Analysing the Impact of Car Features on Price and Profitability

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DESCRIPTION

The project delves into analyzing the correlation between car features, consumer demand, and pricing in the automotive sector. Through regression analysis on a comprehensive dataset, it aims to pinpoint the most sought-after features influencing car prices. By considering shifting consumer preferences like the surge in electric and hybrid vehicles, the project seeks to advise manufacturers on strategic pricing and product development to bolster their market position and profitability effectively.

Data Description

- **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

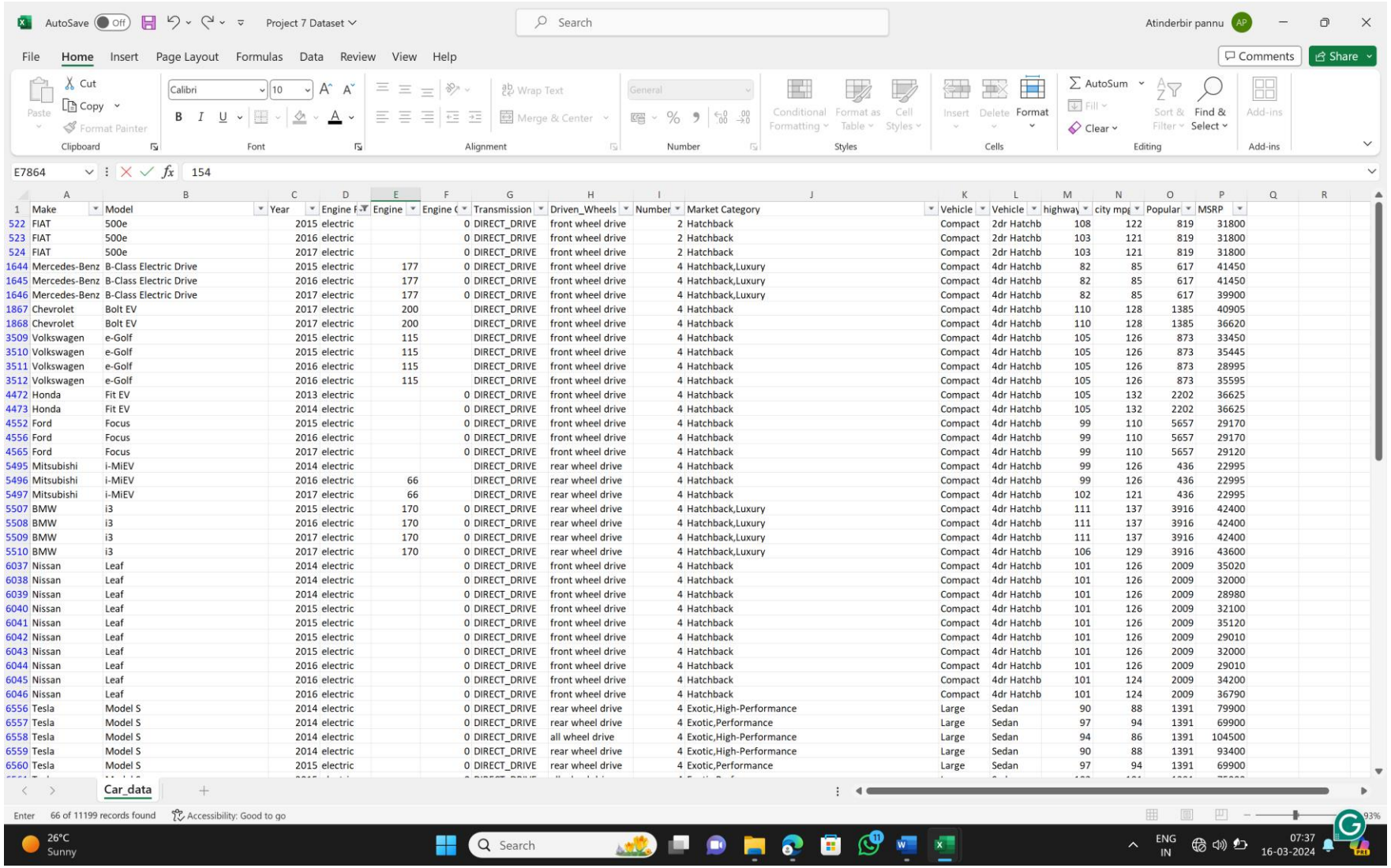
TECH-USED

- Ms-Excel 2021
- Ms-Powerpoint 2021

Approach

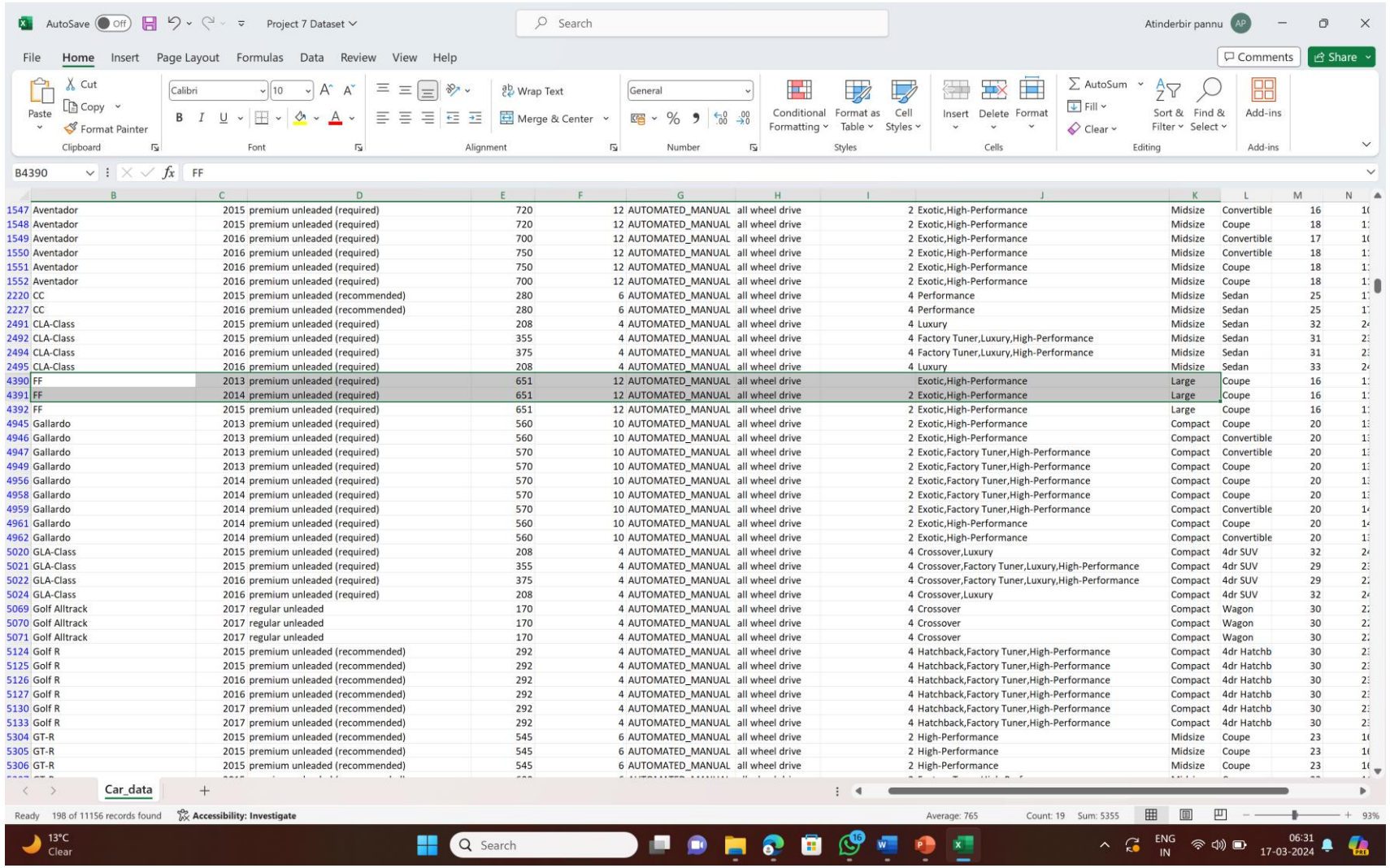
- The initial steps of the project involved data cleaning, including the removal duplicate entries.
- Missing values were then addressed through imputation, utilizing the median for numerical data (Engine HP) and categorical values (Number of Doors and Engine Cylinders) where appropriate.
- Furthermore, data cleaning was conducted, particularly for car model entries containing dates as values, which were deemed unsuitable for analysis and thus removed from the dataset.
- Pivot tables and Excel functions aided in extracting insights, while various charts visually represented the findings for enhanced understanding of the dataset.

- Missing values in the data imputed by using median



	Make	Model	Year	Engine F	Engine	Engine C	Transmission	Driven_Wheels	Number	Market Category	Vehicle	Vehicle	highway	city mpg	Popular	MSRP
522	FIAT	500e	2015	electric		0	DIRECT_DRIVE	front wheel drive	2	Hatchback	Compact	2dr Hatchb	108	122	819	31800
523	FIAT	500e	2016	electric		0	DIRECT_DRIVE	front wheel drive	2	Hatchback	Compact	2dr Hatchb	103	121	819	31800
524	FIAT	500e	2017	electric		0	DIRECT_DRIVE	front wheel drive	2	Hatchback	Compact	2dr Hatchb	103	121	819	31800
1644	Mercedes-Benz	B-Class Electric Drive	2015	electric	177	0	DIRECT_DRIVE	front wheel drive	4	Hatchback,Luxury	Compact	4dr Hatchb	82	85	617	41450
1645	Mercedes-Benz	B-Class Electric Drive	2016	electric	177	0	DIRECT_DRIVE	front wheel drive	4	Hatchback,Luxury	Compact	4dr Hatchb	82	85	617	41450
1646	Mercedes-Benz	B-Class Electric Drive	2017	electric	177	0	DIRECT_DRIVE	front wheel drive	4	Hatchback,Luxury	Compact	4dr Hatchb	82	85	617	39900
1867	Chevrolet	Bolt EV	2017	electric	200		DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	110	128	1385	40905
1868	Chevrolet	Bolt EV	2017	electric	200		DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	110	128	1385	36620
3509	Volkswagen	e-Golf	2015	electric	115		DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	105	126	873	33450
3510	Volkswagen	e-Golf	2015	electric	115		DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	105	126	873	35445
3511	Volkswagen	e-Golf	2016	electric	115		DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	105	126	873	28995
3512	Volkswagen	e-Golf	2016	electric	115		DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	105	126	873	35595
4472	Honda	Fit EV	2013	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	105	132	2202	36625
4473	Honda	Fit EV	2014	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	105	132	2202	36625
4552	Ford	Focus	2015	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	99	110	5657	29170
4556	Ford	Focus	2016	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	99	110	5657	29170
4565	Ford	Focus	2017	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	99	110	5657	29120
5495	Mitsubishi	i-MiEV	2014	electric			DIRECT_DRIVE	rear wheel drive	4	Hatchback	Compact	4dr Hatchb	99	126	436	22995
5496	Mitsubishi	i-MiEV	2016	electric	66		DIRECT_DRIVE	rear wheel drive	4	Hatchback	Compact	4dr Hatchb	99	126	436	22995
5497	Mitsubishi	i-MiEV	2017	electric	66		DIRECT_DRIVE	rear wheel drive	4	Hatchback	Compact	4dr Hatchb	102	121	436	22995
5507	BMW	i3	2015	electric	170	0	DIRECT_DRIVE	rear wheel drive	4	Hatchback,Luxury	Compact	4dr Hatchb	111	137	3916	42400
5508	BMW	i3	2016	electric	170	0	DIRECT_DRIVE	rear wheel drive	4	Hatchback,Luxury	Compact	4dr Hatchb	111	137	3916	42400
5509	BMW	i3	2017	electric	170	0	DIRECT_DRIVE	rear wheel drive	4	Hatchback,Luxury	Compact	4dr Hatchb	111	137	3916	42400
5510	BMW	i3	2017	electric	170	0	DIRECT_DRIVE	rear wheel drive	4	Hatchback,Luxury	Compact	4dr Hatchb	106	129	3916	43600
6037	Nissan	Leaf	2014	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	35020
6038	Nissan	Leaf	2014	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	32000
6039	Nissan	Leaf	2014	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	28980
6040	Nissan	Leaf	2015	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	32100
6041	Nissan	Leaf	2015	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	35120
6042	Nissan	Leaf	2015	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	29010
6043	Nissan	Leaf	2015	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	32000
6044	Nissan	Leaf	2016	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	126	2009	29010
6045	Nissan	Leaf	2016	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	124	2009	34200
6046	Nissan	Leaf	2016	electric		0	DIRECT_DRIVE	front wheel drive	4	Hatchback	Compact	4dr Hatchb	101	124	2009	36790
6556	Tesla	Model S	2014	electric		0	DIRECT_DRIVE	rear wheel drive	4	Exotic,High-Performance	Large	Sedan	90	88	1391	79900
6557	Tesla	Model S	2014	electric		0	DIRECT_DRIVE	rear wheel drive	4	Exotic,Performance	Large	Sedan	97	94	1391	69900
6558	Tesla	Model S	2014	electric		0	DIRECT_DRIVE	all wheel drive	4	Exotic,High-Performance	Large	Sedan	94	86	1391	104500
6559	Tesla	Model S	2014	electric		0	DIRECT_DRIVE	rear wheel drive	4	Exotic,High-Performance	Large	Sedan	90	88	1391	93400
6560	Tesla	Model S	2015	electric		0	DIRECT_DRIVE	rear wheel drive	4	Exotic,Performance	Large	Sedan	97	94	1391	69900

