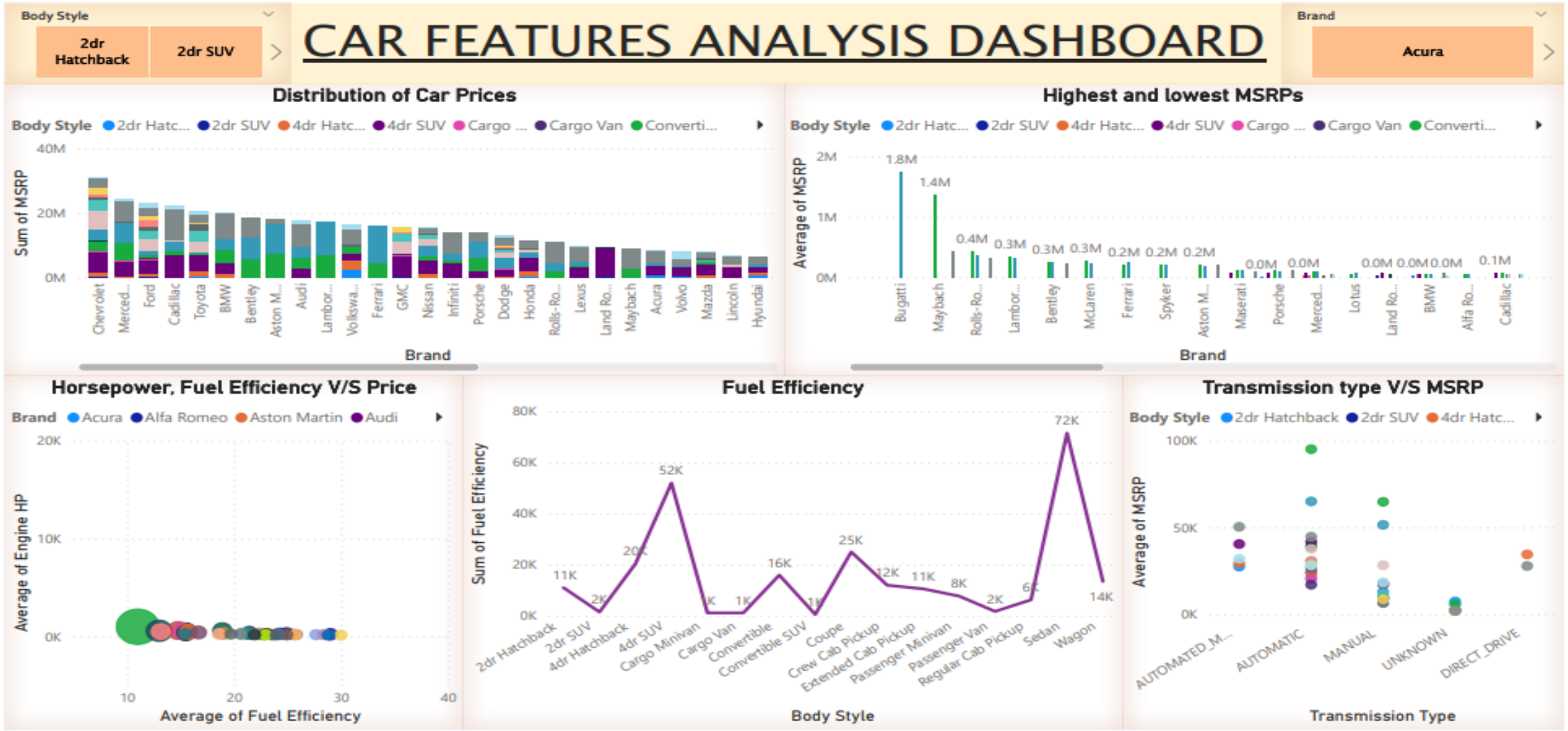
TASK 4

Bugatti manufacturer had highest average MSRP while Plymouth had the least.

TASK 5

Strong Irreversible relation was found between Fuel Efficiency and number of Cylinders.

Results


Body Style
2dr Hatchback
2dr SUV
CAR FEATURES ANALYSIS DASHBOARD
Brand
Acura
Distribution of Car Prices
Body Style 2dr Hatc... 2dr SUV 4dr Hatc... 4dr SUV Cargo ... Cargo Van Converti...
Sum of MSRP
40M
20M
0M
Chevrolet Merced... Ford Cadillac Toyota BMW Bentley Aston M... Audi Lambor... Volkswa... Ferrari GMC Nissan Infiniti Porsche Dodge Honda Rolls-Ro... Lexus Land Ro... Maybach Acura Volvo Mazda Lincoln Hyundai
Brand
Highest and lowest MSRPs
Body Style 2dr Hatc... 2dr SUV 4dr Hatc... 4dr SUV Cargo ... Cargo Van Converti...
Average of MSRP
2M
1M
0M
1.8M 1.4M 0.4M 0.3M 0.3M 0.3M 0.2M 0.2M 0.2M 0.0M 0.0M 0.0M 0.0M 0.0M 0.1M
Bugatti Maybach Rolls-Ro... Lambor... Bentley McLaren Ferrari Spyker Aston M... Maserati Porsche Merced... Lotus Land Ro... BMW Alfa Ro... Cadillac
Brand
Horsepower, Fuel Efficiency V/S Price
Brand Acura Alfa Romeo Aston Martin Audi
Average of Engine HP
20K
10K
0K
10 20 30 40
Average of Fuel Efficiency
Fuel Efficiency
Sum of Fuel Efficiency
80K
60K
40K
20K
0K
11K 2K 20K 52K 1K 1K 16K 1K 25K 12K 11K 8K 2K 6K 72K 14K
2dr Hatchback 2dr SUV 4dr Hatchback 4dr SUV Cargo Minivan Cargo Van Convertible Convertible SUV Coupe Crew Cab Pickup Extended Cab Pickup Passenger Minivan Passenger Van Regular Cab Pickup Sedan Wagon
Body Style
Transmission type V/S MSRP
Body Style 2dr Hatchback 2dr SUV 4dr Hatc...
Average of MSRP
100K
50K
0K
AUTOMATED_M... AUTOMATIC MANUAL UNKNOWN DIRECT_DRIVE
Transmission Type

Thank You

ankitaydv07@gmail.com

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