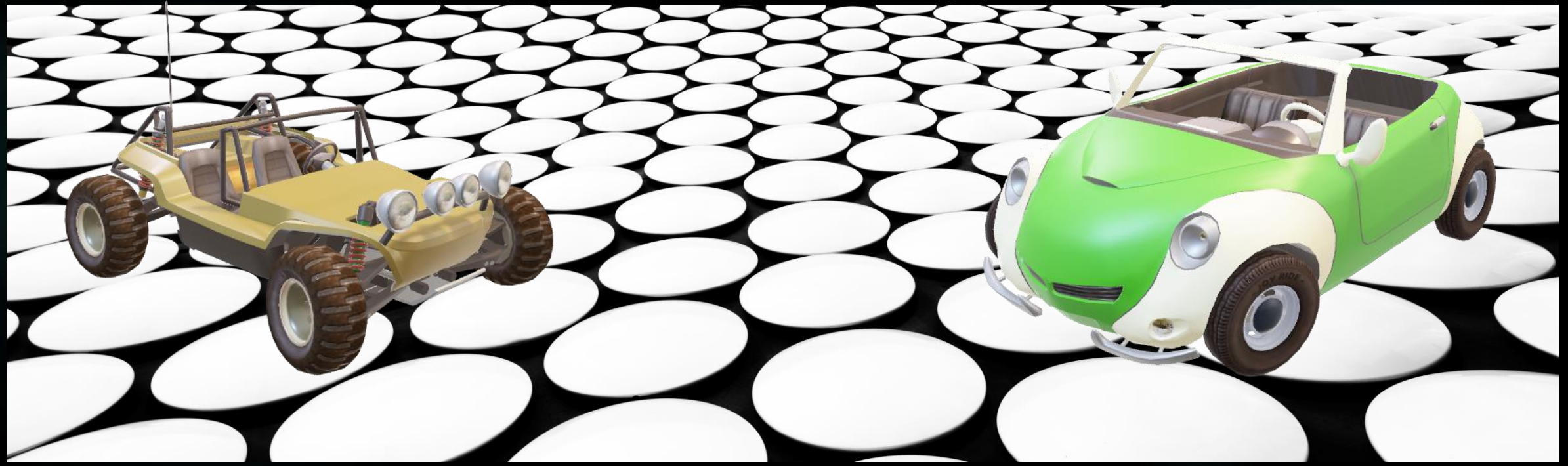
Analyzing the Impact of Car Features on Price and Profitability

FINAL PROJECT 3



PROJECT DESCRIPTION

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

Following are the steps I used to get the ready data from the raw data

- First I calculated total number of blank counts – Engine Fuel Type, Engine HP, Engine Cylinders and Number of Doors columns had blank fields.
- Since Engine Fuel Type is of String data type, I removed the blank records.
- Rest other blank fields such as Engine HP, Engine Cylinders and number of Doors column blank fields are filled with the median values respectively
- Finally I got the ready data which can be used for the further analysis

Tech stack Used

Microsoft Excel 2021

Reason: Excel provides easy sorting of data, large selection of formulas, provides graphs, pie charts to visualize the data and so on.

Drive Link : (Excel File)

https://docs.google.com/spreadsheets/d/1NCHjwSnbyUL2f5lBASVxotxb8FIipEta/edit?usp=drive_link&ouid=111599462622587335316&rtpof=true&sd=true

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

Market Category	Count of Model	Average of Popularity
Crossover	1110	1545.263063
Crossover,Diesel	7	873
Crossover,Exotic,Luxury,High-Performance	1	238
Crossover,Exotic,Luxury,Performance	1	238
Crossover,Factory Tuner,Luxury,High-Performance	26	1823.461538
Crossover,Factory Tuner,Luxury,Performance	5	2607.4
Crossover,Factory Tuner,Performance	4	210
Crossover,Flex Fuel	64	2073.75
Crossover,Flex Fuel,Luxury	10	1173.2
Crossover,Flex Fuel,Luxury,Performance	6	1624
Crossover,Flex Fuel,Performance	6	5657
Crossover,Hatchback	72	1675.694444
Crossover,Hatchback,Factory Tuner,Performance	6	2009
Crossover,Hatchback,Luxury	7	204
Crossover,Hatchback,Performance	6	2009
Crossover,Hybrid	42	2563.380952
Crossover,Luxury	410	884.5487805
Crossover,Luxury,Diesel	34	2149.411765
Crossover,Luxury,High-Performance	9	1037.222222
Crossover,Luxury,Hybrid	24	630.9166667
Crossover,Luxury,Performance	113	1344.849558
Crossover,Luxury,Performance,Hybrid	2	3916
Crossover,Performance	69	2585.956522
Diesel	84	1730.904762
Diesel,Luxury	51	2275
Exotic,Factory Tuner,High-Performance	21	1046.380952
Exotic,Factory Tuner,Luxury,High-Performance	52	517.5384615
Exotic,Factory Tuner,Luxury,Performance	3	520
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Performance	13	520
Exotic,Flex Fuel,Luxury,High-Performance	11	520
Exotic,High-Performance	261	1271.333333
Exotic,Luxury	12	112.6666667
Exotic,Luxury,High-Performance	79	467.0759494
Exotic,Luxury,High-Performance,Hybrid	1	204
Exotic,Luxury,Performance	36	217.0277778
Exotic,Performance	10	1391
Factory Tuner,High-Performance	106	1941.415094
Factory Tuner,Luxury	2	617
Factory Tuner,Luxury,High-Performance	215	2133.367442
Factory Tuner,Luxury,Performance	31	1413.419355
Factory Tuner,Performance	92	1695.695652
Flex Fuel	872	2217.302752
Flex Fuel,Diesel	16	5657
Flex Fuel,Factory Tuner,Luxury,High-Performance	1	258
Flex Fuel,Hybrid	2	155
Flex Fuel,Luxury	39	746.5384615
Flex Fuel,Luxury,High-Performance	33	878.9090909
Flex Fuel,Luxury,Performance	28	1380.071429
Flex Fuel,Performance	87	1680.471264
Flex Fuel,Performance,Hybrid	2	155
Hatchback	641	1318.865835
Hatchback,Diesel	14	873
Hatchback,Factory Tuner,High-Performance	13	1205.153846
Hatchback,Factory Tuner,Luxury,Performance	9	886.8888889
Hatchback,Factory Tuner,Performance	22	2159.045455
Hatchback,Flex Fuel	7	5657
Hatchback,Hybrid	72	2121.25
Hatchback,Luxury	46	1379.5
Hatchback,Luxury,Hybrid	3	454
Hatchback,Luxury,Performance	38	1566.131579
Hatchback,Performance	252	1039.646825
High-Performance	199	1821.447236
Hybrid	123	2105.569106
Luxury	855	1102.65731
Luxury,High-Performance	334	1668.017964
Luxury,High-Performance,Hybrid	12	568.8333333
Luxury,Hybrid	52	673.6346154
Luxury,Performance	673	1292.615156
Luxury,Performance,Hybrid	11	2333.181818
N/A	3739	1677.84889
Performance	601	1348.873544
Performance,Hybrid	1	155
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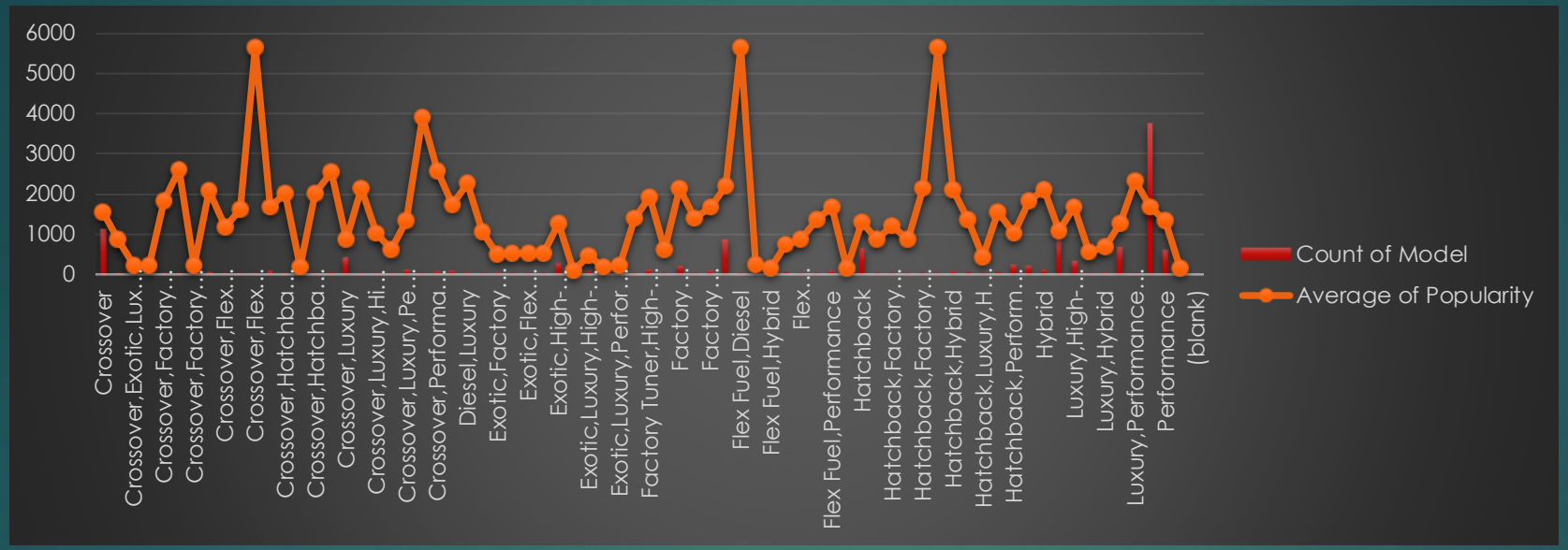
Grand Total	**11911**	**1555.181681**