- Missing data that is imputed using the dataset (categorically)



	B	C	D	E	F	G	H	I	J	K	L	M	N
1547	Aventador	2015	premium unleaded (required)	720	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Midsize	Convertible	16	1(
1548	Aventador	2015	premium unleaded (required)	720	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Midsize	Coupe	18	1:
1549	Aventador	2016	premium unleaded (required)	700	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Midsize	Convertible	17	1(
1550	Aventador	2016	premium unleaded (required)	750	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Midsize	Convertible	18	1:
1551	Aventador	2016	premium unleaded (required)	750	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Midsize	Coupe	18	1:
1552	Aventador	2016	premium unleaded (required)	700	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Midsize	Coupe	18	1:
2220	CC	2015	premium unleaded (recommended)	280	6	AUTOMATED_MANUAL	all wheel drive	4	Performance	Midsize	Sedan	25	1:
2227	CC	2016	premium unleaded (recommended)	280	6	AUTOMATED_MANUAL	all wheel drive	4	Performance	Midsize	Sedan	25	1:
2491	CLA-Class	2015	premium unleaded (required)	208	4	AUTOMATED_MANUAL	all wheel drive	4	Luxury	Midsize	Sedan	32	2(
2492	CLA-Class	2015	premium unleaded (required)	355	4	AUTOMATED_MANUAL	all wheel drive	4	Factory Tuner,Luxury,High-Performance	Midsize	Sedan	31	2:
2494	CLA-Class	2016	premium unleaded (required)	375	4	AUTOMATED_MANUAL	all wheel drive	4	Factory Tuner,Luxury,High-Performance	Midsize	Sedan	31	2:
2495	CLA-Class	2016	premium unleaded (required)	208	4	AUTOMATED_MANUAL	all wheel drive	4	Luxury	Midsize	Sedan	33	2(
4390	FF	2013	premium unleaded (required)	651	12	AUTOMATED_MANUAL	all wheel drive		Exotic,High-Performance	Large	Coupe	16	1:
4391	FF	2014	premium unleaded (required)	651	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Large	Coupe	16	1:
4392	FF	2015	premium unleaded (required)	651	12	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Large	Coupe	16	1:
4945	Gallardo	2013	premium unleaded (required)	560	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Compact	Coupe	20	1:
4946	Gallardo	2013	premium unleaded (required)	560	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Compact	Convertible	20	1:
4947	Gallardo	2013	premium unleaded (required)	570	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,Factory Tuner,High-Performance	Compact	Convertible	20	1:
4949	Gallardo	2013	premium unleaded (required)	570	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,Factory Tuner,High-Performance	Compact	Coupe	20	1:
4956	Gallardo	2014	premium unleaded (required)	570	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,Factory Tuner,High-Performance	Compact	Coupe	20	1:
4958	Gallardo	2014	premium unleaded (required)	570	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,Factory Tuner,High-Performance	Compact	Coupe	20	1:
4959	Gallardo	2014	premium unleaded (required)	570	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,Factory Tuner,High-Performance	Compact	Convertible	20	1(
4961	Gallardo	2014	premium unleaded (required)	560	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Compact	Coupe	20	1(
4962	Gallardo	2014	premium unleaded (required)	560	10	AUTOMATED_MANUAL	all wheel drive	2	Exotic,High-Performance	Compact	Convertible	20	1:
5020	GLA-Class	2015	premium unleaded (required)	208	4	AUTOMATED_MANUAL	all wheel drive	4	Crossover,Luxury	Compact	4dr SUV	32	2(
5021	GLA-Class	2015	premium unleaded (required)	355	4	AUTOMATED_MANUAL	all wheel drive	4	Crossover,Factory Tuner,Luxury,High-Performance	Compact	4dr SUV	29	2:
5022	GLA-Class	2016	premium unleaded (required)	375	4	AUTOMATED_MANUAL	all wheel drive	4	Crossover,Factory Tuner,Luxury,High-Performance	Compact	4dr SUV	29	2:
5024	GLA-Class	2016	premium unleaded (required)	208	4	AUTOMATED_MANUAL	all wheel drive	4	Crossover,Luxury	Compact	4dr SUV	32	2(
5069	Golf Alltrack	2017	regular unleaded	170	4	AUTOMATED_MANUAL	all wheel drive	4	Crossover	Compact	Wagon	30	2:
5070	Golf Alltrack	2017	regular unleaded	170	4	AUTOMATED_MANUAL	all wheel drive	4	Crossover	Compact	Wagon	30	2:
5071	Golf Alltrack	2017	regular unleaded	170	4	AUTOMATED_MANUAL	all wheel drive	4	Crossover	Compact	Wagon	30	2:
5124	Golf R	2015	premium unleaded (recommended)	292	4	AUTOMATED_MANUAL	all wheel drive	4	Hatchback,Factory Tuner,High-Performance	Compact	4dr Hatchb	30	2:
5125	Golf R	2015	premium unleaded (recommended)	292	4	AUTOMATED_MANUAL	all wheel drive	4	Hatchback,Factory Tuner,High-Performance	Compact	4dr Hatchb	30	2:
5126	Golf R	2016	premium unleaded (recommended)	292	4	AUTOMATED_MANUAL	all wheel drive	4	Hatchback,Factory Tuner,High-Performance	Compact	4dr Hatchb	30	2:
5127	Golf R	2016	premium unleaded (recommended)	292	4	AUTOMATED_MANUAL	all wheel drive	4	Hatchback,Factory Tuner,High-Performance	Compact	4dr Hatchb	30	2:
5130	Golf R	2017	premium unleaded (recommended)	292	4	AUTOMATED_MANUAL	all wheel drive	4	Hatchback,Factory Tuner,High-Performance	Compact	4dr Hatchb	30	2:
5133	Golf R	2017	premium unleaded (recommended)	292	4	AUTOMATED_MANUAL	all wheel drive	4	Hatchback,Factory Tuner,High-Performance	Compact	4dr Hatchb	30	2:
5304	GT-R	2015	premium unleaded (recommended)	545	6	AUTOMATED_MANUAL	all wheel drive	2	High-Performance	Midsize	Coupe	23	1(
5305	GT-R	2015	premium unleaded (recommended)	545	6	AUTOMATED_MANUAL	all wheel drive	2	High-Performance	Midsize	Coupe	23	1(
5306	GT-R	2015	premium unleaded (recommended)	545	6	AUTOMATED_MANUAL	all wheel drive	2	High-Performance	Midsize	Coupe	23	1(

INSIGHTS

These are the insights that have been obtained from the dataset:

- There exists a direct correlation between Engine HP (horsepower) and MSRP (manufacturer's suggested retail price), implying that vehicles with higher horsepower generally command higher prices.
- Conversely, as the number of cylinders increases, Highway MPG (miles per gallon) tends to decrease, showcasing an inverse relationship between these variables.
- Higher the number of cylinders typically corresponds to a higher manufacturer's suggested retail price (MSRP), indicating a direct correlation between the two factors in the automotive industry.
- Results for the obtained insights are given below:

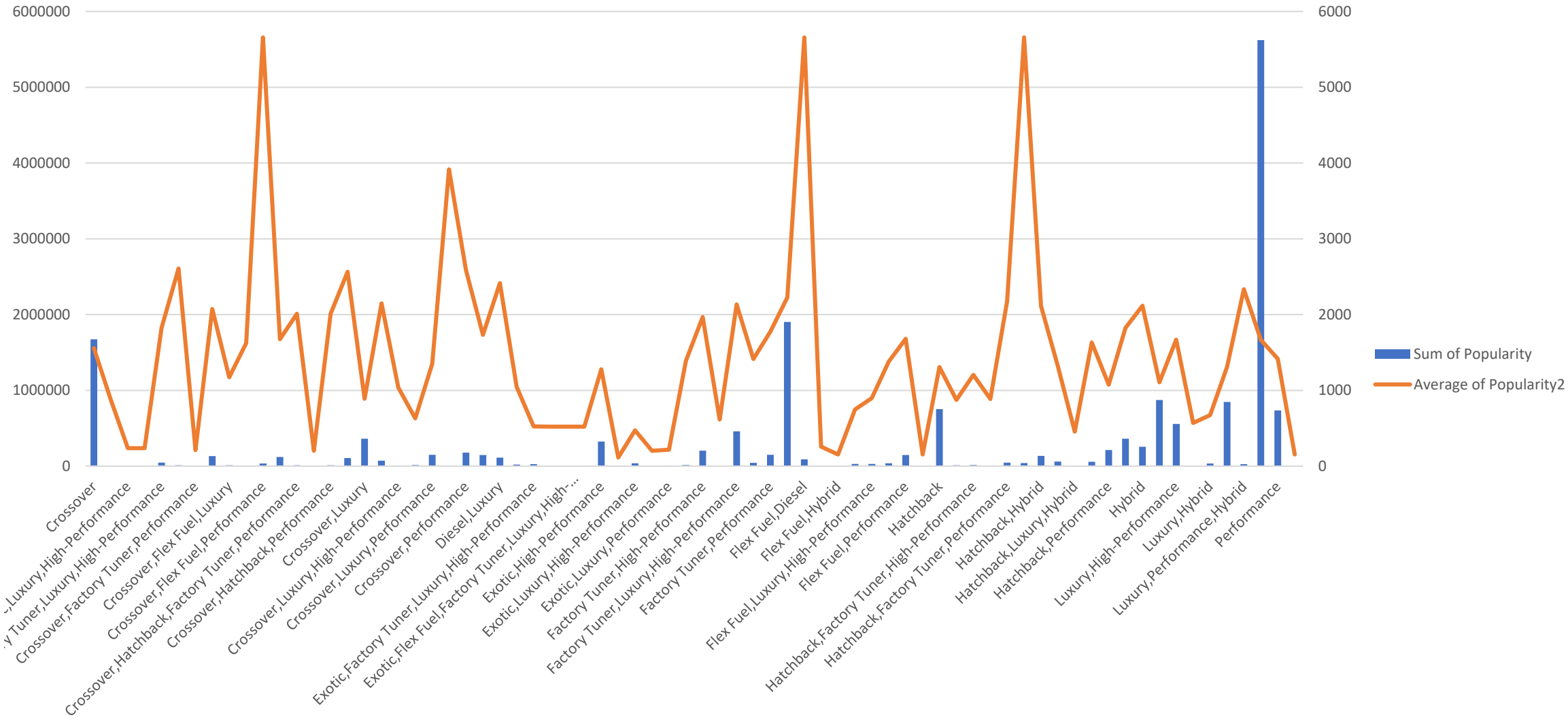
Task 1.A: Create a pivot table that shows the number of car models in each market category and their corresponding popularity scores.

