

ANALYZING THE IMPACT OF CAR FEATURES ON PRICE AND PROFITABILITY

PROJECT REPORT

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PROJECT DESCRIPTION

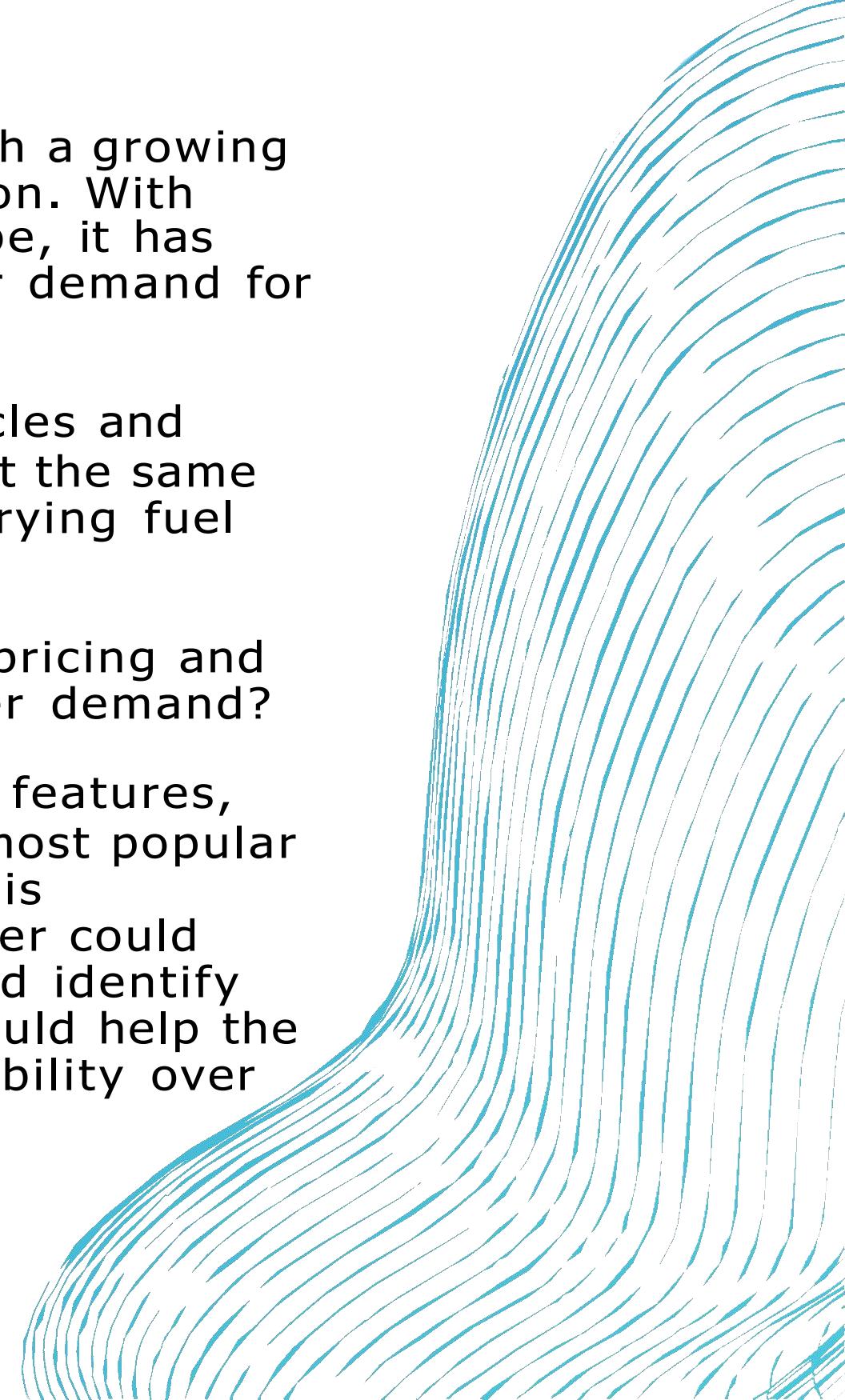
The automotive industry has been rapidly evolving over the past few decades, with a growing focus on fuel efficiency, environmental sustainability, and technological innovation. With increasing competition among manufacturers and a changing consumer landscape, it has become more important than ever to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

The data has been provided by Trainity.



APPROACH

The data is elaborate and hence the following steps are being followed:

- **Cleaning and Explorative data analysis.** Dealing with missing values and presentation of data in a comprehensive way.
- **Detailed analysis** to answer questions as:
 1. The number of car models in each market category and their corresponding popularity scores.
 2. What is the relationship between market category and popularity?
 3. What is the relation between engine power and price?
 4. Which car features are most important in determining a car's price?
 5. How does the average price of a car vary across different manufacturers?
 6. What is the relationship between fuel efficiency and the number of cylinders in a car's engine
- **Building the Dashboard.**
- **Deriving Insight** from collected data.

TECH STACK

The project required me to work extensively with MS-Excel (2022), allowing me to gain a better understanding related to its various features and how I could seek relevant insights with the same when dealing with a huge quantity of data.