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

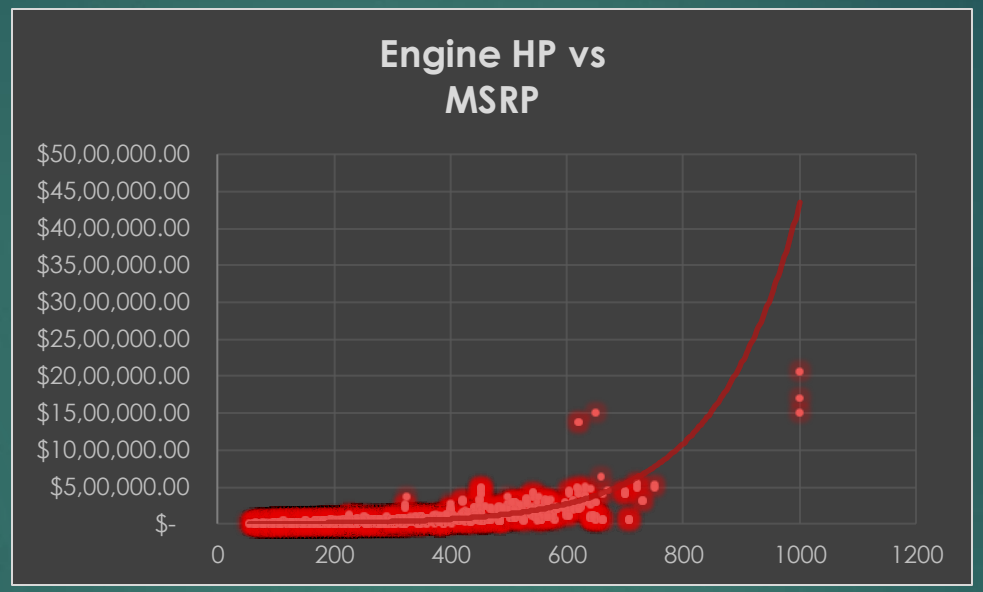


Insight Required: What is the relationship between a car's engine power and its price?

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.

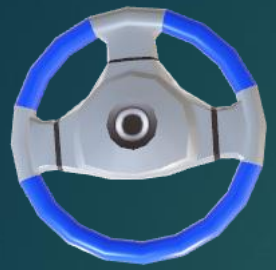
Engine HP	MSRP
335	$ 46,135.00
300	$ 40,650.00
300	$ 36,350.00
230	$ 29,450.00
230	$ 34,500.00
230	$ 31,200.00
300	$ 44,100.00
300	$ 39,300.00
230	$ 36,900.00
230	$ 37,200.00
300	$ 39,600.00
230	$ 31,500.00
300	$ 44,400.00
230	$ 37,200.00
230	$ 31,500.00
320	$ 48,250.00
320	$ 43,550.00
172	$ 2,000.00
172	$ 2,000.00

Steps | Car_data

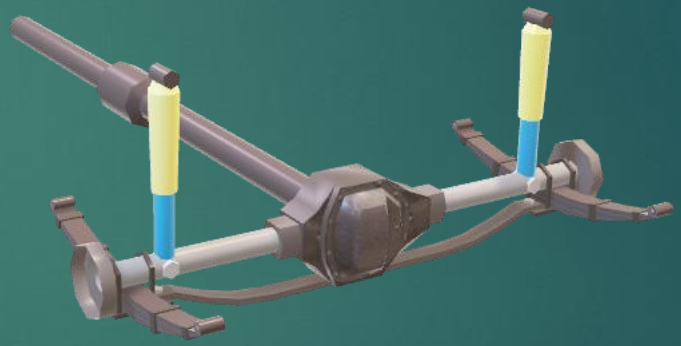


Findings : As we can see the trendline is going upwards it is positive correlation. As the Engine HP increases the price also increases.

*complete pivot table data is available in the attached Excel File.



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.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.681365676
R Square	0.464259184
Adjusted R Squ	0.463989153
Standard Error	44012.33457
Observations	11911

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	1.99824E+13	3.3304E+12	1719.283269	0
Residual	11904	2.30591E+13	1937085594		
Total	11910	4.30415E+13			

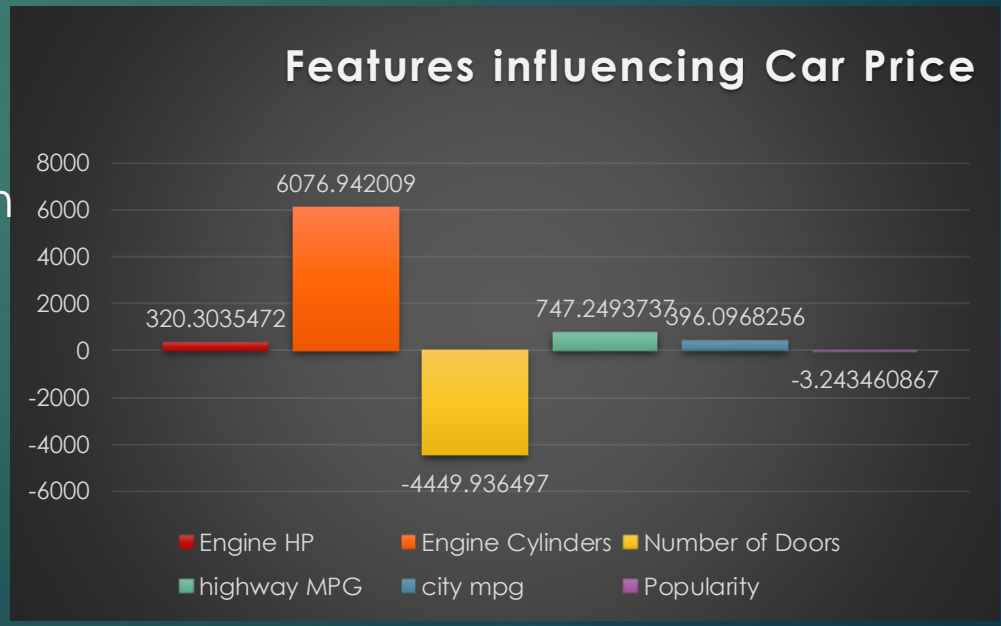
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-80842.73411	3361.769062	-24.0476763	8.1475E-125	-87432.3504	-74253.11781	-87432.3504	-74253.11781
Engine HP	320.3035472	5.892399477	54.35876309	0	308.7534821	331.8536123	308.7534821	331.8536123
Engine Cylinde	6076.942009	422.0685439	14.3979979	1.31112E-46	5249.618744	6904.265273	5249.618744	6904.265273
Number of Doc	-4449.936497	463.259456	-9.6057111	9.07064E-22	-5358.000675	-3541.872319	-5358.000675	-3541.872319
highway MPG	747.2493737	102.9674352	7.257142726	4.19913E-13	545.4163873	949.0823601	545.4163873	949.0823601
city mpg	396.0968256	97.60013118	4.05836366	4.97335E-05	204.7846315	587.4090196	204.7846315	587.4090196
Popularity	-3.243460867	0.28039381	-11.5675195	8.79203E-31	-3.793078521	-2.693843214	-3.793078521	-2.693843214