Row Labels	Count of Model	Sum of Popularity
Crossover	1075	1672881
Crossover,Diesel	7	6111
Crossover,Exotic,Luxury,High-Performance	1	238
Crossover,Exotic,Luxury,Performance	1	238
Crossover,Factory Tuner,Luxury,High-Performance	26	47410
Crossover,Factory Tuner,Luxury,Performance	5	13037
Crossover,Factory Tuner,Performance	4	840
Crossover,Flex Fuel	64	132720
Crossover,Flex Fuel,Luxury	10	11732
Crossover,Flex Fuel,Luxury,Performance	6	9744
Crossover,Flex Fuel,Performance	6	33942
Crossover,Hatchback	72	120650
Crossover,Hatchback,Factory Tuner,Performance	6	12054
Crossover,Hatchback,Luxury	7	1428
Crossover,Hatchback,Performance	6	12054
Crossover,Hybrid	42	107662
Crossover,Luxury	406	361021
Crossover,Luxury,Diesel	34	73080
Crossover,Luxury,High-Performance	9	9335
Crossover,Luxury,Hybrid	24	15142
Crossover,Luxury,Performance	112	151098
Crossover,Luxury,Performance,Hybrid	2	7832
Crossover,Performance	69	178431
Diesel	84	145396
Diesel,Luxury	47	113557
Exotic,Factory Tuner,High-Performance	21	21974
Exotic,Factory Tuner,Luxury,High-Performance	51	26674
Exotic,Factory Tuner,Luxury,Performance	3	1560
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Performance	13	6760
Exotic,Flex Fuel,Luxury,High-Performance	11	5720
Exotic,High-Performance	254	325132
Exotic,Luxury	12	1352
Exotic,Luxury,High-Performance	77	36423
Exotic,Luxury,High-Performance,Hybrid	1	204
Exotic,Luxury,Performance	36	7813
Exotic,Performance	10	13910
Factory Tuner,High-Performance	104	204510
Factory Tuner,Luxury	2	1234
Factory Tuner,Luxury,High-Performance	215	458674
Factory Tuner,Luxury,Performance	31	43816
Factory Tuner,Performance	84	149020
Flex Fuel	855	1902985
Flex Fuel,Diesel	16	90512
Flex Fuel,Factory Tuner,Luxury,High-Performance	1	258
Flex Fuel,Hybrid	2	310
Flex Fuel,Luxury	39	29115
Flex Fuel,Luxury,High-Performance	32	28746
Flex Fuel,Luxury,Performance	28	38642
Flex Fuel,Performance	87	146201
Flex Fuel,Performance,Hybrid	2	310
Hatchback	574	751167
Hatchback,Diesel	14	12222
Hatchback,Factory Tuner,High-Performance	13	15667
Hatchback,Factory Tuner,Luxury,Performance	9	7982
Hatchback,Factory Tuner,Performance	21	45648
Hatchback,Flex Fuel	7	39599
Hatchback,Hybrid	64	135114
Hatchback,Luxury	45	59541
Hatchback,Luxury,Hybrid	3	1362
Hatchback,Luxury,Performance	36	58761
Hatchback,Performance	198	212585
High-Performance	198	361029
Hybrid	121	256107
Luxury	788	872221
Luxury,High-Performance	334	557118
Luxury,High-Performance,Hybrid	12	6826
Luxury,Hybrid	52	35029
Luxury,Performance	647	847616
Luxury,Performance,Hybrid	11	25665
N/A	3376	5620476
Performance	520	735909

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

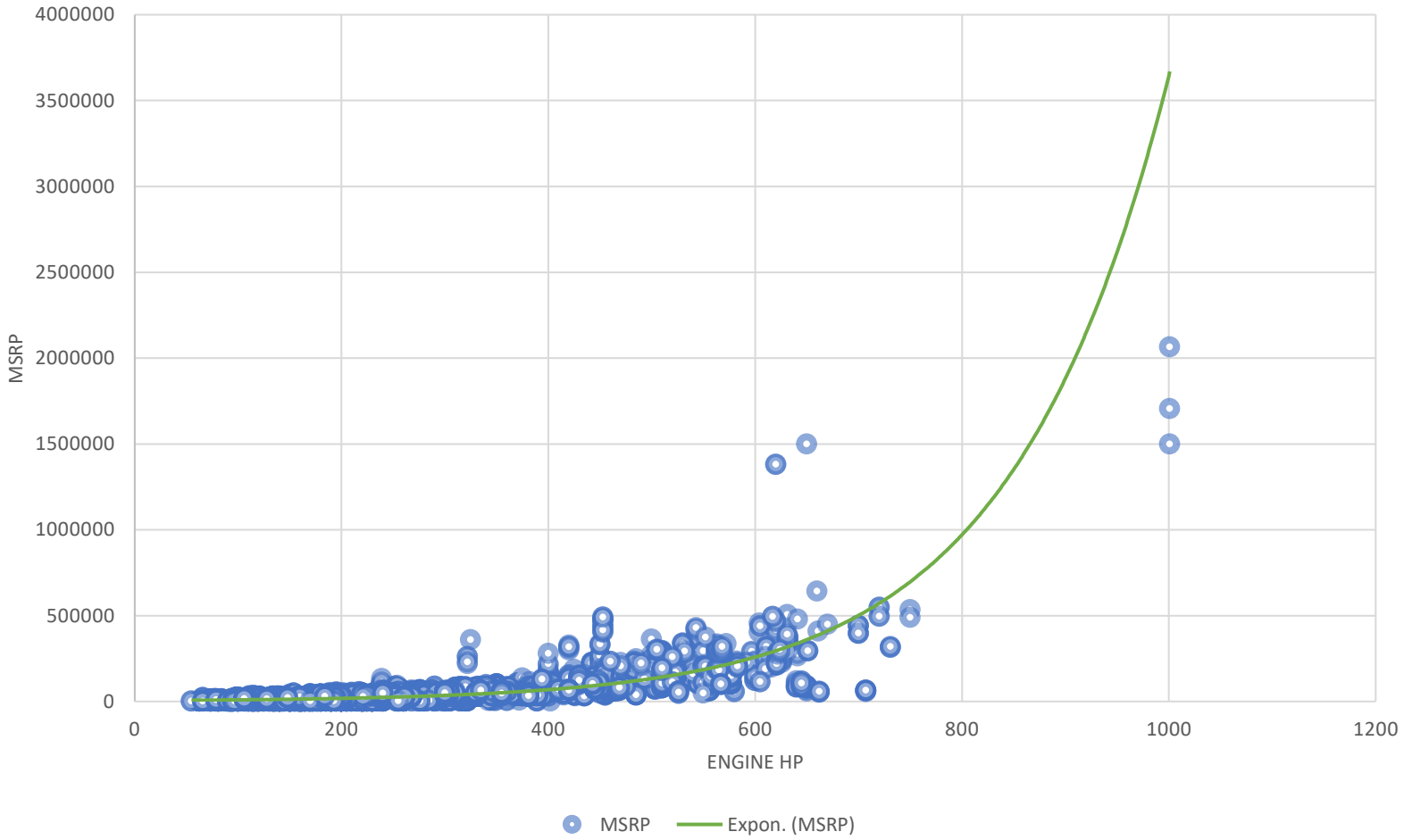
Row Labels	Sum of Popularity	Average of Popularity2
Crossover	1672881	1556.168372
Crossover,Diesel	6111	873
Crossover,Exotic,Luxury,High-Performance	238	238
Crossover,Exotic,Luxury,Performance	238	238
Crossover,Factory Tuner,Luxury,High-Performance	47410	1823.461538
Crossover,Factory Tuner,Luxury,Performance	13037	2607.4
Crossover,Factory Tuner,Performance	840	210
Crossover,Flex Fuel	132720	2073.75
Crossover,Flex Fuel,Luxury	11732	1173.2
Crossover,Flex Fuel,Luxury,Performance	9744	1624
Crossover,Flex Fuel,Performance	33942	5657
Crossover,Hatchback	120650	1675.694444
Crossover,Hatchback,Factory Tuner,Performance	12054	2009
Crossover,Hatchback,Luxury	1428	204
Crossover,Hatchback,Performance	12054	2009
Crossover,Hybrid	107662	2563.380952
Crossover,Luxury	361021	889.2142857
Crossover,Luxury,Diesel	73080	2149.411765
Crossover,Luxury,High-Performance	9335	1037.222222
Crossover,Luxury,Hybrid	15142	630.9166667
Crossover,Luxury,Performance	151098	1349.089286
Crossover,Luxury,Performance,Hybrid	7832	3916
Crossover,Performance	178431	2585.956522
Diesel	145396	1730.904762
Diesel,Luxury	113557	2416.106383
Exotic,Factory Tuner,High-Performance	21974	1046.380952
Exotic,Factory Tuner,Luxury,High-Performance	26674	523.0196078
Exotic,Factory Tuner,Luxury,Performance	1560	520
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Performance	6760	520
Exotic,Flex Fuel,Luxury,High-Performance	5720	520
Exotic,High-Performance	325132	1280.047244
Exotic,Luxury	1352	112.6666667
Exotic,Luxury,High-Performance	36423	473.025974
Exotic,Luxury,High-Performance,Hybrid	204	204
Exotic,Luxury,Performance	7813	217.0277778
Exotic,Performance	13910	1391
Factory Tuner,High-Performance	204510	1966.442308