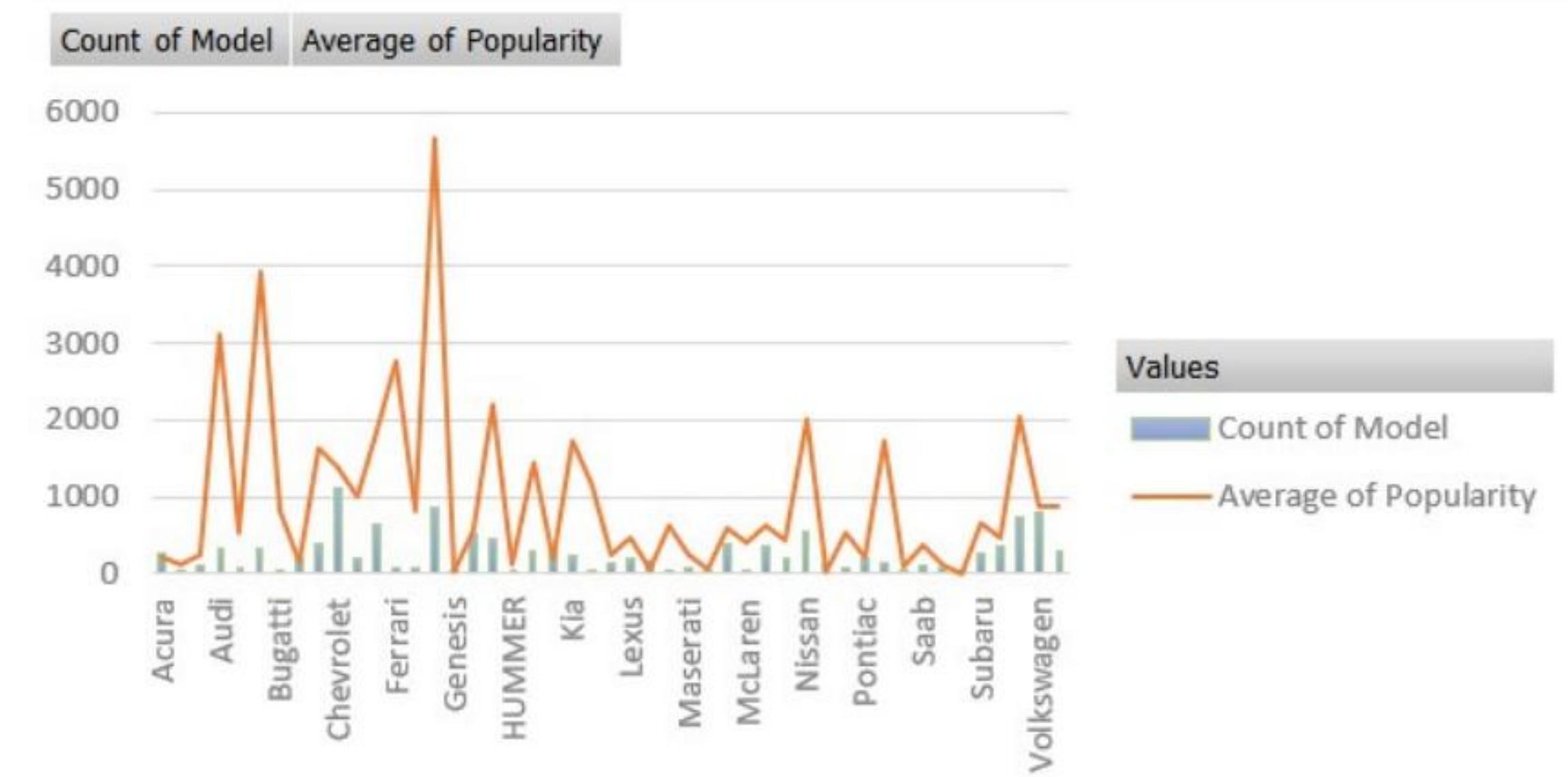


TASK 1 INSIGHT

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

The popularity of a car model definitely varies a lot based on market categories. Based on the trends we see that "Ford" is highly popular with an average popularity of 5657 and only 868 model. While "Chevrolet" with its 1115 models has a popularity score of 1385.

CAR MAKE	Count of Model	Average of Popularity
Acura	252	204
Alfa Romeo	5	113
Aston Martin	93	259
Audi	328	3105
Bentley	74	520
BMW	334	3916
Bugatti	3	820
Buick	196	155
Cadillac	397	1624



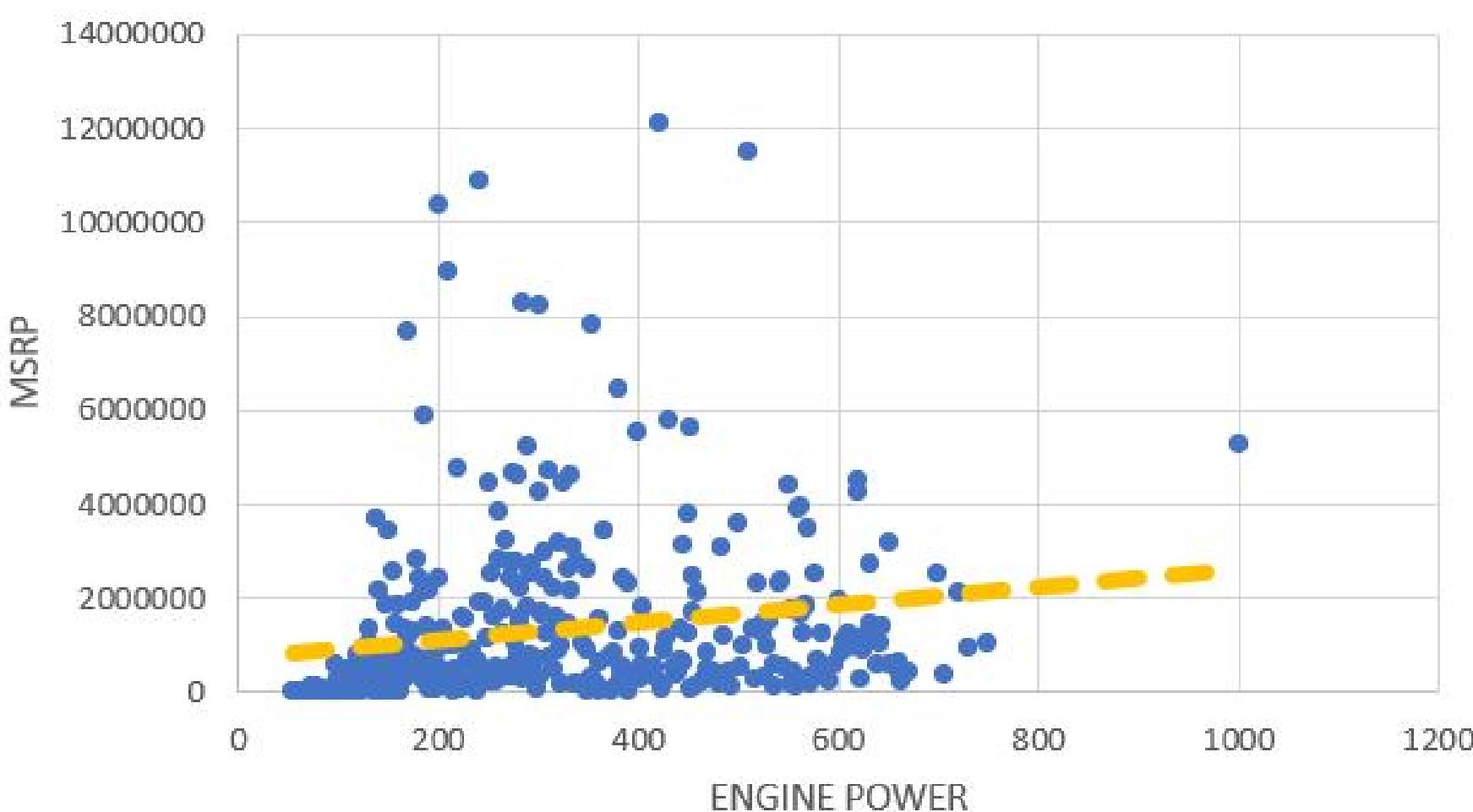
TASK 2 INSIGHT

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

An overall positive relationship is evident between the engine power of a car and its price. The better the engine power is, the higher the price of the automobile.

It is also evident that a lot of cars have an engine power ranging between 200- 600 units with their prices ranging under 4000000 units.