Findings : The regression analysis shows the following variables shows the significant relation with Car Price :

- Engine HP
- Engine cylinders
- Highway MPG
- City MPG

Findings :

- The bar chart clearly shows the strong positive relation between the Engine Cylinder and the car price.
- The negative relation between car price and the number of doors



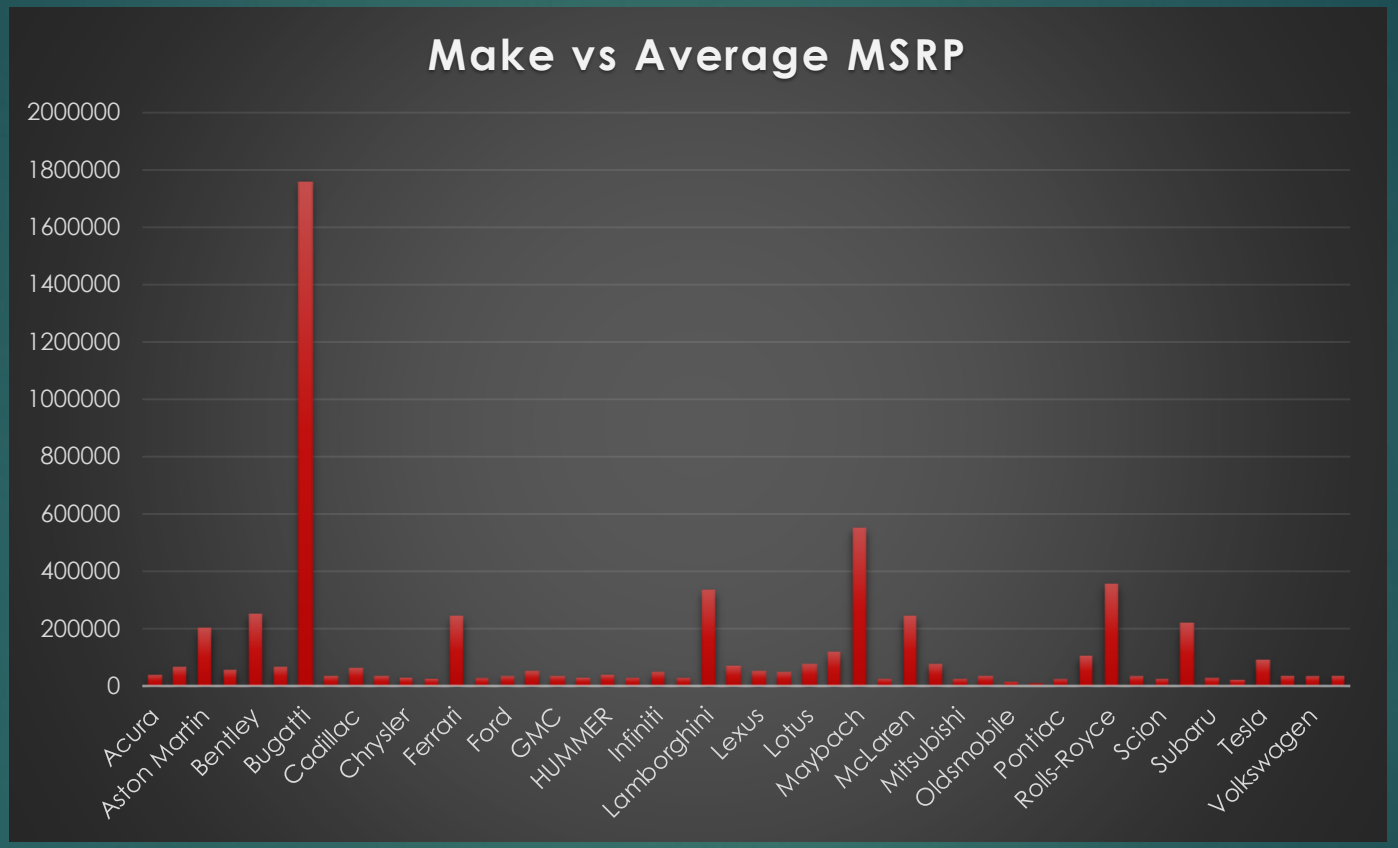
Insight Required: How does the average price of a car vary across different manufacturers?

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

Make	Average of MSRP
Acura	34887.5873
Alfa Romeo	61600
Aston Martin	197910.3763
Audi	53452.1128
Bentley	247169.3243
BMW	61546.76347
Bugatti	1757223.667
Buick	28206.61224
Cadillac	56231.31738
Chevrolet	28350.38557
Chrysler	26722.96257
Dodge	22390.05911
Ferrari	238218.8406
FIAT	22670.24194
Ford	27399.26674
Genesis	46616.66667
GMC	30493.29903
Honda	26674.34076
HUMMER	36464.41176
Hyundai	24597.0363
Infiniti	42394.21212
Kia	25310.17316
Lamborghini	331567.3077
Land Rover	67823.21678
Lexus	47549.06931
Lincoln	42839.82927
Lotus	69188.27586

Lexus	47549.06931
Lincoln	42839.82927
Lotus	69188.27586
Maserati	114207.7069
Maybach	546221.875
Mazda	20039.38298
McLaren	239805
Mercedes-Benz	71476.22946
Mitsubishi	21240.53521
Nissan	28583.4319
Oldsmobile	11542.54
Plymouth	3122.902439
Pontiac	19321.54839
Porsche	101622.3971
Rolls-Royce	351130.6452
Saab	27413.5045
Scion	19932.5
Spyker	213323.3333
Subaru	24827.50391
Suzuki	17900.9569
Tesla	85255.55556
Toyota	29030.01609
Volkswagen	28102.38072
Volvo	28541.16014
Grand Total	**40600.26866**

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



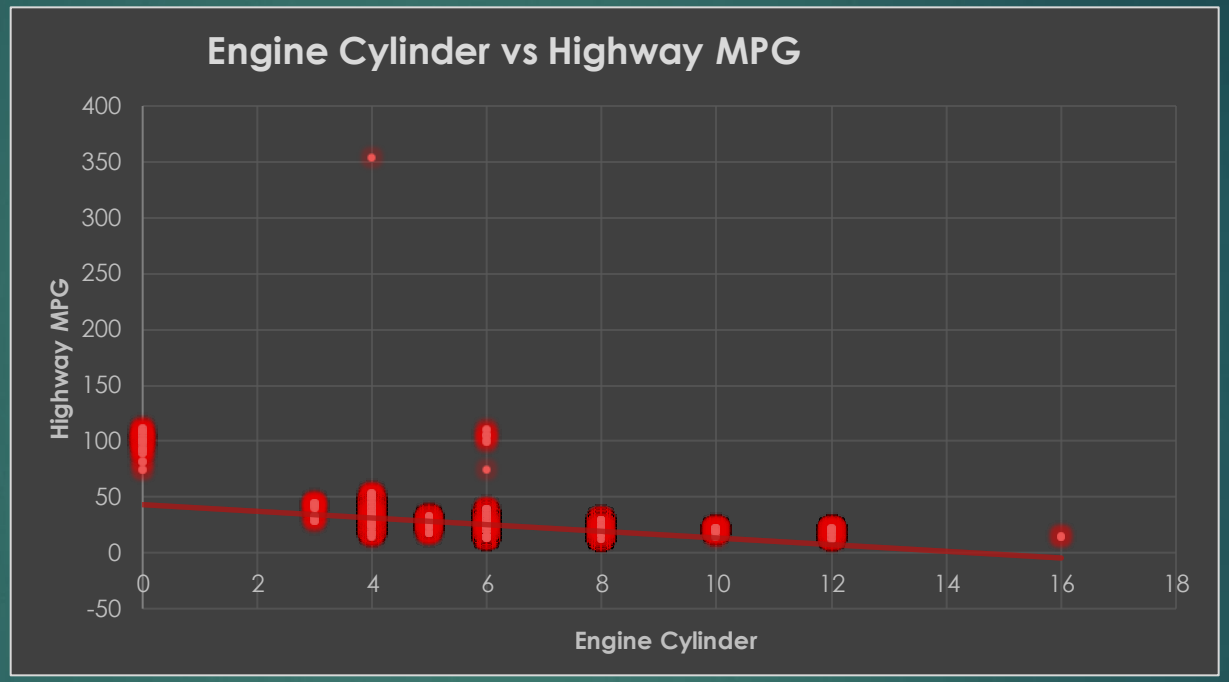
Findings :

- The bar chart shows that Manufacturer 'Bugatti' has the highest average price

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

	A	B
1	Engine Cylinder	Highway MPG
2	6	26
3	6	28
4	6	28
5	6	28
6	6	28
7	6	28
8	6	26
9	6	28
10	6	28
11	6	27
12	6	28
13	6	28
14	6	28
15	6	28
16	6	28
17	6	25
18	6	28
19	6	24
20	6	24
21	6	20
22	6	24
23	6	21



Findings :

- The Scatter plot has declining trendline which implies as the Number of Cylinders in the car engine increases the MPG decreases

*complete pivot table data is available in the attached Excel File.