- Chart for market category and popularity

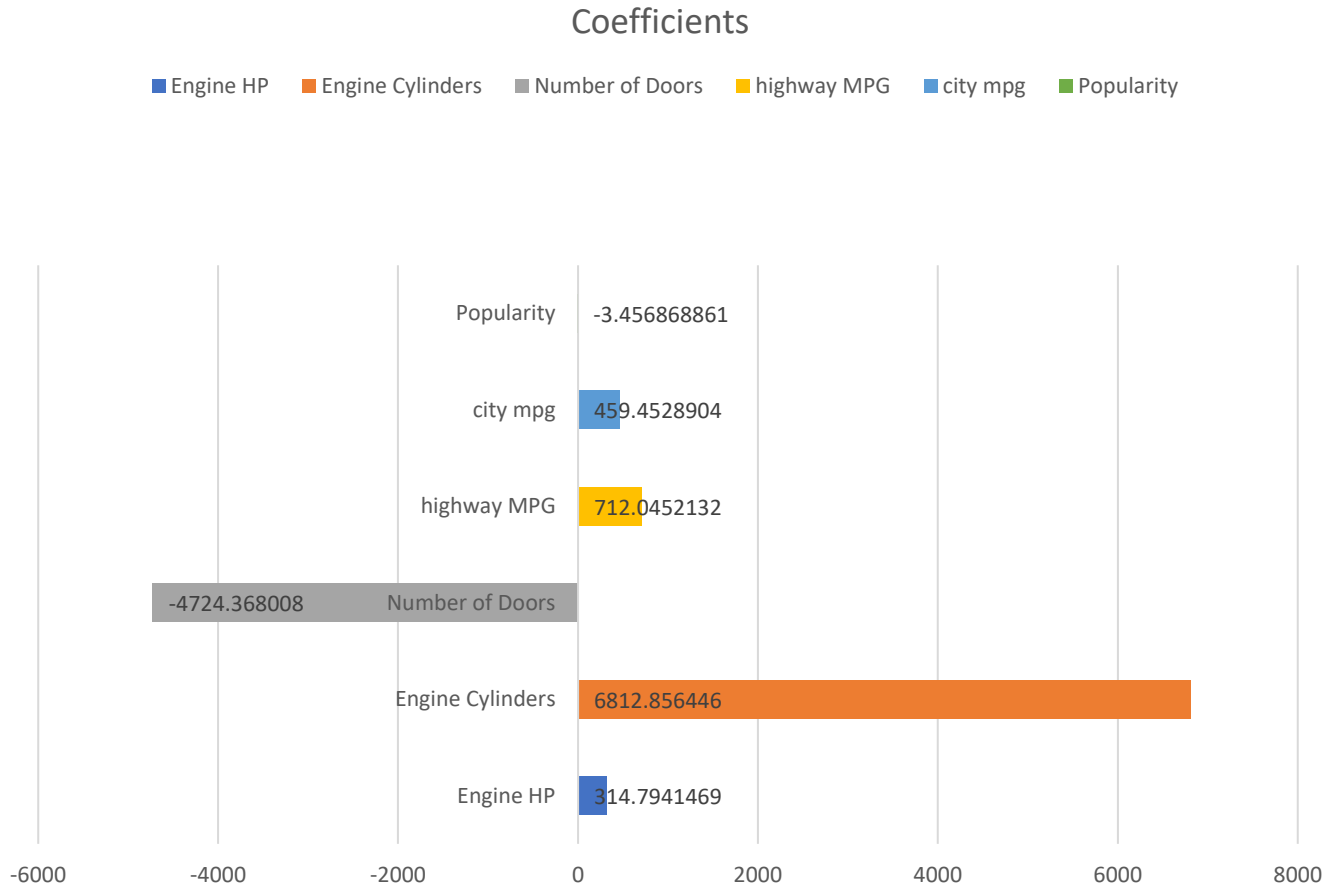


Task 2: Create a scatter chart that plots engine power on the x-axis and price on the y-axis. Add a trendline to the chart to visualize the relationship between these variables.

The graph displays a positive slope on the trendline, indicating a direct relationship between a car's engine power and its price. In simpler terms, cars with more powerful engines tend to have higher prices.



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	0.679902133
R Square	0.462266911
Adjusted R	0.461977521
Standard Er	45221.92822
Observatio	11156

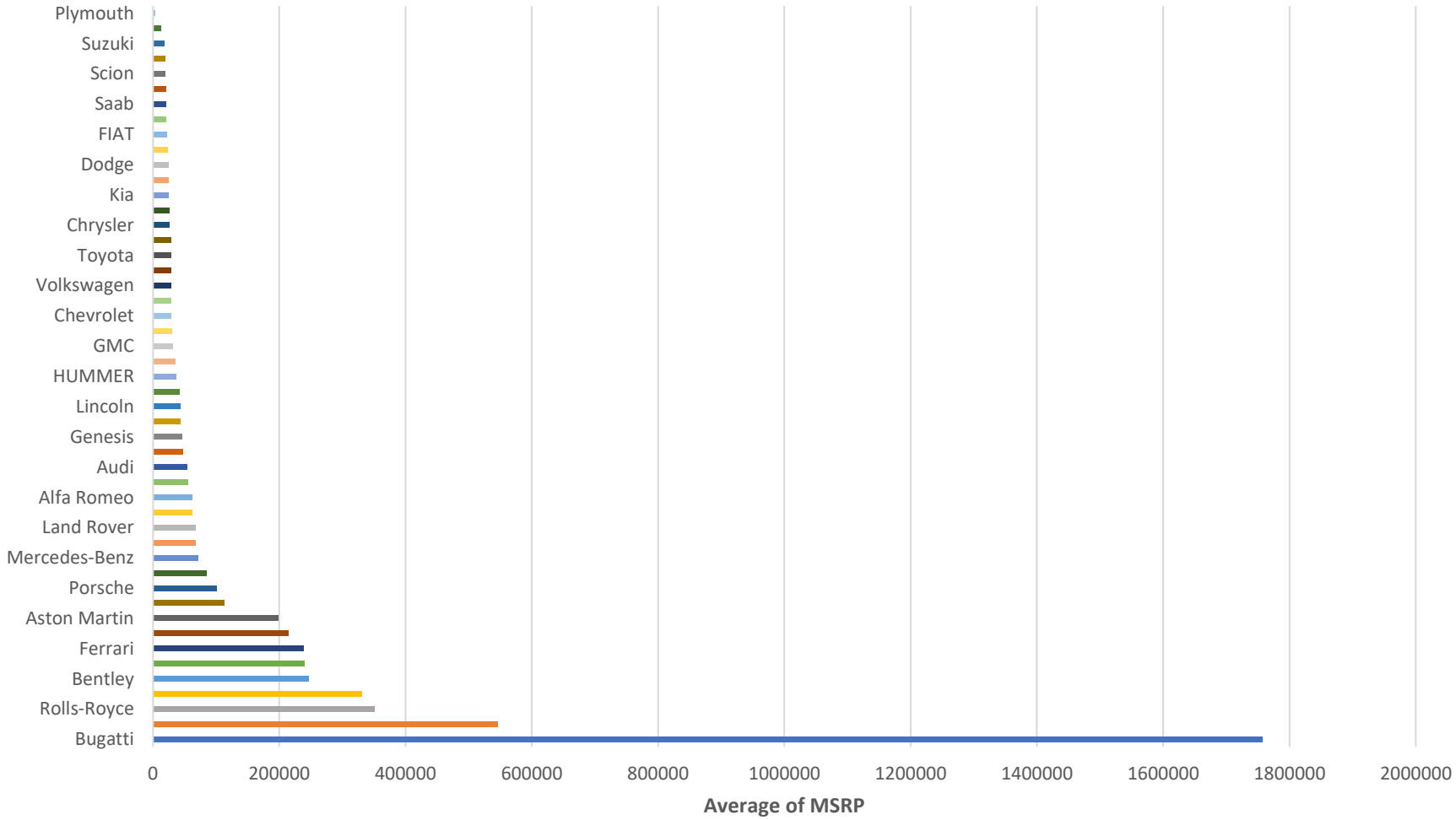
	Coefficients
Intercept	-82738.95031
Engine HP	314.7941469
Engine Cylir	6812.856446
Number of	-4724.368008
highway MI	712.0452132
city mpg	459.4528904
Popularity	-3.456868861

- More the number of cylinders typically corresponds to a higher manufacturer's suggested retail price (MSRP), indicating a direct correlation between the two factors in the automotive industry.

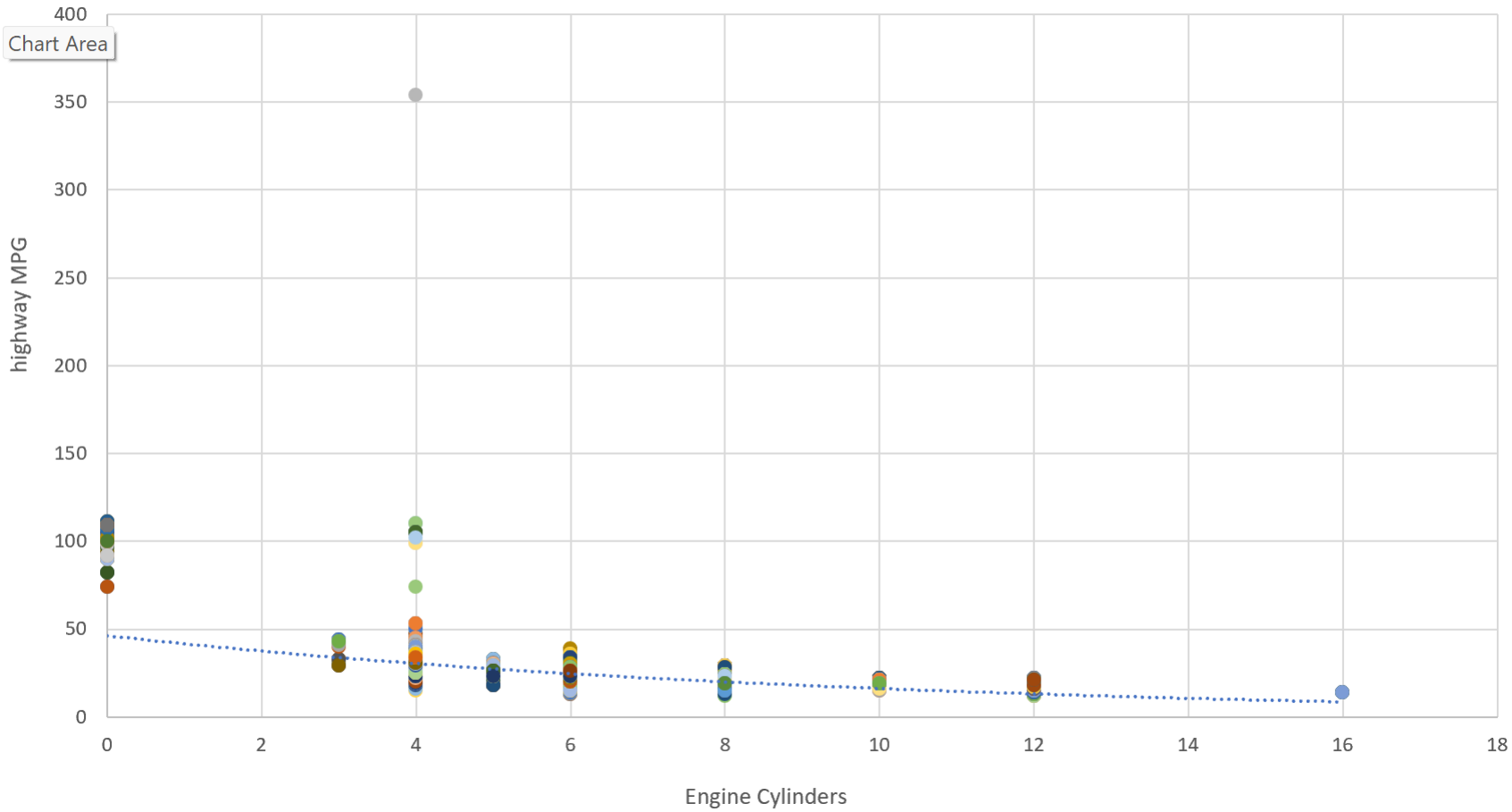
Task 4.A: Create a pivot table that shows the average price of cars for each manufacturer.