ENGINE POWER	MSRP
420	12088750
510	11511598
240	10871909
200	10362676
210	8956992
285	8288545
300	8233713
355	7846525



TASK 3 INSIGHT

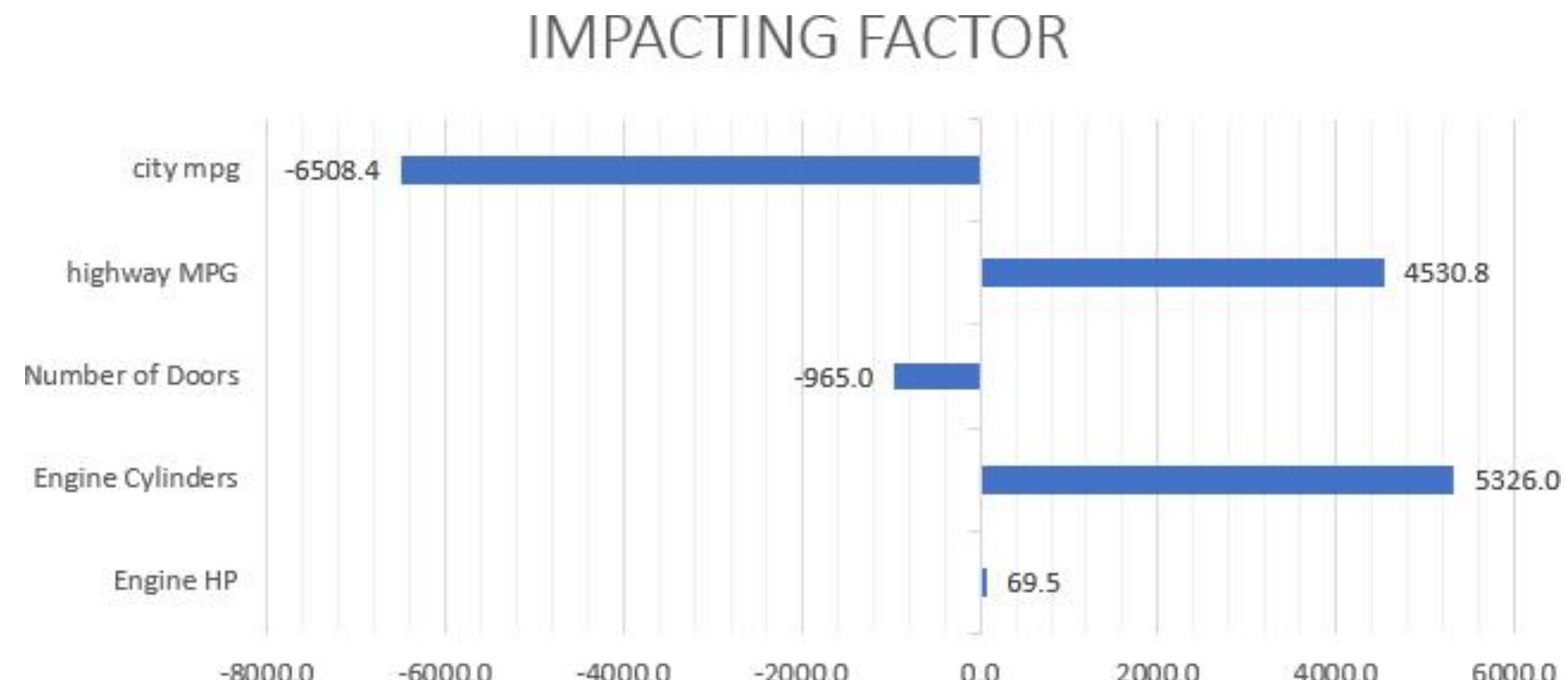
Which car features are most important in determining a car's price?

After carrying out the regression analysis, the “engine cylinders” seem to be an important determining factor when it comes to impacting a car’s price, followed closely by the “highway MPG.”

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.058803
R Square	0.0034578
Adjusted R Square	0.0030358
Standard Error	60188.456
Observations	11814

ANOVA							
	df	SS	MS	F		Significance F	
Regression	5	1.484E+11	2.968E+10	8.1942476	9.804E-08		
Residual	11808	4.278E+13	3.623E+09				
Total	11813	4.292E+13					

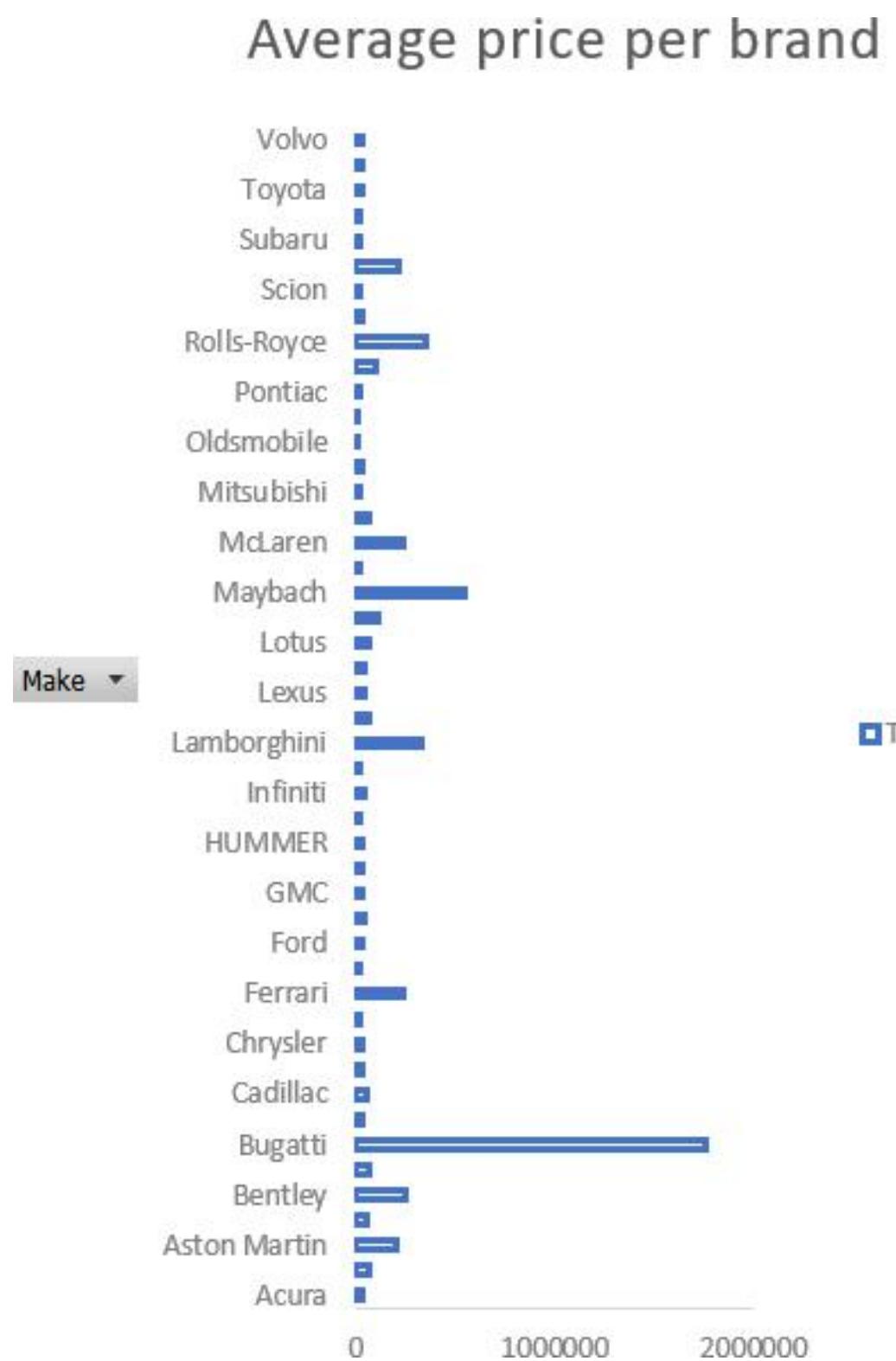
	Coefficients	Standard Err	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%
Intercept	4179.6	44809.9	0.1	0.9	-83655.1	92014.4	-83655.1	92014.4
Engine HP	69.5	52.3	1.3	0.2	-33.0	172.1	-33.0	172.1
Engine Cylinders	5326.0	6753.2	0.8	0.4	-7911.5	18563.4	-7911.5	18563.4
Number of Doors	-965.0	3731.9	-0.3	0.8	-8280.2	6350.2	-8280.2	6350.2
highway MPG	4530.8	1510.3	3.0	0.0	1570.5	7491.2	1570.5	7491.2
city mpg	-6508.4	1479.5	-4.4	0.0	-9408.4	-3608.3	-9408.4	-3608.3