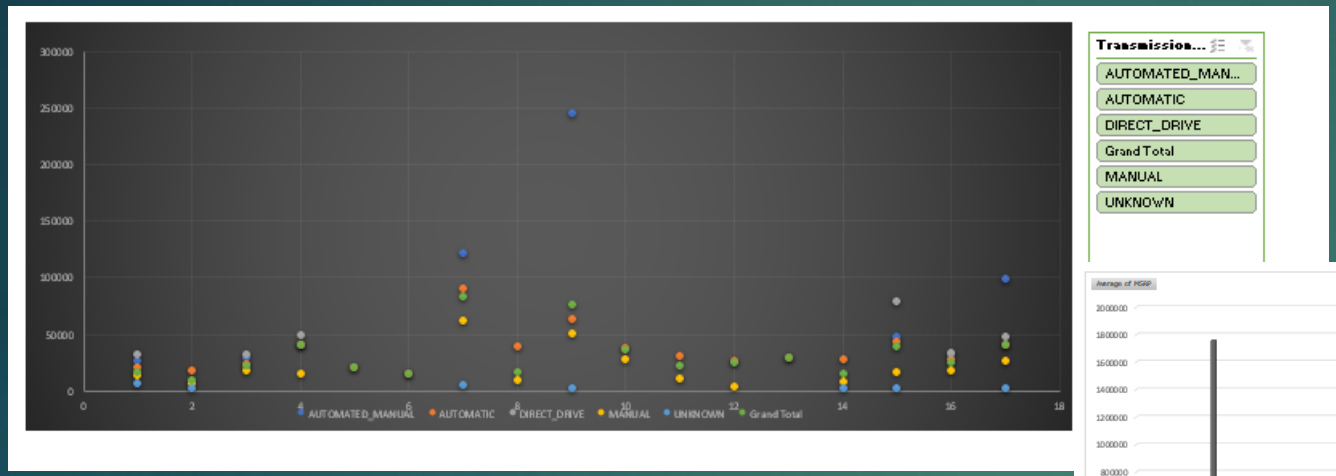
Task 5.B: Calculate the correlation coefficient between the number of cylinders and highway MPG to quantify the strength and direction of the relationship

Correlation		
Engine Cylinders	1	-0.600943429
Highway MPG	-0.600943429	1
	Engine Cylinders	Highway MPG

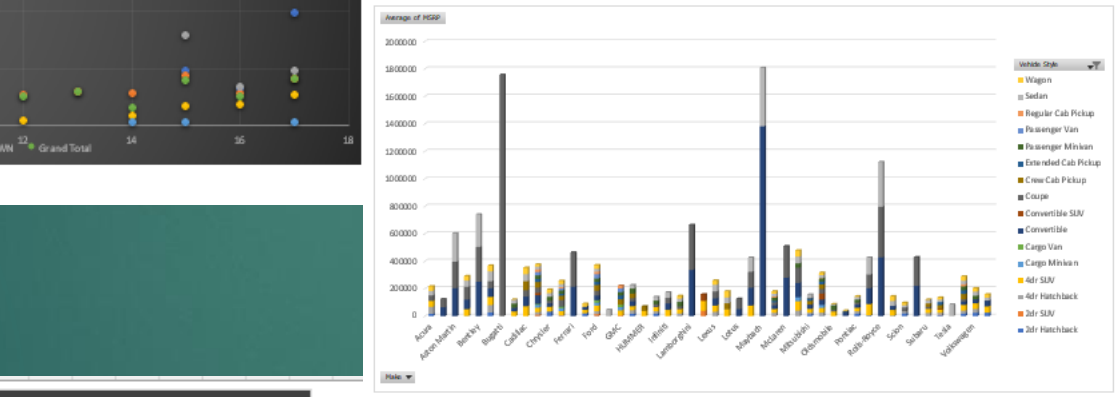
Findings :

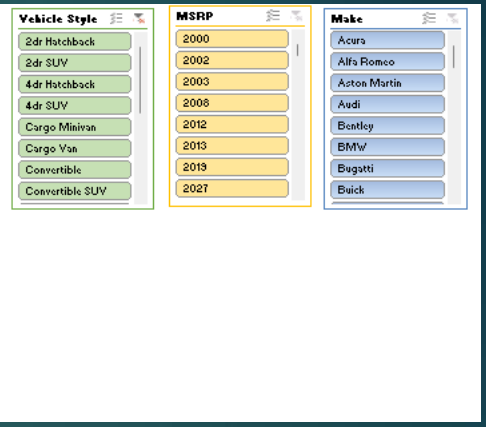
- The calculations shows the negative correlation between the Number of Engine Cylinders and the Highway MPG. As the number of Engine Cylinders increase the Highway MPG decreases

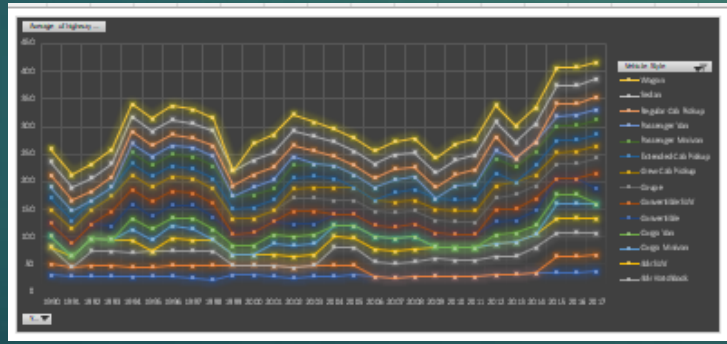
DASHBOARD

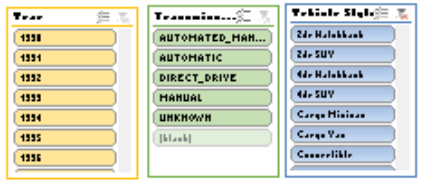

AUTOMATED_MANUAL
AUTOMATIC
DIRECT_DRIVE
MANUAL
UNKNOWN
Grand Total

Transmission...
AUTOMATED_MAN...
AUTOMATIC
DIRECT_DRIVE
Grand Total
MANUAL
UNKNOWN