Row Labels	Average of MSRP
Acura	35087.4878
Alfa Romeo	61600
Aston Martin	198123.4615
Audi	54574.1215
Bentley	247169.3243
BMW	62218.47988
Bugatti	1757223.667
Buick	29034.18947
Cadillac	56368.26515
Chevrolet	29074.72576
Chrysler	26722.96257
d	44100
Dodge	24857.04537
Ferrari	238218.8406
FIAT	22670.24194
Ford	28511.30788
Genesis	46616.66667
GMC	32444.08506
Honda	26655.14781
HUMMER	36464.41176
Hyundai	24926.26255
Infiniti	42640.27134
Kia	25513.75546
Lamborghini	331567.3077
Land Rover	68067.08633
Lexus	47549.06931
Lincoln	43860.825
Lotus	68377.14286
Maserati	113684.4909
Maybach	546221.875
Mazda	20416.62379
McLaren	239805
Mercedes-Benz	72069.52786
Mitsubishi	21340.5625
Nissan	28921.15245
Oldsmobile	12843.79545
Plymouth	3296.873239
Pontiac	19800.0442
Porsche	101622.3971
Rolls-Royce	351130.6452
Saab	20657.71212
Scion	19932.5
Spyker	214990
Subaru	24240.67364
Suzuki	18026.4152
Tesla	85255.55556
Toyota	28846.5605
Volkswagen	28978.52289
Volvo	29724.68421

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

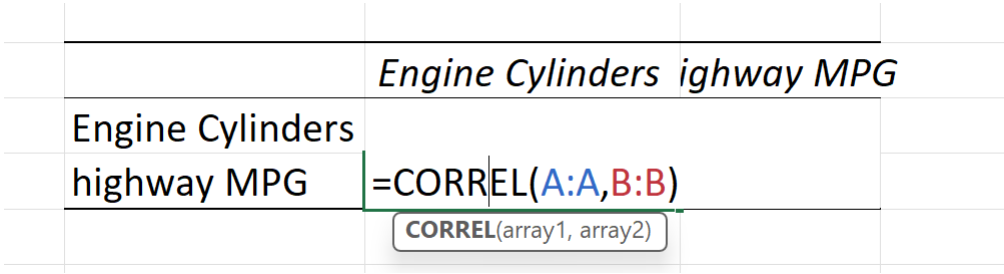


Task 5.A: Create a scatter plot with the number of cylinders on the x-axis and highway MPG on the y-axis. Then create a trendline on the scatter plot to visually estimate the slope of the relationship and assess its significance.



- More cylinders in the engine lead to lower highway MPG, as shown by a negative correlation in the analysis. The trendline slope on the graph confirms this relationship.

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



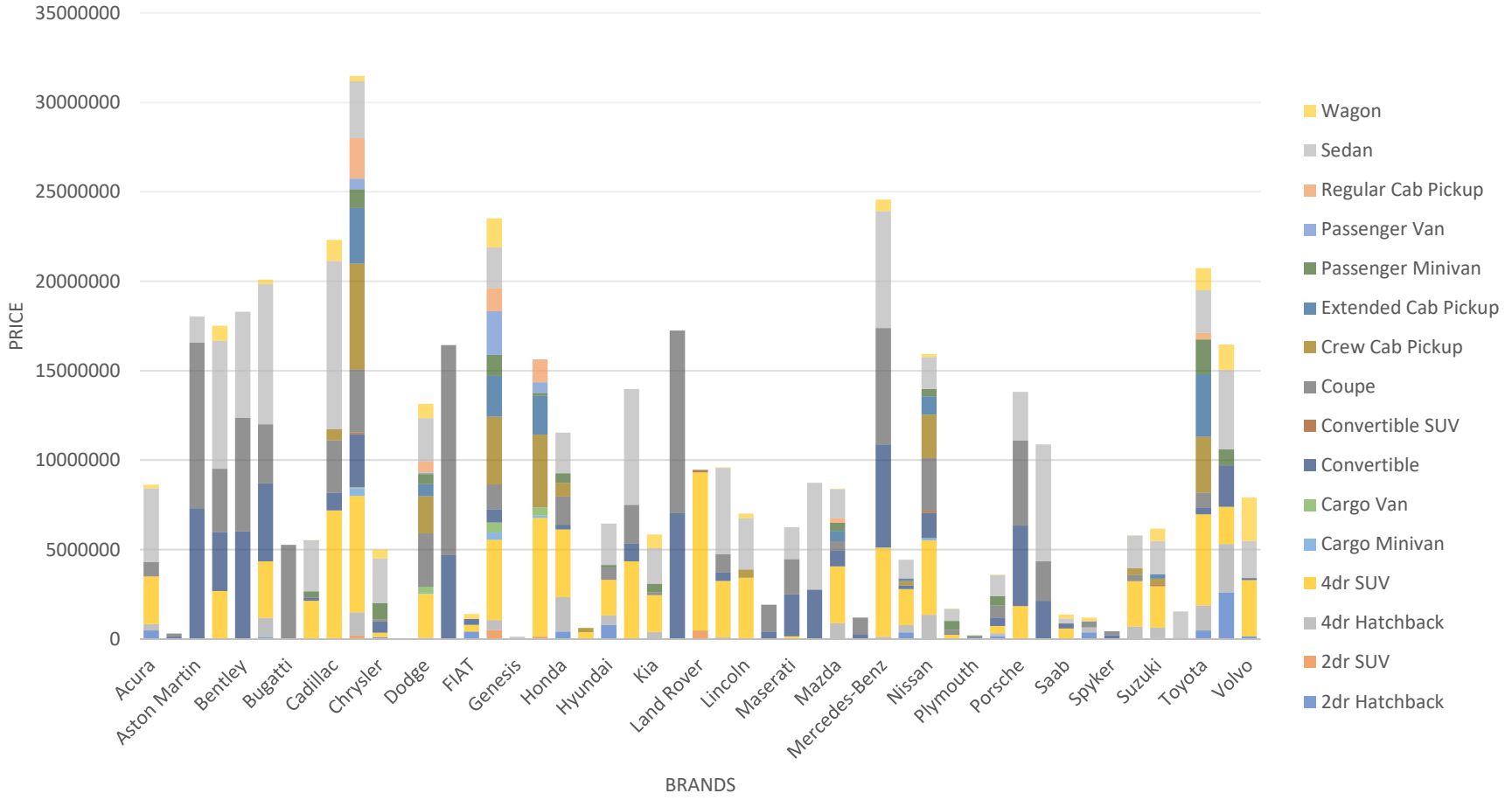
	Engine Cylinders	*highway MPG*
Engine Cylinders	1	
highway MPG	-0.604333097	1

Dashboards

Part-2

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

Sum 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 Van	Regular Cab Pickup	Sedan	Wagon
Acura	480917		357440	2663505					793748						4134552	201360
Alfa Romeo							129800		178200							
Aston Martin							7321655		9258845						1448735	
Audi	4000			2674900			3291405		3556290						7144348	847350
Bentley							6012870		6356760						5920900	
BMW	80097		1103100	3160950			4359071		3304051						7829700	259600
Bugatti									5271671							
Buick				2141770			179325		18534			330065			2838590	8212
Cadillac				7182555			985607		2953574	599150					9416847	1184100
Chevrolet	8000	193310	1287260	6509468	420150	74688	2953245	106300	3504525	5927617	3117951	1047240	599670	2260032	3177797	300675
Chrysler	98805			250545			630105		114510			922295			2479859	501075
d							44100									
Dodge	38000	12000	16000	2462875	60520	338497	6000		2973842	2072780	684682	557425	70708	653408	2409585	793055
Ferrari							4723811		11713289							
FIAT	420715			369305			327965									287570
Ford	24000	467873	567615	4482771	415630	556351	730007		1398144	3782518	2285584	1179285	2429898	1299240	2279348	1623565
Genesis															139850	
GMC		128319		6633919	142750	460085				4062482	2175866	150630	599670	1284328		
Honda	413200		1919260	3800589			252135		1588705	750215		553185			2264390	
HUMMER				377490						242405						
Hyundai	789650		528880	1994390					685920			133075			2323987	
Infiniti				4340200			980050		2175750						6490009	
Kia			406960	2049645					142630			494650			1976360	772405
Lamborghini							7064450		10177050							
Land Rover		476394		8839200				145731								
Lexus			94700	3152974			472065		1016472						4837596	31105
Lincoln				3422570					17342	453260					2854855	269705
Lotus							413260		1501300							
Maserati				155000			2342963		1972284						1782400	
Maybach							2762750								5976800	
Mazda	18000	12000	853180	3175515			870505		541879		580033	443130		265486	1618571	33350
McLaren							280225		918800							
Mercedes-Benz			122800	4974610	28950		5753964		6473107			32500			6543743	646035
Mitsubishi	370169		403835	2009807	2000		209893			240210	134360	2000		8000	1058563	
Nissan	14683		1347320	4149630	128620		1406552	131075	2937632	2422300	1026379	413320		19914	1763130	175000
Oldsmobile				238150			2000		276015			492055			667161	20000
Plymouth	40000		14000				85631		8000			31688			38759	16000
Pontiac	163505		162975	401550			473481		663715			541192			1156535	20855
Porsche	28827			1815200			4504586		4758533						2713500	
Rolls-Royce							2141365		2204675						6539010	
Saab	12000		34586	541905			277228								266850	230840
Scion	366325		282470						330210						32500	184445
Spyker							219990		209990							
Subaru	12000		678060	2539900					354476	365975					1833110	10000
Suzuki	44496	12000	584387	2303493				120194		304131	259659				1852967	683707
Tesla															1534600	
Toyota	473750		1397750	5106450			386668		811995	3131895	3491424	1952518		369446	2380826	1237955
Volkswagen	2606540		2699540	2084955			2296916		6000			906430			4434595	1424825
Volvo	157550			3131700			121600		6000						2072945	2416971