TASK 4 INSIGHT

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

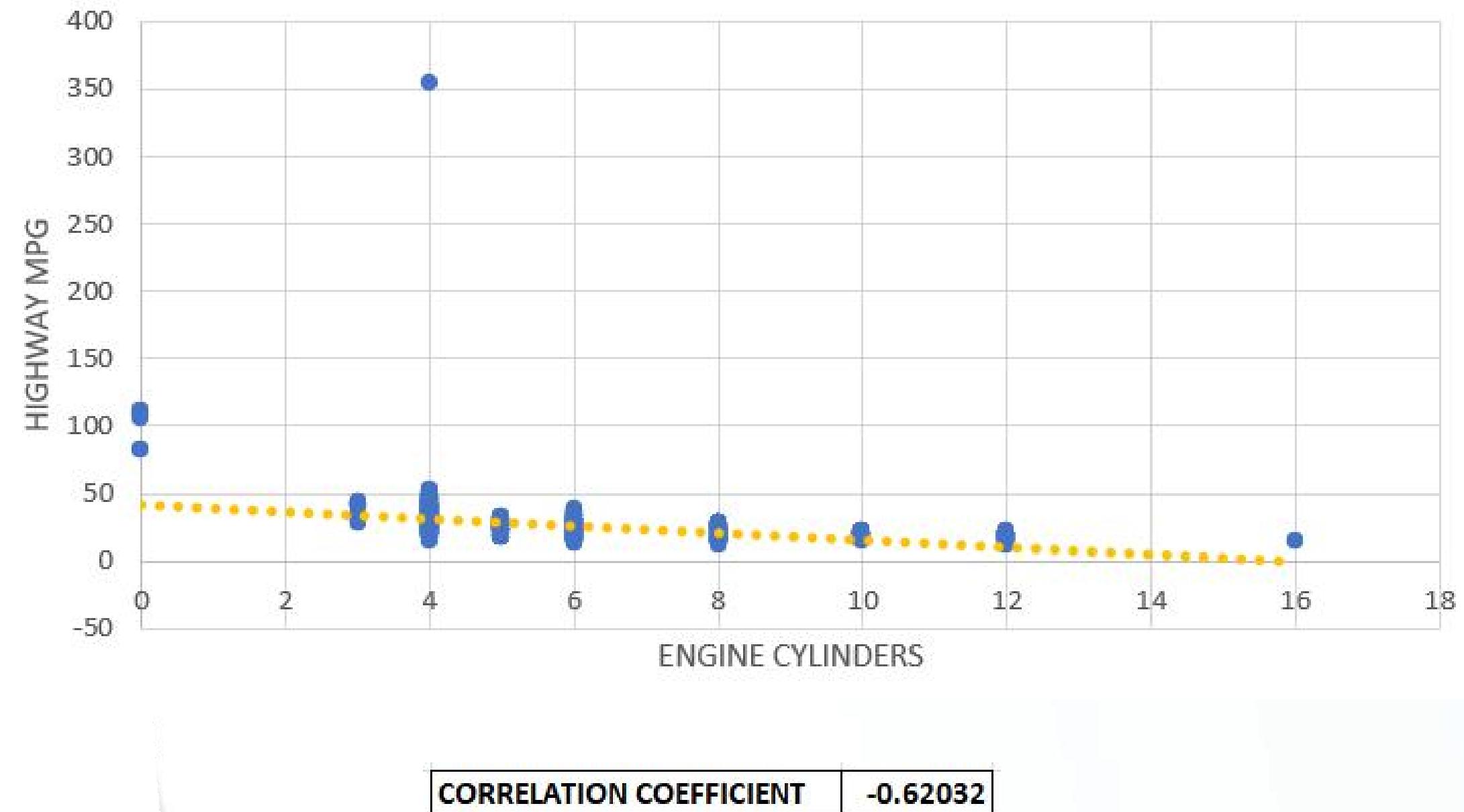
The average price of a car significantly varies based on the manufacturer. We see that “Bugatti” has the highest average price 1757223.66, of all manufacturers, followed by “Maybach” and “Rolls Royce”. While “Plymouth” has the lowest average at 3122.902.



TASK 5 INSIGHT

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

There appears to be a negative correlation between fuel efficiency and the number of cylinders. Thus, more the number of cylinders in engine, lesser is its fuel efficiency.



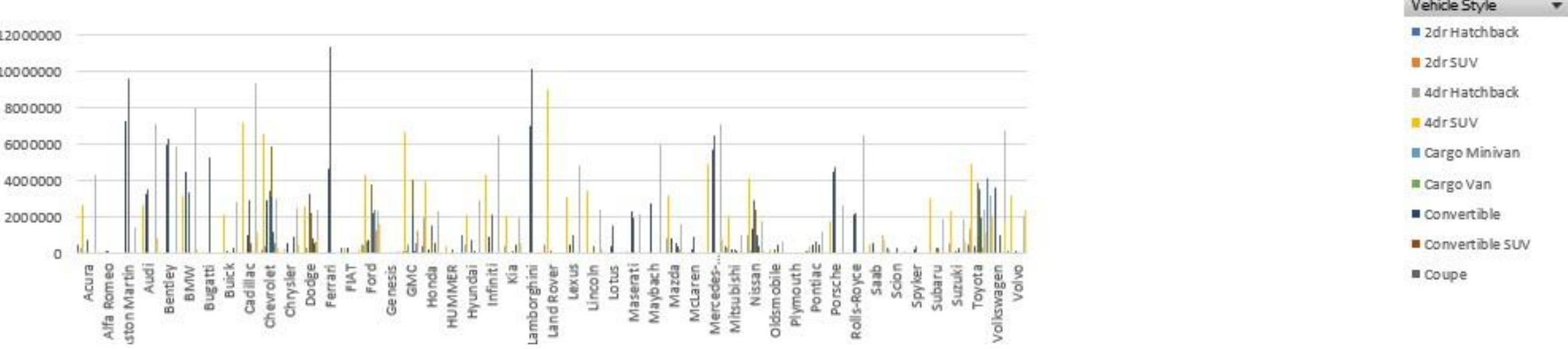
BUILDING THE DASHBOARD

TASK 1 INSIGHT

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

There is a significant difference when it comes to the prices of cars when the brand and the body style are concerned. It has been seen that cars from the brand "Ferarri" of the style "Coupe", have been priced the highest at 11418289. While, "Cargo Mini Van" from "Mitsubishi" has been priced the lowest at 2000.