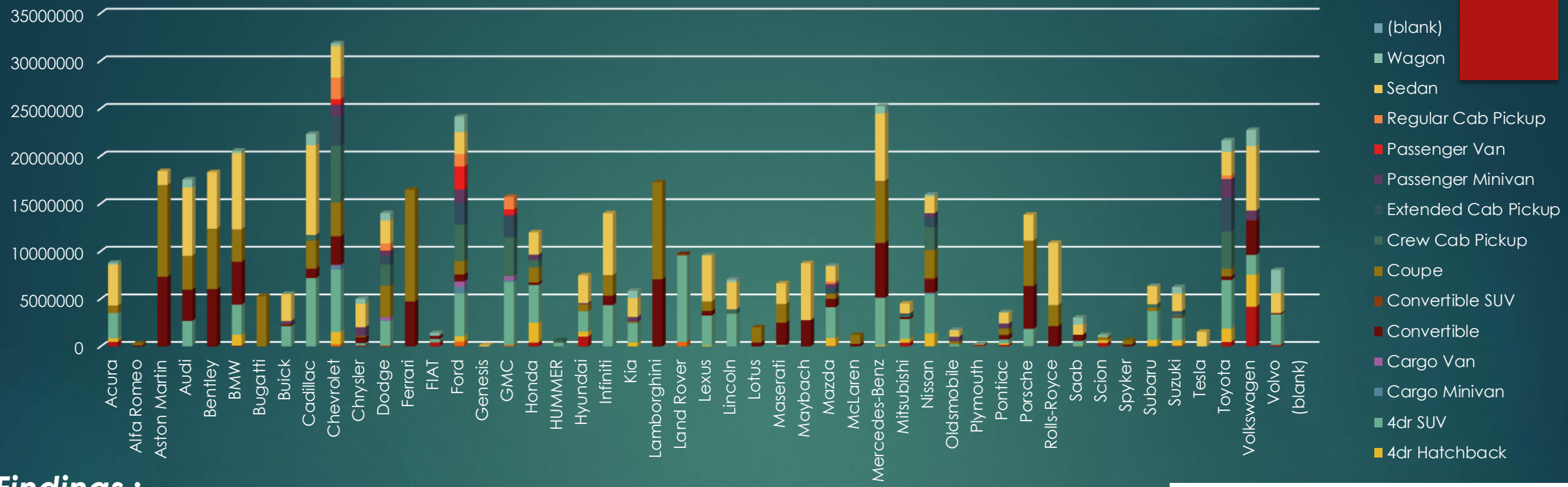

Vehicle Style
2dr Hatchback
2dr SUV
4dr Hatchback
4dr SUV
Cargo Minivan
Cargo Van
Convertible
Convertible SUV
MSRP
2000
2002
2003
2008
2012
2013
2019
2027
Make
Acura
Alfa Romeo
Aston Martin
Audi
Bentley
BMW
Bugatti
Buick




Year
1990
1991
1992
1993
1994
1995
1996
Transmiss...
AUTOMATED_MAN...
AUTOMATIC
DIRECT_DRIVE
MANUAL
UNKNOWN
Vehicle Styl...
2dr Hatchback
2dr SUV
4dr Hatchback
4dr SUV
Cargo Minivan
Cargo Van
Convertible

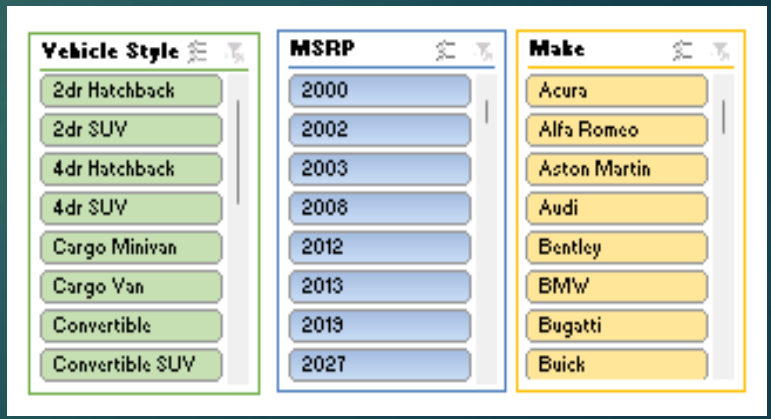
Task 1: How does the distribution of car prices vary by brand and body style?

Sum of MS	Column Lab	s																
Row Lab	2dr Hatchbac	2dr SU	4dr Hatch	4dr SUV	Cargo Mi	Cargo	Converti	Convertible	Coupe	Crew Cab P	Extended Cab	Passenger Mi	Passenger	Regular Cab	Sedan	Wagon	(blan	Grand Total
Acura	480917		357440	2663505					793748						4294702	201360		8791672
Alfa Romeo							129800		178200									308000
Aston Martin							7321655		1E+07						1448735			18405665
Audi	4000			2674900			3291405		4E+06						7158348	847350		17532293
Bentley							6012870		6E+06						5920900			18290530
BMW	80037		1144350	3160950			4502671		3E+06						7989300	259600		20556619
Bugatti									5E+06									5271671
Buick				2141770			179325		18534			330065			2850590	8212		5528496
Cadillac				7182555			985607		3E+06	539150					9418847	1E+06		22323833
Chevrolet	8000	2E+05	1287260	6563568	420150	78688	2953245	106300	4E+06	5927617	3117951	1178515	607670	2260032	3303977	300675		31837483
Chrysler	98805			250545			630105		114510			922295			2479859	501075		4997194
Dodge	48000	44000	18000	2572405	60520	338497	12000		3E+06	2235775	864172	557425	70708	719408	2417585	793055		14016177
Ferrari							4723811		1E+07									16437100
FIAT	420715			369305			327965									287570		1405555
Ford	36000	5E+05	567615	4482771	702400	566351	730007		1E+06	3812353	2285584	1411605	2431838	1239240	2293348	2E+06		24138754
Genesis															139850			139850
GMC		1E+05		6641919	142750	468085				4062482	2183866	150630	603670	1306328				15704049
Honda	413200		2088520	3953209			252135		2E+06	787720		553185			2340105			11376779
HUMMER				377490						242405								619895
Hyundai	1038050		528880	2128890					724070			133075			2899937			7452902
Infiniti				4340200			980050		2E+06						6494090			13990090
Kia			406960	2043645					142630			494650			1980360	772405		5846650
Lamborghini							7064450		1E+07									17241500
Land Rover		5E+05		3076595				145731										9638720
Lexus			94700	3152974			472065		1E+06						4837596	31105		9604912
Lincoln				3422570					25342	453260					2854855	263705		7025732
Lotus							413260		2E+06									2006460
Maserati				155000			2342963		2E+06						2153800			6624047
Maybach							2762750								5976800			8739550
Mazda	22000	24000	853180	3222525			870505		543879		580033	443130		265486	1618571	33350		8476659
McLaren							280225		918800									1199025
Mercedes-Benz			122800	4974610	28950		5753964		6E+06			32500			7080243	764935		25231109
Mitsubishi	394868		407835	2066505	2000		209893			240210	134360	2000		8000	1058563			4524234
Nissan	14683		1347320	4149630	128620		1406552	131075	3E+06	2422300	1026379	413320		21914	1769130	175000		15343555
Oldsmobile				238150			2000		286015			492055			631161	22000		1731381
Plymouth	42000		16000				85631		14000			33688			46759	18000		256078
Pontiac	163505		162975	401550			473481		667715			541192			1160535	22855		3593808
Porsche	28827			1815200			4504586		5E+06						2713500			13820646
Rolls-Royce							2141365		2E+06						6539010			10885050
Saab	14000		36586	541905			632628								1066500	751280		3042899
Scion	366325		282470						330210						32500	184445		1195950
Spyker							219390		419980									639370
Subaru	12000		678060	3020230					356476	365975					1313100	10000		6355841
Suzuki	46496	14000	584387	2362141				122194		304131	259659				1850818	685707		6229533
Tesla															1534600			1534600
Toyota	473750		1397750	5106450			386668		811995	3893760	3558504	1956518		373446	2459596	1E+06		21656392
Volkswagen	4171275		3355760	2084955			3612631		8000			1038130			6760050	2E+06		22734826
Volvo	157550			3219000			121600		6000						2086945	2E+06		8020066
(blank)																		
Grand Tota	8535063	###	1.6E+07	1E+08	1485390	1E+06	7E+07	505300	9E+07	25347138	14010508	10683978	3713946	6253854	1E+08	2E+07		483589800