Make

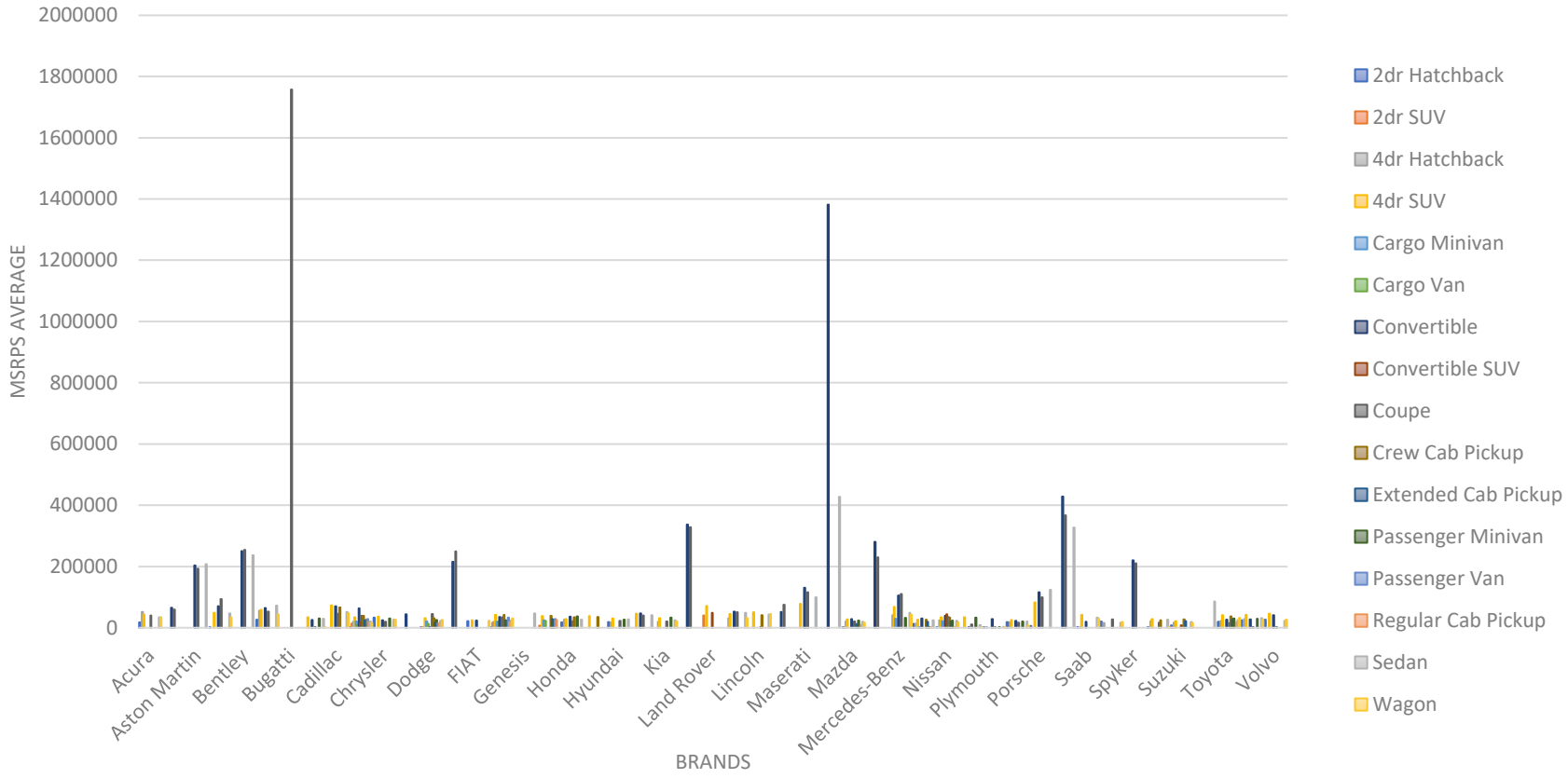
- Acura
- Alfa Romeo
- Aston Martin
- Audi
- Bentley
- BMW
- Bugatti
- Buick

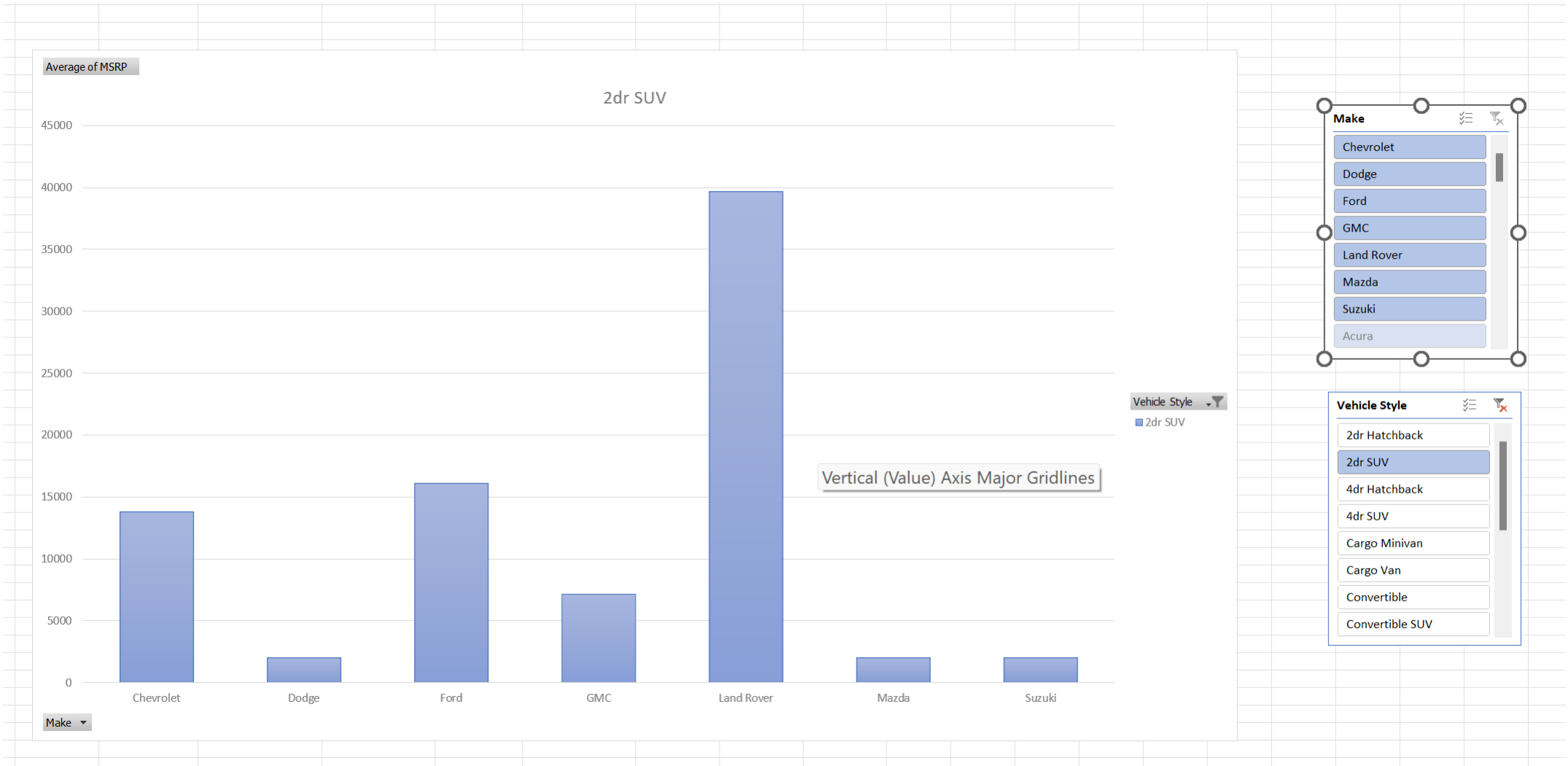
Vehicle Style

- 2dr Hatchback
- 2dr SUV
- 4dr Hatchback
- 4dr SUV
- Cargo Minivan
- Cargo Van
- Convertible
- Convertible SUV

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

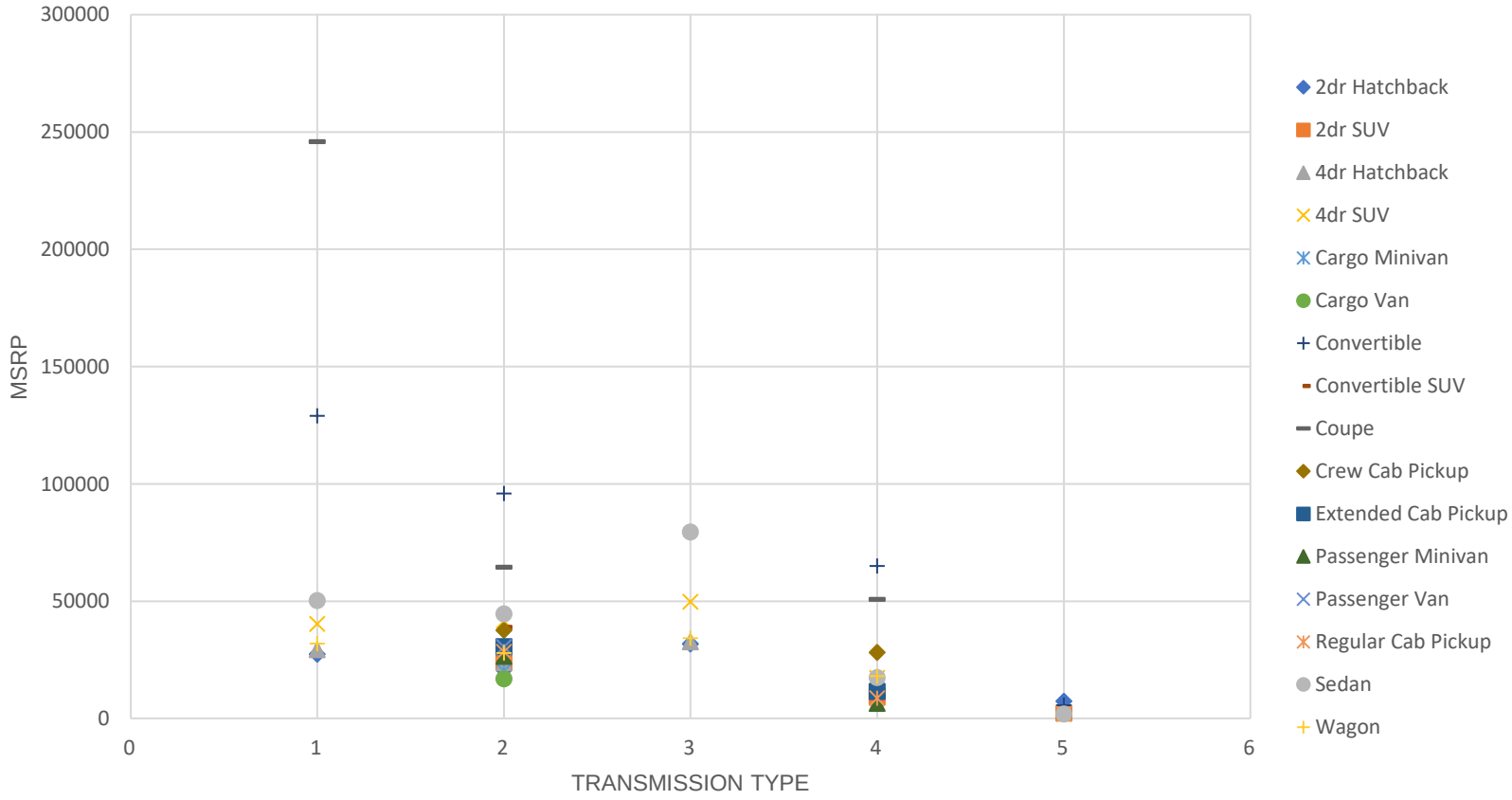
	Brand name	Average MSRP
Maximum	Bugatti	1757223.667
Minimum	Plymouth	3296.873239