Sum of MSRP	Column 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 Van	Regular Cab Pickup	Sedan	Wagon	Grand Total
Row Labels																		
Acura	480917			357440	2663505					793748						4298702	201360	8791673
Alfa Romeo										129800	178200							3080000
Aston Martin										7321655	9635275							1448735
Audi	4000				2674900					3291405	3556290							18405665
Bentley										6012870								7156348
BMW	80097		1144850	3160950						4502671	3419051							847350
Bugatti										5271671								5920900
Buick				2141770					179325	18534								259600
Cadillac				7182555					985607	2953574	599150							20556619
Chevrolet	8000	213310	1209735	6569568	420150	78688	2953245	106300	3504525	5927617	3117951	1178515	607670	2260032	3068812	300675	17532793	
Chrysler	98805			356545					630105	114510								2479859
Dodge	48000	44000		18000	2572405	60520	338497	12000	3264627	2235775	864172	557425	70708	719408	2417585	793055	14016177	
Ferrari									4723811	11418289								16142100
Fiat	325315			369305					327965									287570
Ford	36000	479873	480155	4370871	680770	566351	730007		1398144	3812353	2285584	1271330	2431898	1299240	2299348	1635565	23777489	
Gemini																		139850
GMC	144319			6641919	142750	468085				4062482	2183866	150630	603670	1306328				15704049
Honda	413200		2015270	3953209					252135	1588705	787720							2342105
HUMMER				377490							242405							619895
Hyundai	1038050		528880	2128890						724070								7452902
Infiniti				4340200					980050	2175750								6494090
Kia			406990	2049645					7064450	10177050								1980360
Lamborghini																		17241500
Land Rover	476394		9026595						1457311									9698720
Lexus		94700	3153974					472065	1016472									4837595
Lincoln			3422570						25342	453260								2458245
Lotus				155000				413260	1593200									2006460
Maserati								2342963	1972284									2153800
Maybach								2762750										6624047
Mazda	22000	24000	853180	3222525				870505	14000			580033	443130					1618571
McLaren								280225	918800									964780
Mercedes-Benz			122800	4924810	28950			5753964	6473107									1199625
Mitsubishi	394868	338850	2066505	2000		209893				260210	134360	2000						7080243
Nissan	14483	1023090	4149630	128620		1406552	131075	2943632	2422300	1026379	413320	21914	1769130					25181309
Oldsmobile			238150			2000				286015								4455249
Plymouth	82000		16000					85631	14000									691161
Pontiac	163505		162975	401550				473481	667715				541192					25679
Porsche	28827			1815200				4504586	4758533									1160535
Rolls-Royce								2141365	2204675									2713500
Saab	14000		36586	541905				632628										6519010
Scion	366325		282470						330210									1066590
Spyker								219990	419980									751280
Subaru	12000		678060	3020230					356476	365975								3042899
Suzuki	46496	14000	584387	2362141					122194	304131	259659							31500
Toyota	473750		1397750	4957050				386668	811995	3893760	3558504	1956518						2459596
Volkswagen	4171275		3222725	2084955				3612631	8000				1038130					21506992
Volvo	157550			3219000				121600	6000									22601341
Grand Total	8439663	1395896	14974513	100258517	1463760	1451621	66789858	505300	91511839	25347138	14010508	10543703	3713946	6253854	117530687	14959050	479149853	



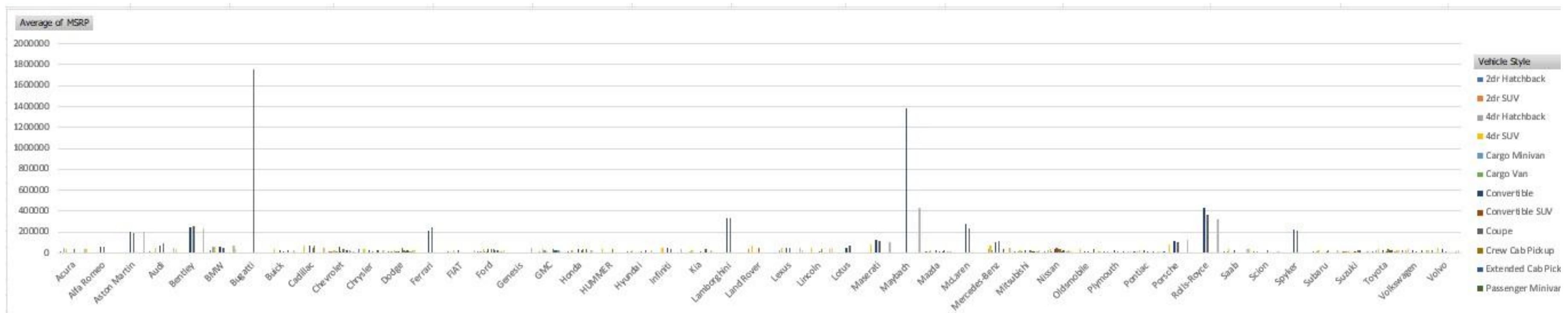
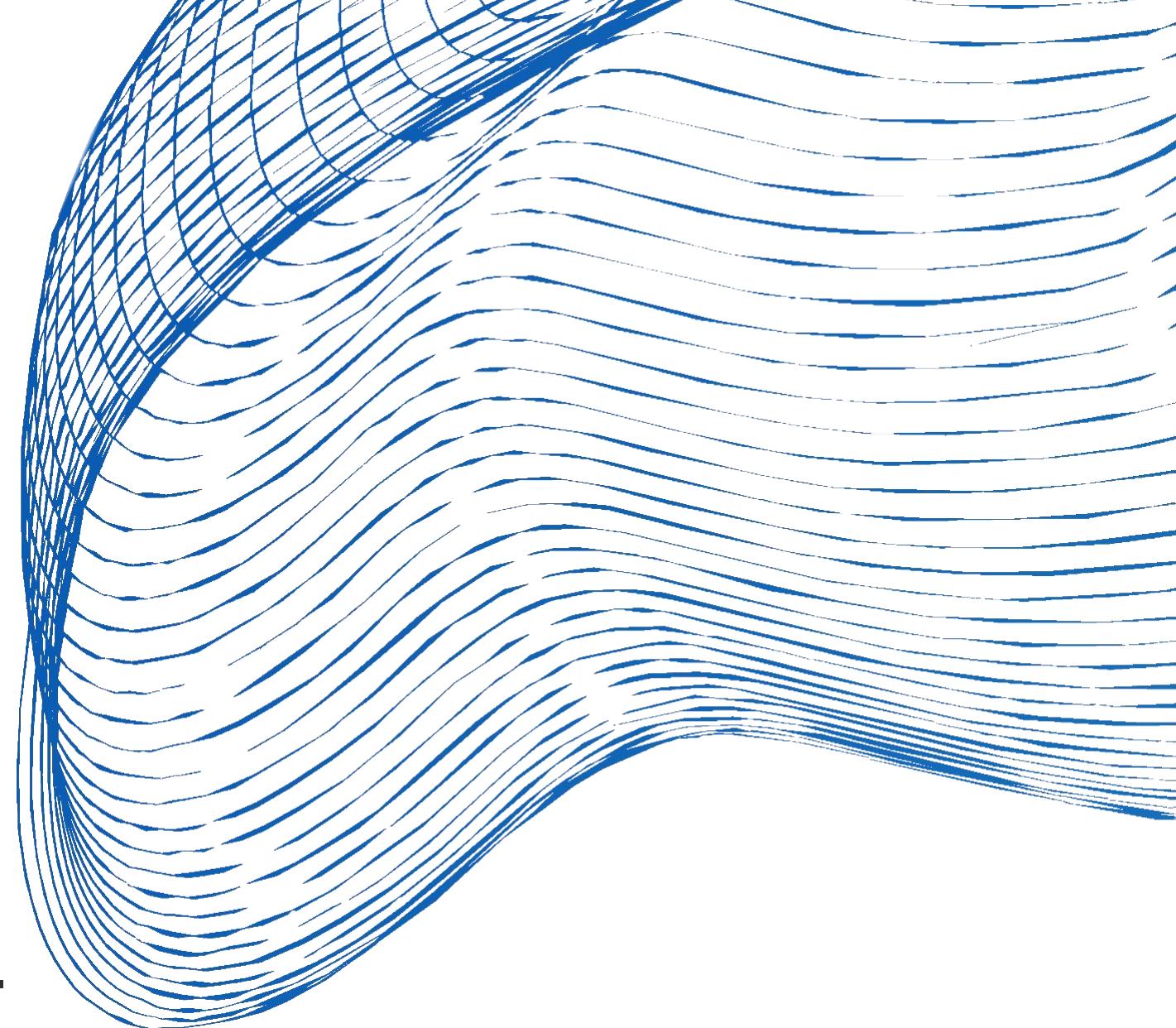
BUILDING THE DASHBOARD

TASK 2 INSIGHT

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

Cars of the style “Coupe” from the brand “Bugatti” has the highest average MSRP at 1757223.66.