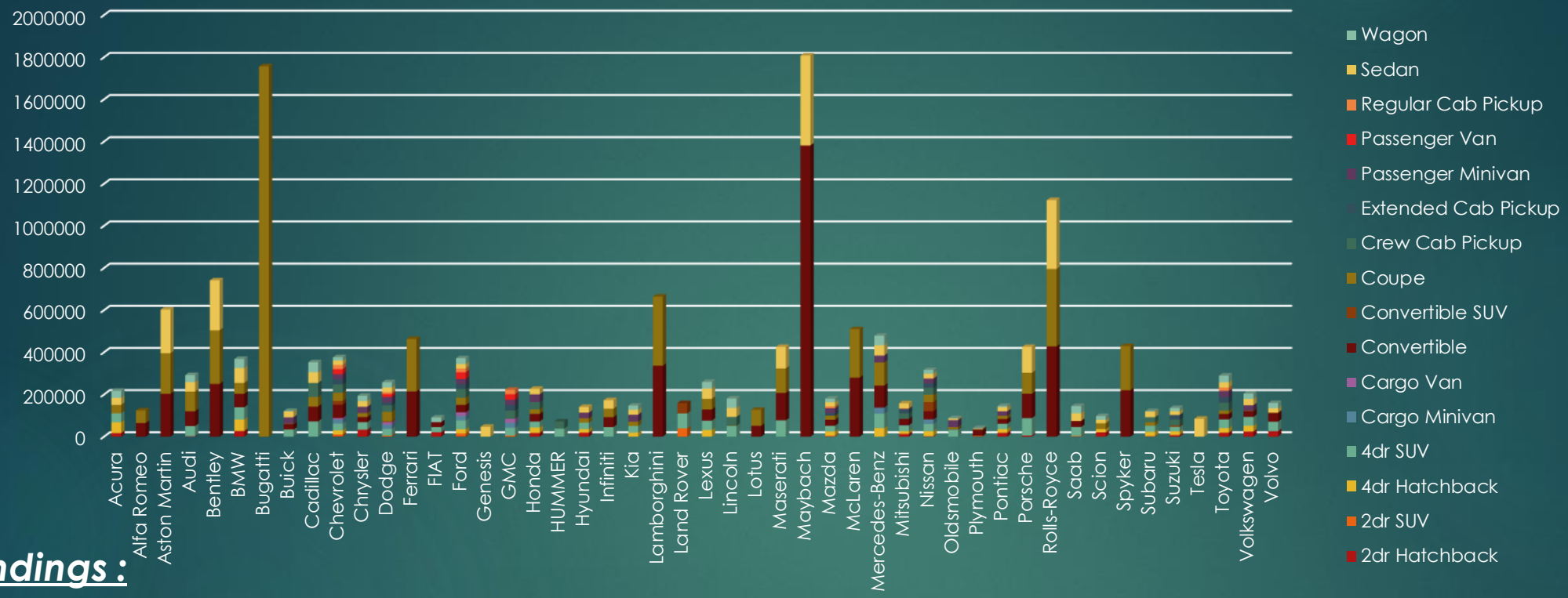
Findings :

- This analysis provides insightful information about the differences in car costs according to body type and brand
- Manufacturers may find these insights useful in maximizing their pricing tactics and raising profitability.
- The greatest total MSRPs are found in Ford, Chevrolet, and Mercedes-Benz. Similarly, the highest total MSRPs are found in sedan, coupe, and passenger minivan vehicle styles.



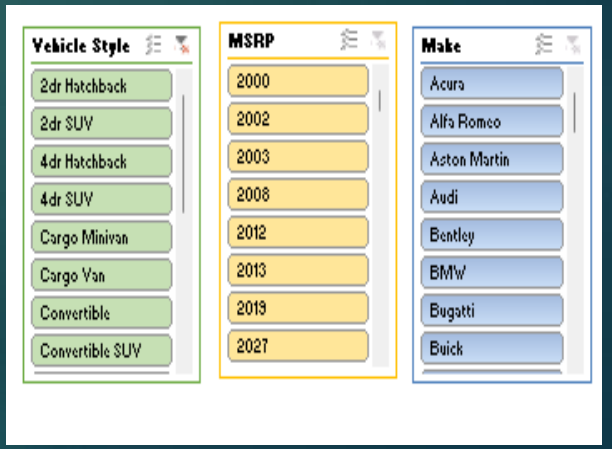
Task 2: Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?

Average of M	Column Labe																
Row Labels	2dr Hatchback	2dr SUV	4dr Hatchb	4dr SUV	Cargo Mini	Cargo Van	Convertib	Convertible	Coupe	Crew Cab Pi	Extended Cab P	Passenger Mi	Passenger	Regular Cab P	Sedan	Wagon	Grand Total
Acura	17175.60714		51062.857	42959.76					39687.4						33292.26	33560	34887.5873
Alfa Romeo							64900		59400								61600
Aston Martin							203379.3		192705.5						206962.1		197910.3763
Audi	2000			48634.55			70029.89		93586.58						44461.79	33894	53452.1128
Bentley							250536.3		254270.4						236836		247163.3243
BMW	26639		54521.429	58536.11			63417.9		51803.8						70701.77	43266.67	61546.76347
Bugatti									1757224								1757223.667
Buick				33996.35			25617.86		2059.333			30005.90909			27946.96	2053	28206.61224
Cadillac				72551.06			70400.5		45439.6	66572.22222					50912.63	47364	56231.31738
Chevrolet	2000	8887.917	18930.294	32046.67	20007.143	7153.455	62835	17716.6667	38939.17	39255.74172	24170.16279	24552.39583	24306.8	19824.84211	20521.6	15825	28350.38557
Chrysler	32335			35732.14			24234.81		19085			29751.45161			26103.78	26372.37	26722.36257
Dodge	2000	2000	2000	30992.83	20173.333	12536.93	2000		45980.66	31052.43056	13938.25806	25337.5	14141.6	9342.961039	21780.05	24782.97	22390.05911
Ferrari							214718.7		249218.9								238218.8406
FIAT	21035.75			24620.33			23426.07									22120.77	22670.24194
Ford	2000	13710.66	19572.931	41507.14	21284.848	17638.47	34762.24		34101.07	41438.61957	23808.16667	23526.75	32425.307	17797.80822	21290.26	27259.42	27399.26674
Genesis															46616.67		46616.66667
GMC		5550.731		36695.69	23731.667	18723.4				39062.32692	26632.5122	25105	26246.522	21069.80645			30493.29303
Honda	17216.66667		26106.5	28855.54			36019.29		21763.08	34248.63565		36879			26001.17		26674.34076
HUMMER				37749						34629.28571							36464.41176
Hyundai	18536.60714		17629.333	30412.71					20687.71			26615			27102.21		24597.0363
Infiniti				45686.32			46663.05		40231.67						40588.06		42394.21212
Kia			19379.048	31533					20375.71			32976.66667			23298.35	20326.45	25310.17316
Lamborghini							336402.4		328291.9								331567.3077
Land Rover		39699.5		70910.9				48577									67823.21678
Lexus			31566.667	45042.43			52451.67		50823.6						48864.61	31105	47543.06931
Lincoln				50331.91					2111.833	41205.45455					42609.78	44950.83	42839.82927
Lotus							51657.5		75866.67								63188.27586
Maserati				77500			130164.6		116016.7						102561.9		114207.7069
Maybach							1381375								426914.3		546221.875
Mazda	2000	2000	20809.268	27080.04			28080.81		20143.67		11600.66	23322.63158		9154.689655	19738.67	16675	20039.38298
McLaren							280225		229700								239805
Mercedes-Benz			40933.333	68145.34	28950		104617.5		109713.7			32500			43168.35	44936.18	71476.22946
Mitsubishi	13162.26667		13155.368	26158.29	2000		29384.71			26690	19194.28571	2000		2000	24058.25		21240.53521
Nissan	2097.571429		24059.286	34294.46	21436.667		39070.89	43691.6667	34228.28	32733.78378	20527.58	22962.22222		2191.4	21841.11	17500	28583.4319
Oldsmobile				34021.43			2000		9226.29			32803.66667			8131.306	2000	11542.54
Plymouth	2000		2000				28543.67		2000			2105.5			2597.722	2000	3122.302439
Pontiac	18167.22222		18108.333	25036.88			22546.71		15528.26			20815.07692			20003.22	5713.75	19321.54839
Porsche	5765.4			82509.09			115502.2		93136.1						123340.9		101622.3971
Rolls-Royce							428273		367445.8						326950.5		351130.6452
Saab	2000		2032.5556	41685			28755.82								36775.86	34143.09	27413.5045
Scion	20351.38889		15692.778						27517.5						16250	18444.5	19932.5
Spyker							219990		209990								213323.3333
Subaru	2000		21189.375	29322.62					15498.96	24398.33333					26570.83	2000	24827.50391
Suzuki	6642.285714	2000	16696.771	21090.54				7187.88235		27648.27273	21638.25				18145.27	15237.93	17900.9569
Tesla															85255.56		85255.55556
Toyota	18950		22186.508	40851.6			25777.87		15615.29	37803.49515	26359.28889	29201.76119		16236.78261	24844.4	31742.44	29030.01609
Volkswagen	24251.59884		27964.667	41693.1			27789.47		2000			25320.2439			29311.73	25818.56	28102.38072
Volvo	26258.33333			45338.03			40533.33		2000						20869.45	24785.42	28541.16014
Grand Total	**16867.7134**	**10115.2**	**22420.9**	**40421.9**	**20921**	**15280.2**	**84224.3**	**17424.14**	**76248.3**	**37220.467**	**22488.77683**	**25621.0504**	**29015.2**	**15953.7092**	**39291**	**25557.9**	**40600.26866**