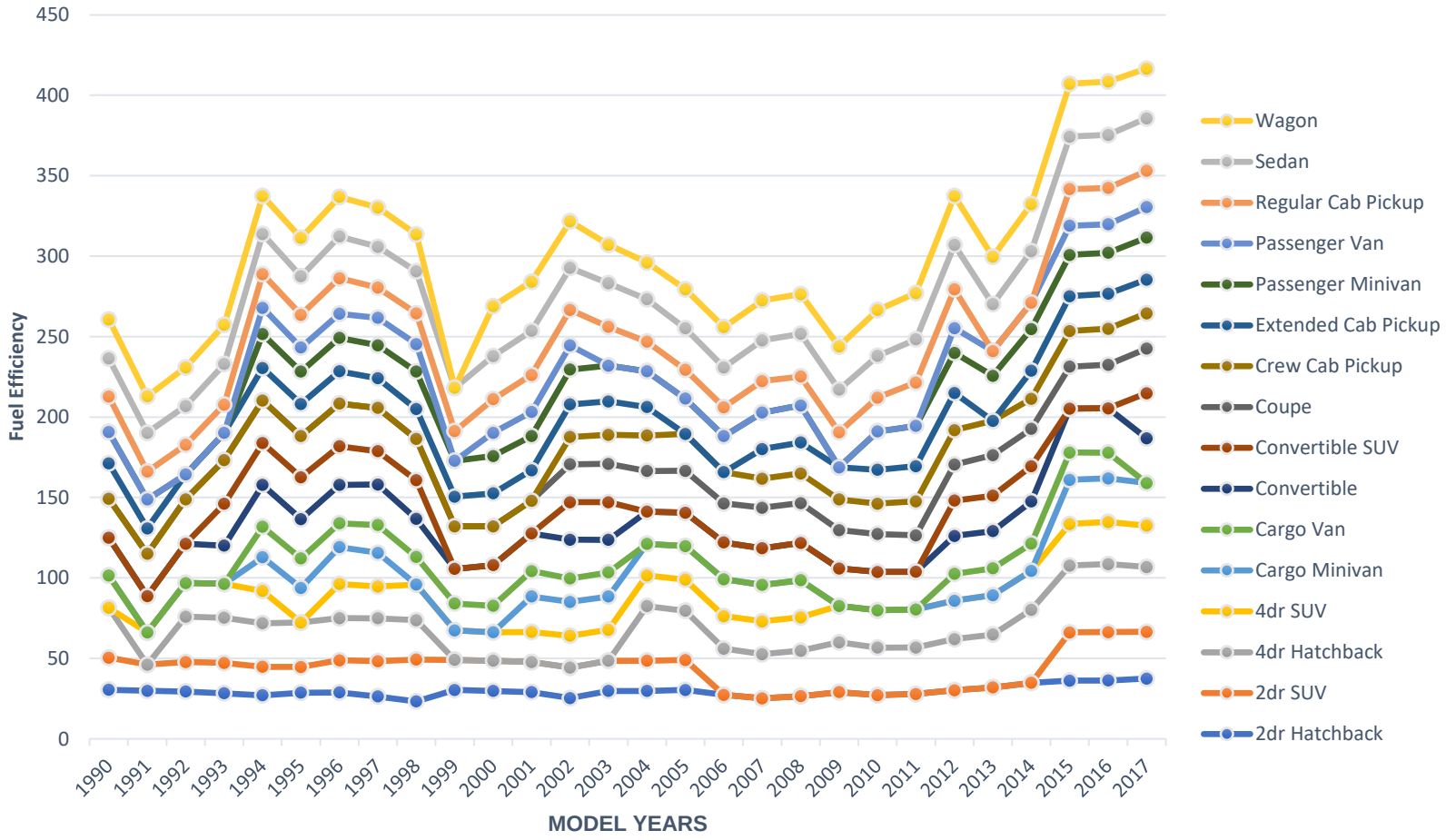

Average of MSRP
2dr SUV
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Chevrolet
Dodge
Ford
GMC
Land Rover
Mazda
Suzuki
Make
Vertical (Value) Axis Major Gridlines
Vehicle Style
2dr SUV
Make
Chevrolet
Dodge
Ford
GMC
Land Rover
Mazda
Suzuki
Acura
Vehicle Style
2dr Hatchback
2dr SUV
4dr Hatchback
4dr SUV
Cargo Minivan
Cargo Van
Convertible
Convertible SUV

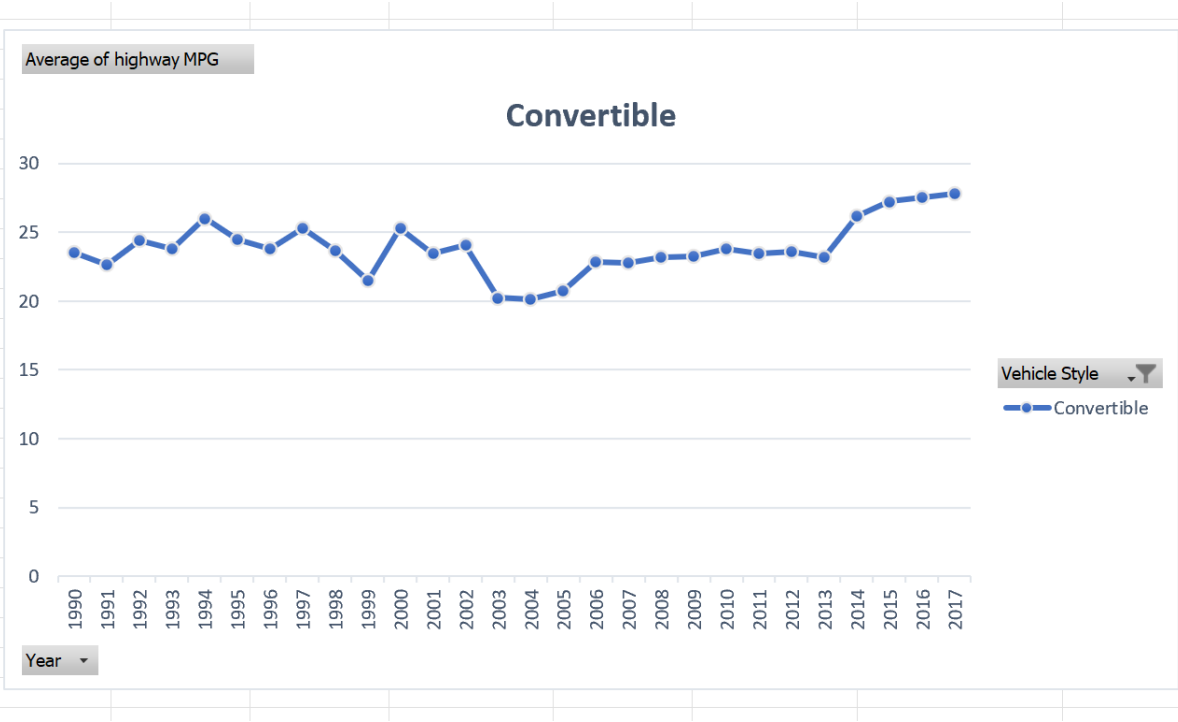
Task 3: How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?

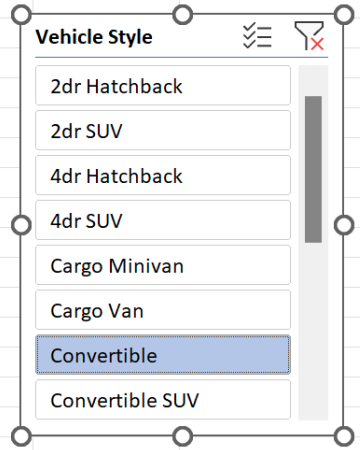
Average of MSRP	Column Labels															
Row Labels	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger Van	Regular Cab Pickup	Sedan	Wagon
AUTOMATED_MANUAL	27470.41667		29347.04545	40451.15385			129082.2339		245977.4252						50385.39326	31985.27778
AUTOMATIC	20784.09901	24153.60606	23888.73529	41638.26534	20315.59322	17019.29762	95940.57468	38925.5	64523.41955	37718.95307	30711.45251	26589.50919	30578.06612	28536.8239	44712.05697	27925.5175
DIRECT_DRIVE	31800		32799.72973	49800											79512.25	34250
MANUAL	12840.65556	9173.018519	17500.36364	17422.08791			65036.0602	9594.8	50901.4973	28233.10811	11553.29707	6510		8759.454054	17444.12625	18100.544
UNKNOWN	7361.5	2371					5783.5		2000					2000	2000	