While, “2dr hatchbacks” from the brands “Chevrolet”, “Audi”, and “ 2dr SUV” from “Dodge” happen to have the lowest average MSRP at 2000.



BUILDING THE DASHBOARD

TASK 3 INSIGHT

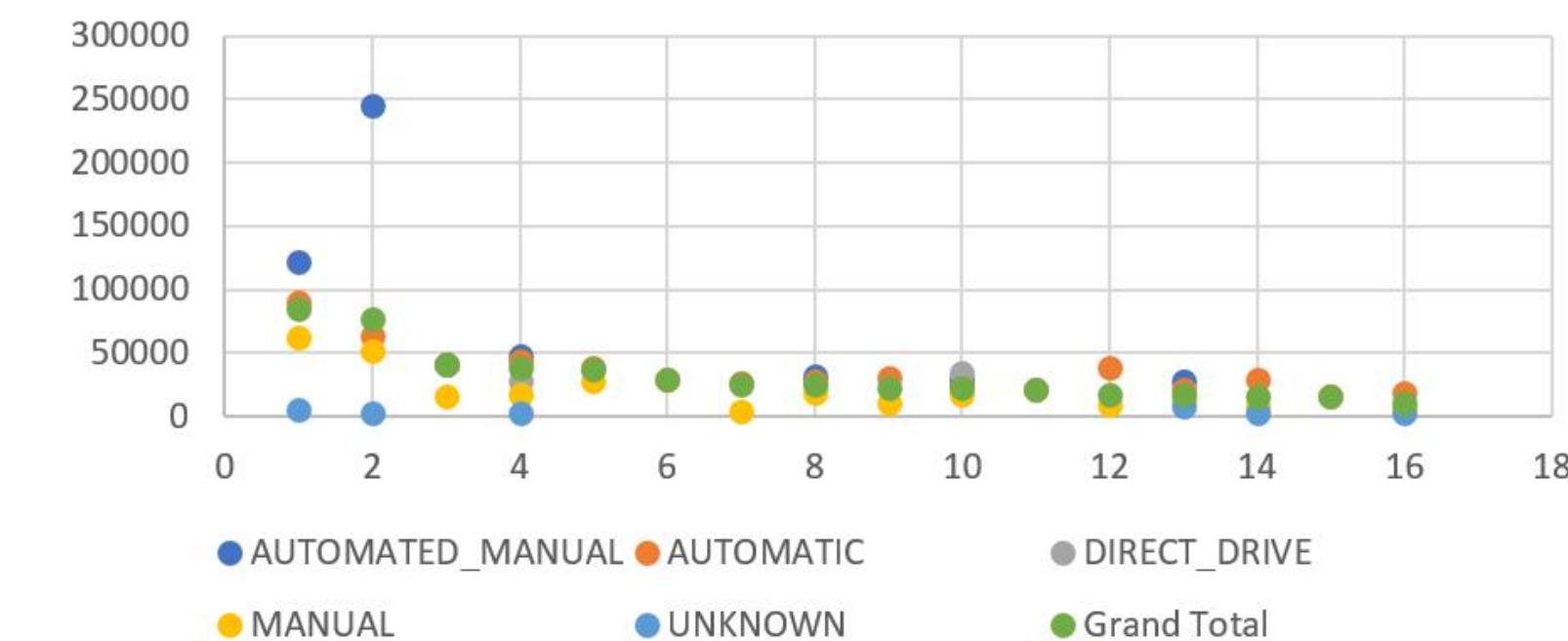
How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?

Different features have a different impact on the average MSRP of a car. Even the body style brings about a difference.

“Automated_Manual” type “Coupe” can have an average MSRP as high as 245588.36. whereas a “Coupe”, “Sedan”, and “Wagon” of unknown transmission type can have an average MSRP of 2000.00.

Average of MSRP	Column Labels							
Row Labels	AUTOMATED_MANUAL	AUTOMATIC	DIRECT_DRIVE	MANUAL	UNKNOWN	Grand Total		
2dr Hatchback	27180.96491	20926.464		13353.65831	7361.5	16778.65408		
2dr SUV		18615.20455		6303.811111	2371	10115.18841		
4dr Hatchback	29249.07407	23833.67898	34511.92308	17594.41313		22086.30236		
4dr SUV	40451.15385	41555.18825		15426.46226		40426.82137		
Cargo Minivan		20910.85714				20910.85714		
Cargo Van		15280.22105				15280.22105		
Convertible	121256.6444	90637.3869		62357.75625	5783.5	84224.28499		
Convertible SUV		38925.5		9233.142857		17424.13793		
Coupe	245588.3571	63852.00808		51070.47972	2000	76900.70504		
Crew Cab Pickup		37744.07154		28360.52632		37220.46696		
Extended Cab Pickup		30637.34973		10884.19455		22488.77689		
Passenger Minivan		26391.99748		4405.333333		25591.51214		
Passenger Van		29015.20313				29015.20313		
Regular Cab Pickup		28536.8239		7557.773333	2000	15953.70918		
Sedan	47498.70813	43760.61208	27822.5	17119.23374	2000	38969.06068		
Wagon	31985.27778	27613.19169		17844.13971		25483.90119		
Grand Total	99195.584	41129.06449	33620	26671.39699	3040.736842	40554.36758		