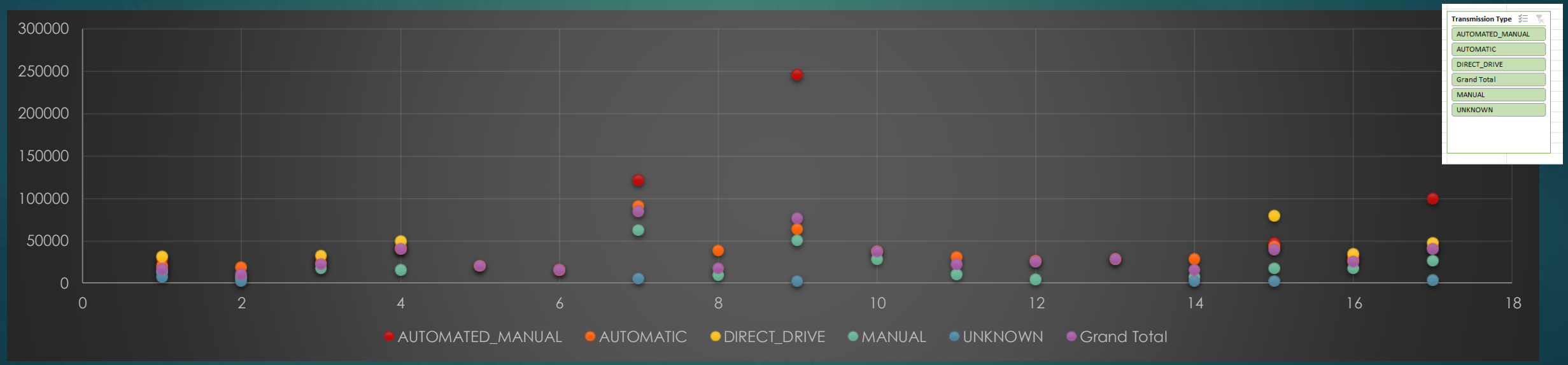
Findings :

- It is discovered throughout this analysis that some brands have average Manufacturer's Suggested Retail Prices (MSRPs) that are noticeably higher or lower than those of other brands
- Compared to brands like BMW, Toyota, and Audi, luxury brands like Rolls Royce, Maybach, and Bugatti typically have higher average MSRP values. Furthermore, the average MSRP prices of some car types—like sedans, 4DR SUVs, and coupes—tend to be greater than those of other types.



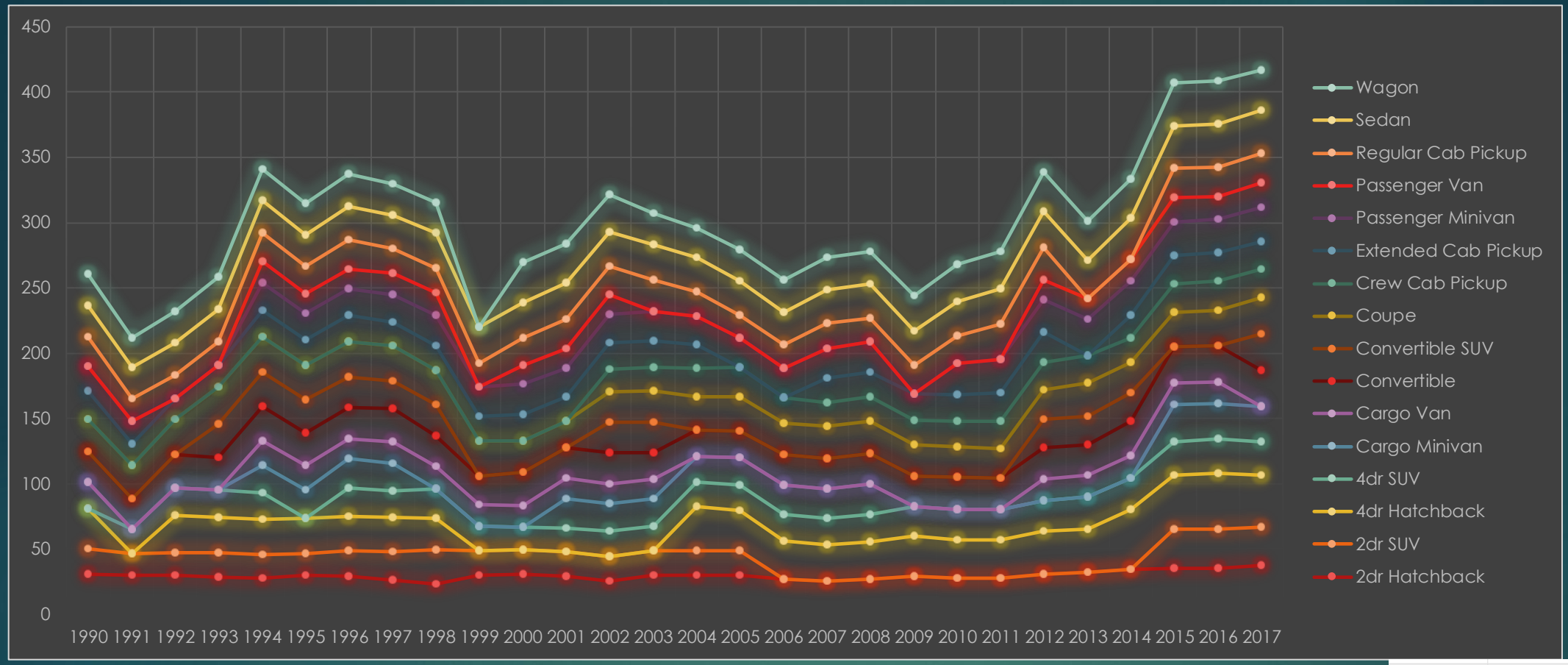
Task 3: How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?

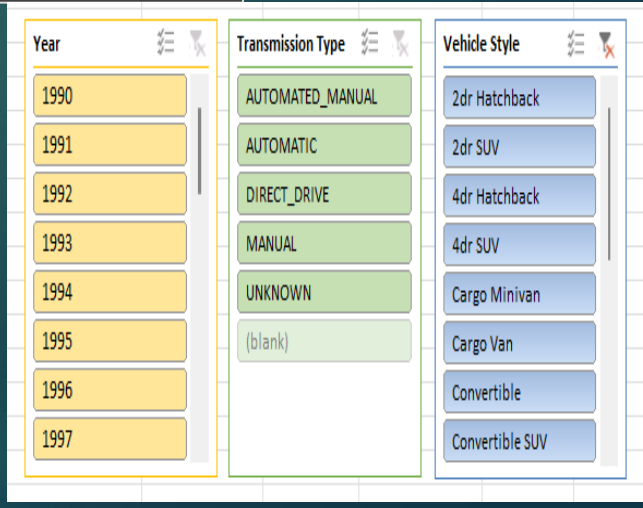
Average of MSRP	Column Labels																
Row Labels	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger Van	Regular Cab Pickup	Sedan	Wagon	Grand Total
AUTOMATED_MANUAL	27180.96491		29249.07407	40451.15385			121256.6444		245977.4252						47498.70813	31985.27778	99508.37061
AUTOMATIC	20926.464	18615.20455	23833.67898	41535.60646	20920.98592	15280.22105	90637.3869	38925.5	63371.81076	37744.07154	30637.34973	26412.68159	29015.20313	28536.8239	43802.6919	27613.19169	41118.49268
DIRECT_DRIVE	31800		32799.72973	49800											79512.25	34250	47351.25
MANUAL	13353.65831	6303.811111	17594.41313	15426.46226			62357.75625	9233.142857	50484.37241	28360.52632	10884.19455	4405.333333		7557.773333	17119.23374	17844.13971	26663.64429
UNKNOWN	7361.5	2371					5783.5		2000					2000	2000		3040.736842
Grand Total	16867.71344	10115.18841	22420.8661	40421.87178	20920.98592	15280.22105	84224.28499	17424.13793	76248.32205	37220.46696	22488.77689	25621.05036	29015.20313	15953.70918	39291.02299	25557.93919	40600.26866