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

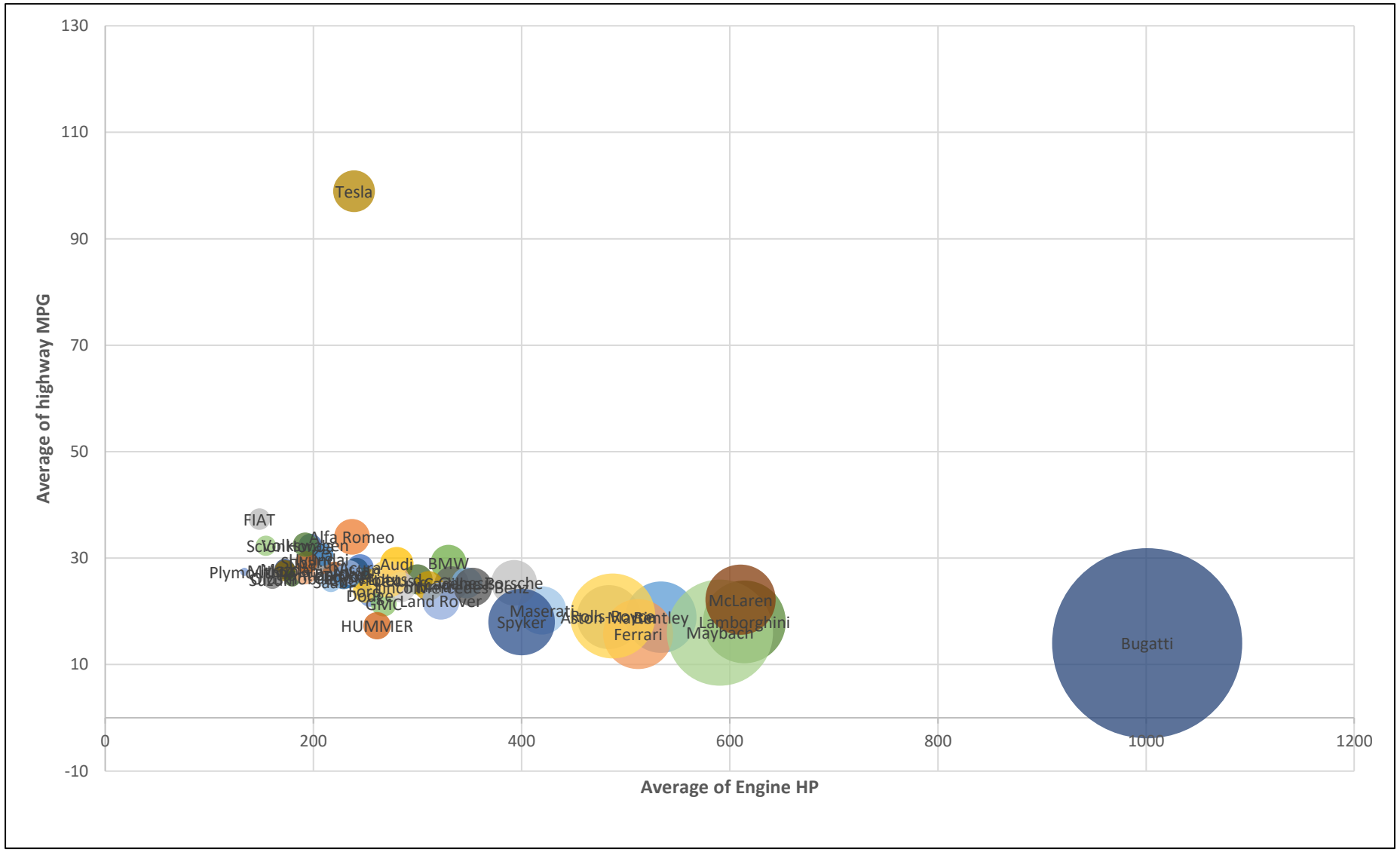


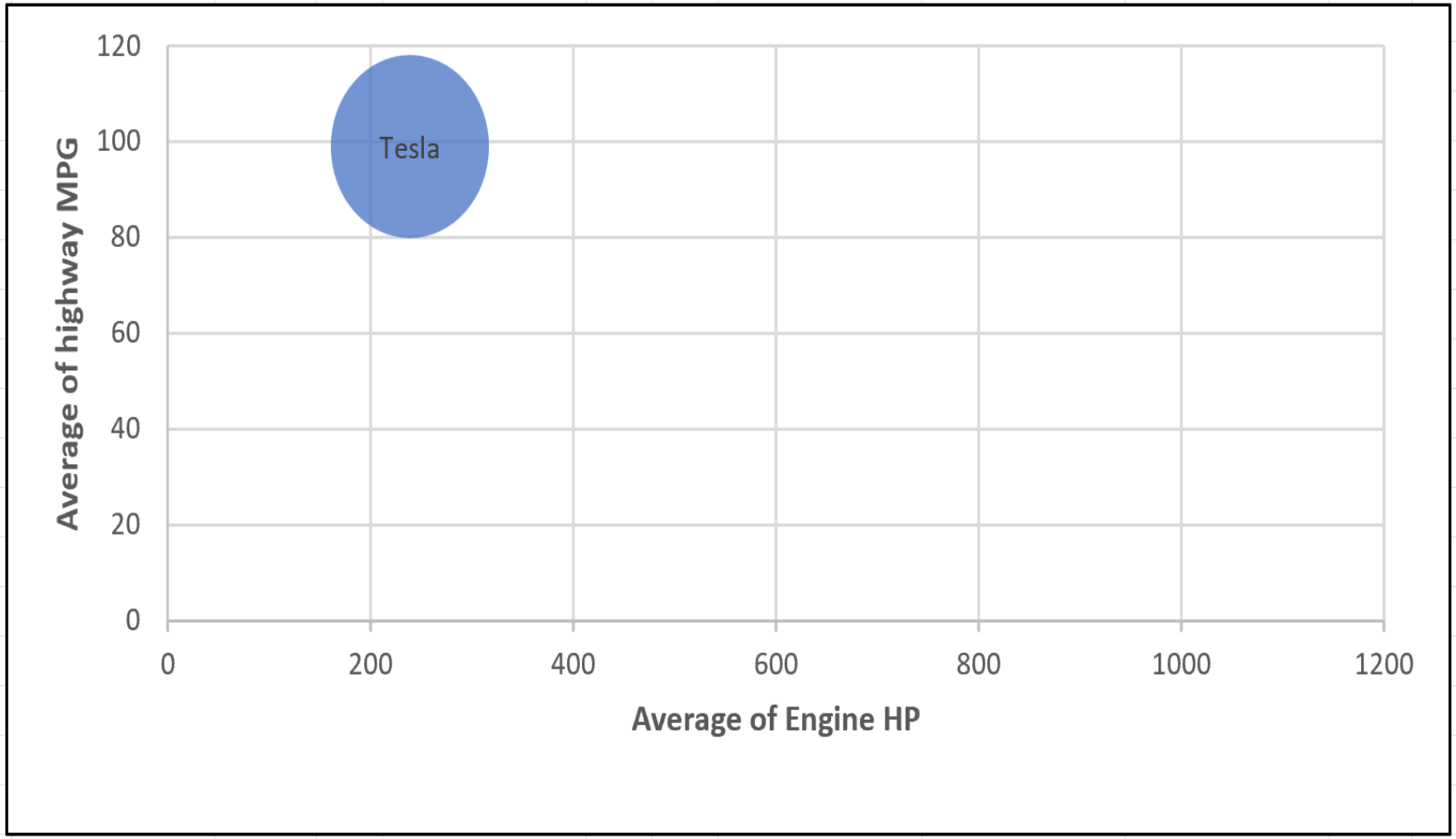


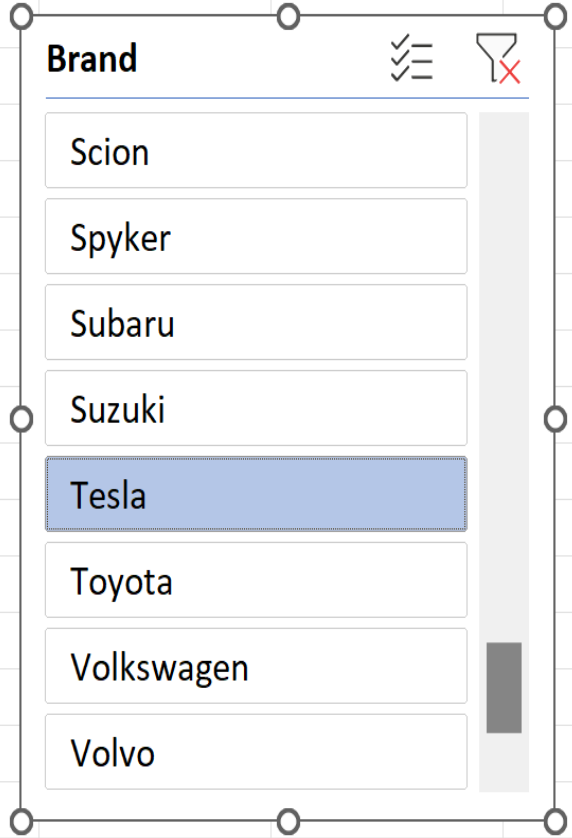


Average of highway MPG	Column Labels														
Row Labels	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger Van	Regular Cab Pickup	Sedan	Wagon
1990	30.4	20	31		20		23.5		24.27272727		22	19.5		22	23.65384615	24.3
1991	29.83333333	16.25		20			22.625		26.25		15.83333333	18		17.28571429	24.11111111	22.72727273
1992	29.39285714	18.28571429	28.16666667	21			24.375		27.63636364		15.4			18.42857143	24.175	24
1993	28.25925926	18.85714286	28.125	21			23.81818182	26	27.13636364		16.90909091			17.625	25.2	24.41666667
1994	27.05263158	17.625	27.14285714	20	21	19	26	26	26.42857143		20.28571429	21	16.33333333	21	24.90625	23.63636364
1995	28.6	16	27.66666667		21.5	18.33333333	24.5	26	25.51724138		20	20.1	15	20.375	23.88461538	23.88888889
1996	28.8	20	26.125	21.25	23	14.8	23.8	24	26.6		20	20.77777778	15	22.2	25.83333333	24.57142857
1997	26.25	22	26.66666667	19.7	21	17.2	25.28571429	20.66666667	26.92857143		18.35714286	20.55555556	17	18.78571429	25.42105263	24.4
1998	23.2	26	24.5	22.11111111		17.2	23.66666667	24	25.64285714		18.625	23.33333333	17	19.15151515	26.1	23
1999	30.33333333	18.75		18.3		16.66666667	21.5		26.5		18.42307692	22.33333333		18.42857143	26.875	
2000	29.72727273	18.75		17.73333333		16.4	25.28571429		24.16666667		20.5	23.16666667	14.5	20.83333333	26.86363636	31
2001	29	18.66666667		18.72727273	22	15.8	23.4375		20.29411765		19	21.2	15	23	27.37735849	30.625
2002	25.25	19		19.79411765	21	14.6	24.07142857	23.28571429	23.6	17	20.22222222	21.6875	15	22.06666667	26.14	28.88888889
2003	29.75	18.75		19.22857143	20.66666667	15	20.23076923	23.4	23.87878788	18	20.77777778	22.2972973		24.08333333	27.05769231	24
2004	29.71428571	18.75	34	19.04081633	19.6		20.1		25.26666667	22	17.75	22.2		18.46153846	26.36231884	22.8
2005	30.33333333	18.66666667	30.6	19.33333333	20.85714286		20.72727273		26	23		21.88888889		18	25.75409836	24.27777778
2006	27.25		28.75	20.19444444	23		22.85714286		24.25925926	19.38461538		22.45		18	24.75	25
2007	25.09090909		27.45454545	20.46296296	22.66666667		22.76		25.2	18.03333333	18.38983051	22.75		19.57692308	25.30769231	24.8
2008	26.42857143		28.33333333	20.765625	23		23.19047619		24.78947368	18.43181818	19.22222222	23		18	26.52173913	24.71428571
2009	29		31	22.59139785			23.25		23.89473684	19.02941176	19.95454545			21.85714286	26.47826087	26.84
2010	27.125		29.5	23.25454545			23.82352941		23.52173913	18.94594595	21	23.85714286		21	25.96666667	28.5
2011	27.83333333		28.93103448	23.58333333			23.4375		22.67857143	21.1	21.9	25		27	26.84057971	28.83333333
2012	30.21428571		31.76190476	23.84444444		16.66666667	23.57692308	22	22.37142857	21.43333333	23.0625	25	15.33333333	24.125	27.60493827	30.44117647
2013	31.90909091		32.8627451	24.47368421		16.66666667	23.18181818	22	25.18604651	21.31818182		28	15.33333333		29.234375	29.39473684
2014	34.75		45.46808511	24.2231405		16.85714286	26.15789474	22	23.16883117	18.71428571	17.4	26	16.375		31.99065421	29.25
2015	36.10294118	30	41.57638889	25.76951673	27.5	17	27.22377622		26.16931217	22.12121212	21.65934066	25.65384615	18.14285714	22.74285714	32.64007092	32.83333333
2016	36.26530612	30	42.28	26.1965812	27.11111111	16	27.51666667		27.10989011	22.37593985	21.78409091	25.5	17.71428571	22.52941176	33	33.08333333
2017	37.4375	29	40.29411765	25.73739496	26.5		27.80263158	28	27.71724138	21.96153846	20.98684211	26.05555556	19	22.52941176	32.61589404	30.86486486

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




120
100
80
60
40
20
0
Average of highway MPG
Tesla
0
200
400
600
800
1000
1200
Average of Engine HP


Brand
Scion
Spyker
Subaru
Suzuki
Tesla
Toyota
Volkswagen
Volvo

THANK YOU

Excelsheet link