relationship between MSRP and transmission type

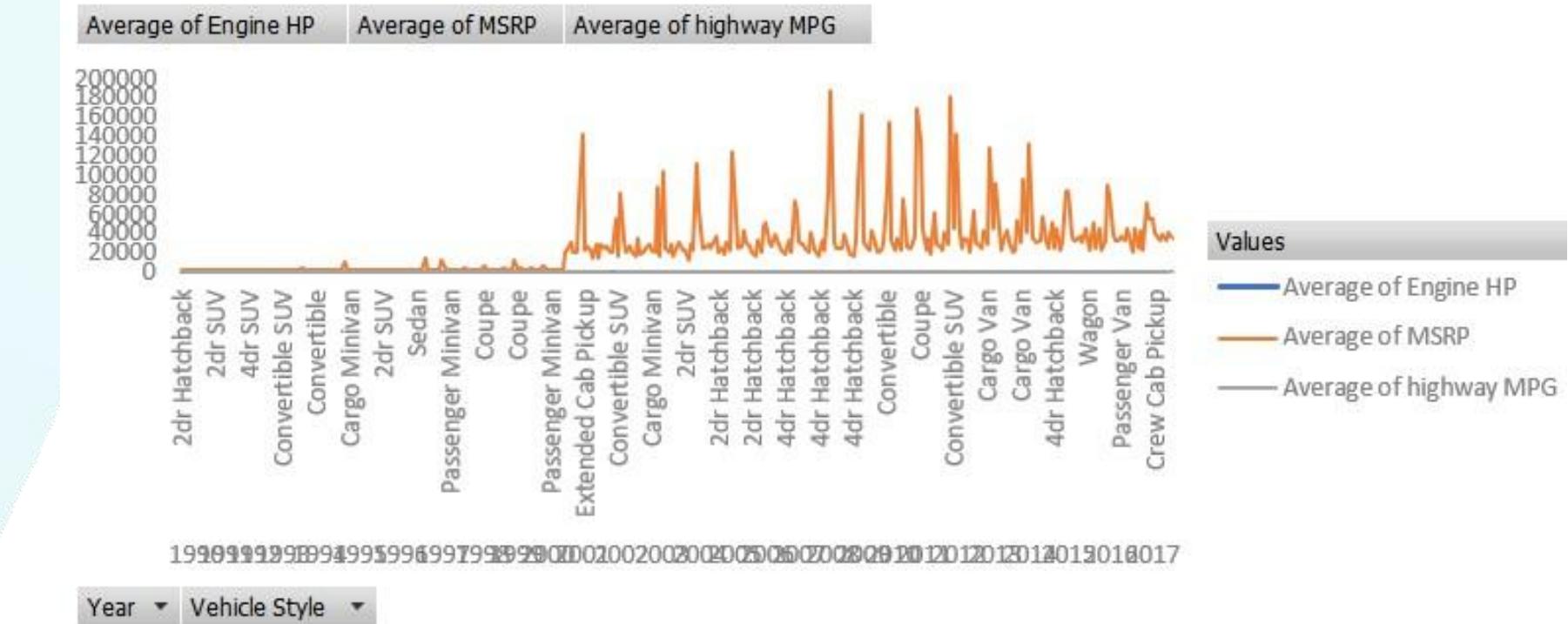
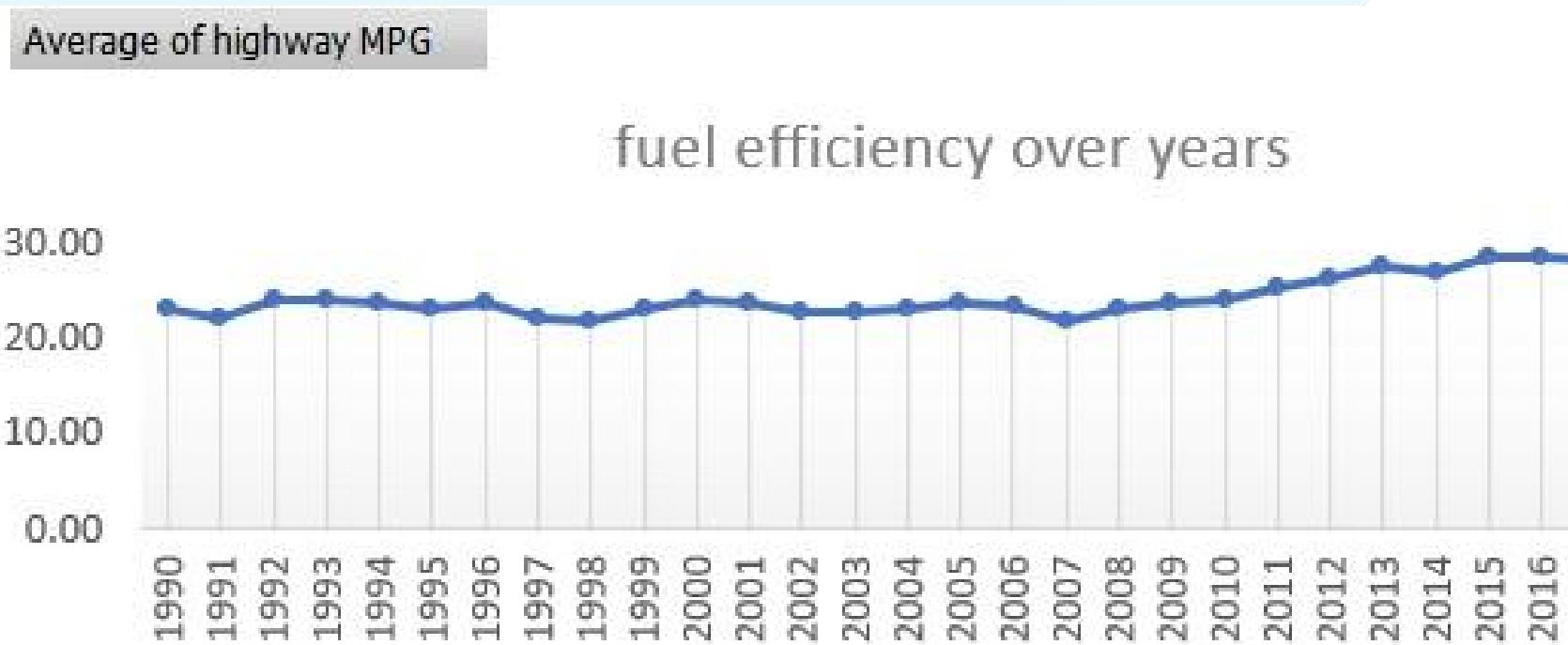


BUILDING THE DASHBOARD

TASK 4 INSIGHT

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

Given modern advancements, the trends have been in the favour of a fuel-efficient approach. The fuel efficiency of cars has increased as a whole, especially in models like “2008 coupe” and “convertible”.



Row Labels	Average of Engine HP	Average of MSRP	Average of highway MPG
1990	141.1300813	2020.203252	23.07317073
2dr Hatchback	126.8	2133.4	30.4
2dr SUV	148.5714286	2000	20
4dr Hatchback	93	2000	31
Cargo Minivan	107	2000	20
Convertible	178.5	2270.75	23.5
Coupe	166.2142857	2023.071429	24.5
Extended Cab Pickup	132.5	2000	22
Passenger Minivan	107.2142857	2000	18.85714286
Regular Cab Pickup	130.3846154	2000	22.23076923
Sedan	148.8571429	2011.771429	24
Wagon	140.6666667	2000	24.13333333
1991	147.7894737	2080.657895	22.15131579
2dr Hatchback	120.4666667	2069.8	30.06666667
2dr SUV	160	2000	16.25
4dr SUV	150	2000	19.33333333
Convertible	190.625	2660.625	22.625
Coupe	154.7894737	2032.736842	26.15789474

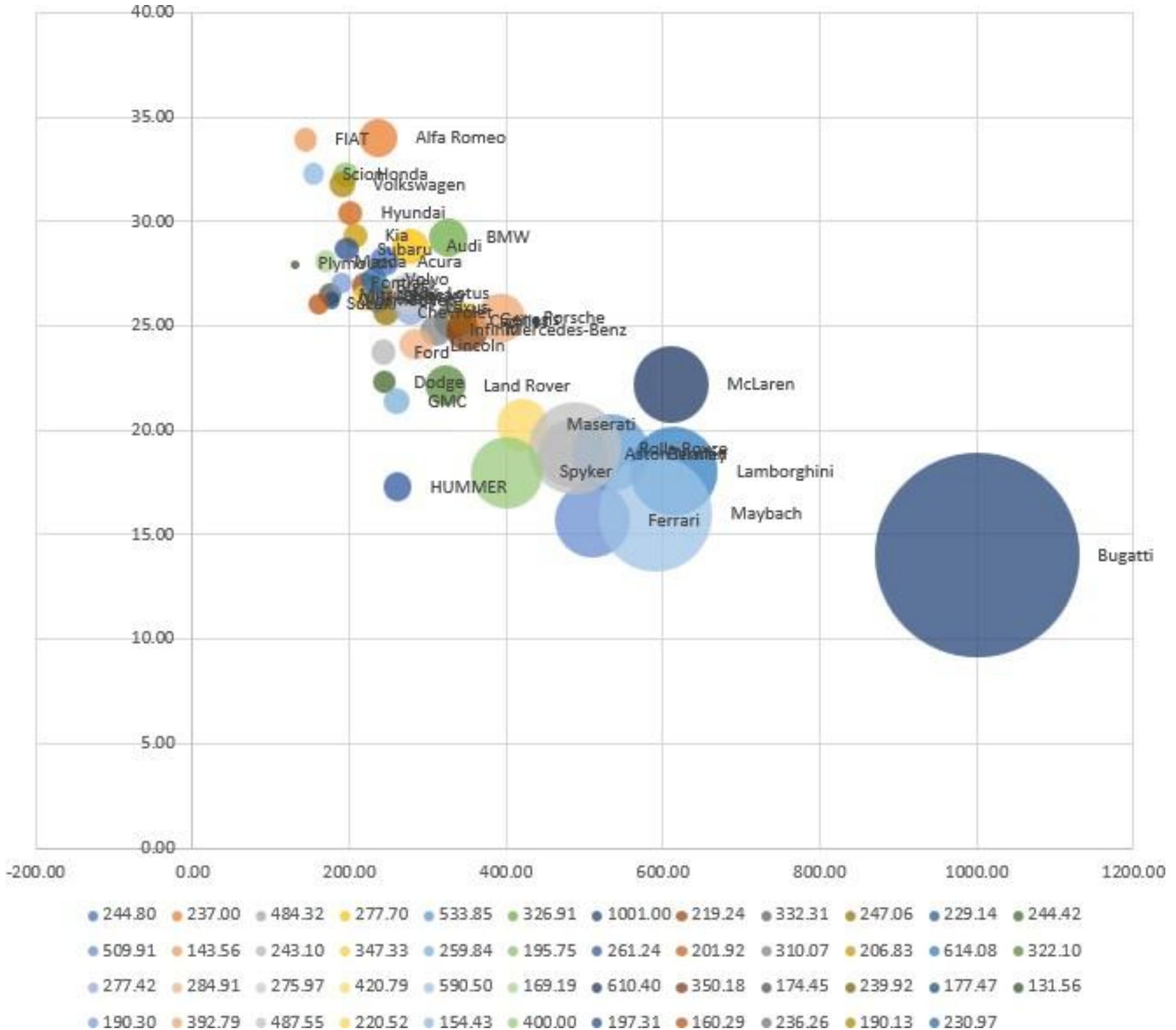
BUILDING THE DASHBOARD

TASK 5 INSIGHT

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

Bugatti Has the highest average MSRP, with highest average Engine HP and lowest of average Highway MPG.

Row Labels	Average of Engine HP	Average of highway MPG	Average of MSRP
Acura	244.80	28.11	34887.59
Alfa Romeo	237.00	34.00	61600.00
Aston Martin	484.32	18.89	197910.38
Audi	277.70	28.82	53452.11
Bentley	533.85	18.91	247169.32
BMW	326.91	29.25	61546.76
Bugatti	1001.00	14.00	1757223.67
Buick	219.24	26.95	28206.61
Cadillac	332.31	25.24	56231.32
Chevrolet	247.06	25.67	28273.36
Chrysler	229.14	26.37	26722.96
Dodge	244.42	22.35	22390.06

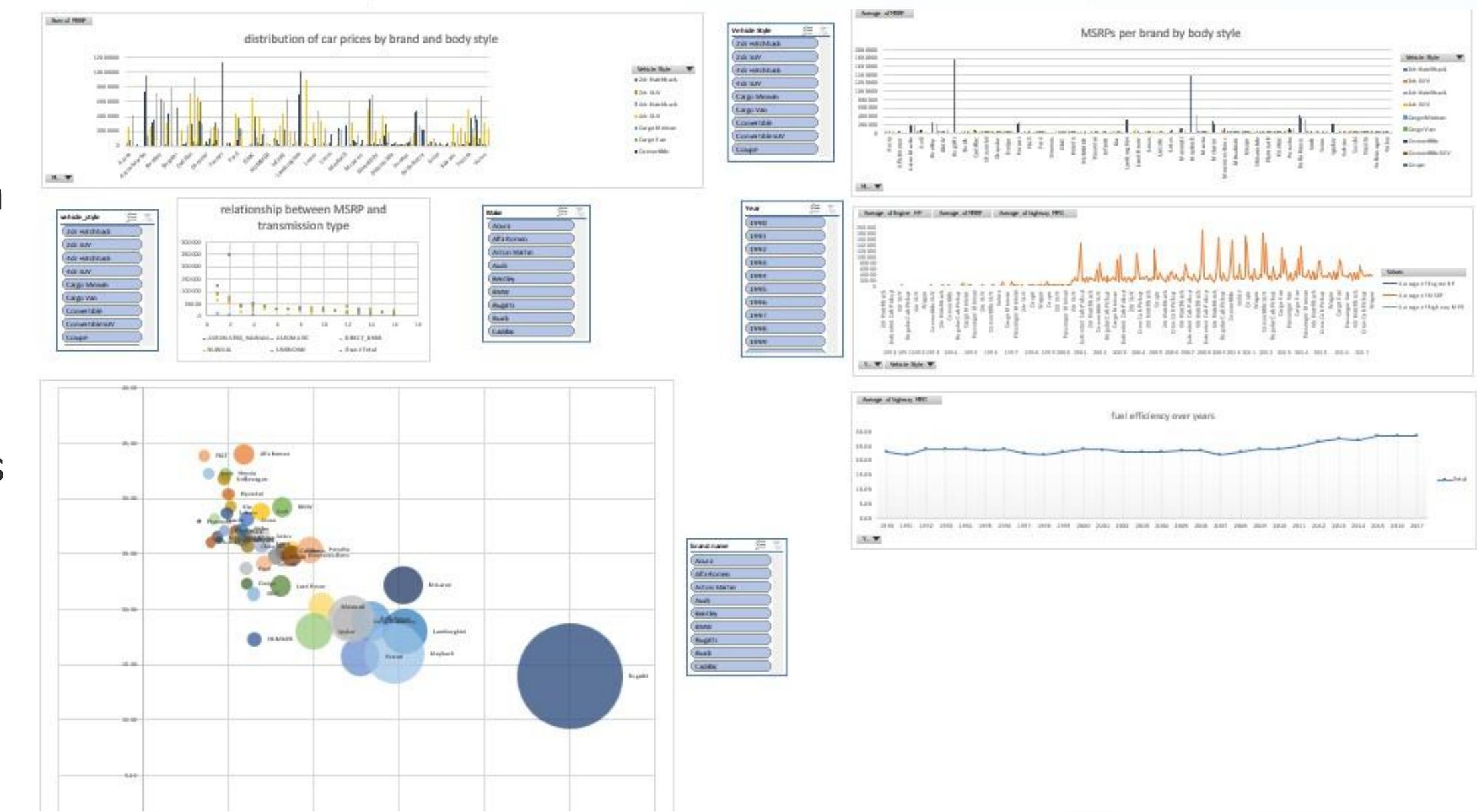


RESULTS

The Project provided us with a detailed insight related to the various factors and how they impact the prices associated with that of a car and how things vary based on the brands. The interactive dashboard proved to be quite the intriguing approach to answer the questions from the clients as requested.

[Link to Presentation folder.](#)

[Link to Analysis folder.](#)



THANK YOU!