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	Grand Total
1990	30.4	20	31		20		23.5		24.5		22	18.85714286		22.23076923	24	24.13333333	23.07317073
1991	30.06666667	16.25		19.33333333			22.625		26.15789474		15.83333333	18		16.95238095	24.2195122	22.57142857	22.15131579
1992	29.6969697	17.47058824	28.375	21.33333333			25.5		27.28571429		15.6			17.88235294	24.52083333	24.26666667	24.05084746
1993	28.53333333	18.47368421	27.3	21			24.46153846	26	28.25925926		16.71428571			17.64705882	25.32758621	24.46153846	24.21052632
1994	27.35	18.42857143	27.14285714	20	21	19.33333333	26	26	27.29166667		20.28571429	21	16.4	21.66666667	25.22727273	23.83333333	23.86503067
1995	30.14285714	16	27.66666667		21.5	19	24.5	26	25.67741935		20	20.08333333	15	21.2	24.06451613	24.1	23.22962963
1996	29	20	26.125	21.6	23	14.55555556	23.8	24	26.72727273		20	20.77777778	15	22.2	25.72727273	24.66666667	23.72519084
1997	26.11111111	22	26.5	19.7	21	17.125	25.28571429	20.66666667	27.20689655		18.35714286	20.55555556	17	18.78571429	25.31818182	24.4	22.30857143
1998	23.2	26	24.5	22.11111111		17.2	23.66666667	24	26.26666667		18.625	23.4	17	19.15151515	27.12	23	21.85064935
1999	30.33333333	18.75		18.3		16.66666667	21.5		27.55555556		18.42307692	22.33333333		18.42857143	27.40540541		22.975
2000	30.41666667	18.75		17.73333333		16.4	25.28571429		24.16666667		20.5	23.16666667	14.5	20.83333333	26.84444444	31	24.04237288
2001	29	18.66666667		18.72727273	22	15.8	23.4375		20.29411765		19	21.2	15	23	27.37735849	30.625	23.70833333
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	22.76585366
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	22.73529412
2004	29.71428571	18.75	34	19.04081633	19.6		20.1		25.26666667	22	17.75	22.2		18.46153846	26.42424242	22.8	23.125
2005	30.33333333	18.66666667	30.6	19.33333333	20.85714286		20.72727273		26	23		21.88888889		18	25.75409836	24.27777778	23.58685446
2006	27.25		28.75	20.35555556	23		22.85714286		24.25925926	19.38461538		22.5		18	24.75	25	23.42439024
2007	25.53846154		27.53846154	20.50847458	22.66666667		22.76		25.2	18.03333333	18.38983051	22.77777778		19.57692308	25.30769231	24.8	21.93913043
2008	27.31818182		28.5	20.79411765	23		23.51111111		24.78947368	18.45652174	19.2	23		18	26.72	24.71428571	22.98853868
2009	29		30.8	22.59139785			23.76190476		23.74358974	19.05405405	19.875			21.85714286	26.63291139	26.84848485	23.86015831
2010	27.76923077		29.5	23.19298246			24.61904762		23.52173913	18.94871795	20.78947368	24.2		21	26.06060606	28.47826087	24.1442953
2011	27.83333333		28.93103448	23.58333333			23.94444444		22.67857143	21.1	21.9	25		27	26.97435897	28.73333333	25.1754386
2012	30.73913043		32.7037037	23.84444444		16.66666667	23.57692308	22	22.08108108	21.43333333	23.0625	25	15.33333333	24.125	27.93333333	30.55263158	26.47286822
2013	31.94736842		33.37313433	24.47368421		16.66666667	23.18181818	22	25.25	21.31818182		28	15.33333333		29.75	29.5952381	27.75409836
2014	34.7037037		45.46808511	24.2231405		16.85714286	26.64772727	22	23.19230769	18.86666667	17.4	26	16.375		32.03418803	29.375	28.04584041
2015	35.12359551	30	41.51724138	25.77007299	28	17	27.625		26.22395833	22.01481481	21.65934066	25.78181818	18.14285714	22.74285714	32.76237624	32.74626866	29
2016	35.56451613	30	42.28	26.24534687	27.69230769	16	27.87692308		27.07650273	22.25714286	21.79775281	25.63636364	17.71428571	22.52941176	33.1015625	32.98360656	29.20213259
2017	37.4375	29	40.29411765	25.75625	26.66666667		27.80263158	28	27.73469388	21.84782609	21.01298701	26.12820513	19	22.52941176	32.59704641	30.86486486	28.57733813
Grand Total	31.37549407	19.11594203	37.56125356	24.49276527	24.47887324	16.61052632	25.78814628	23.72413793	25.71428571	21.05726872	20.1364366	23.56115108	17.1796875	20.61989796	30.24367816	28.35472973	26.63789774



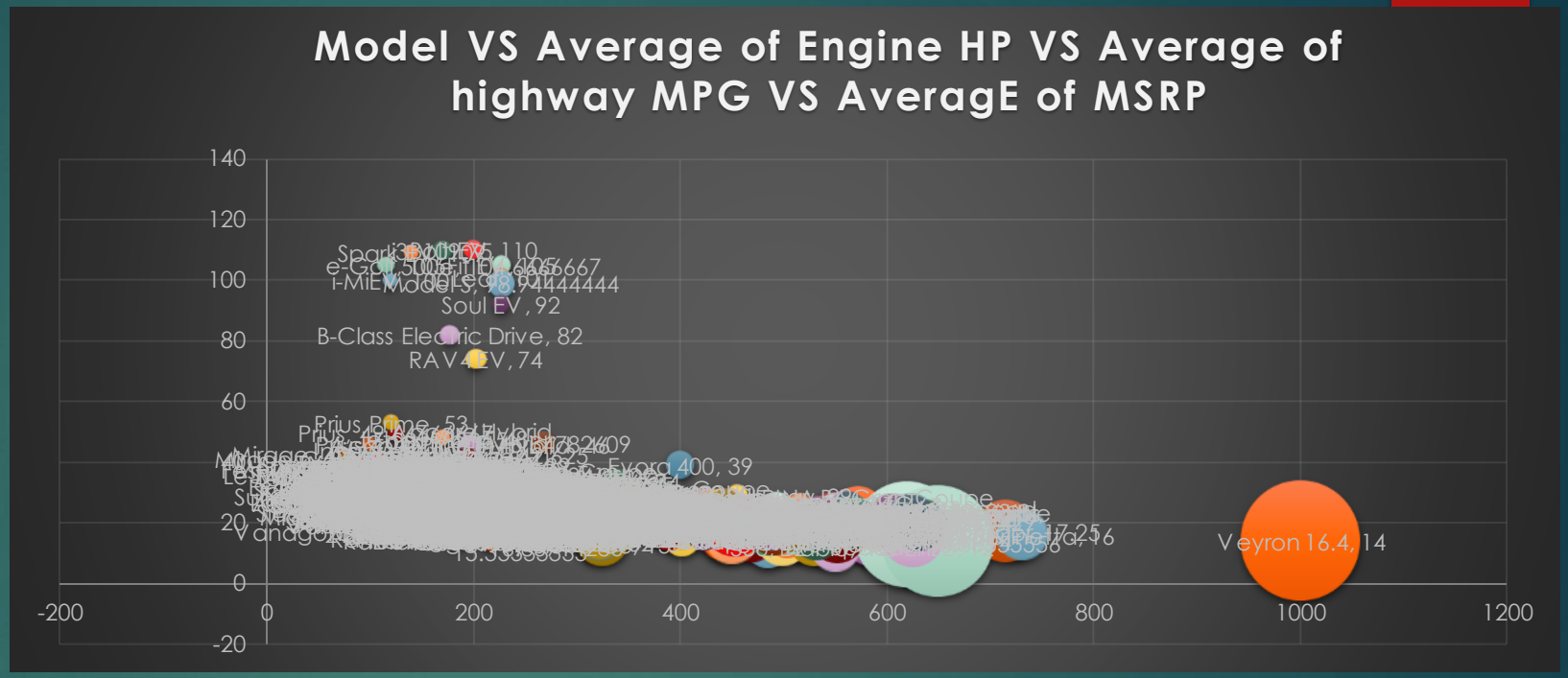


Findings:

- Car body types with higher overall fuel efficiency include sedans, 2 door hatchbacks, and 4 door hatchbacks, according to the analysis. This implies that, in comparison to other body designs, these specific body styles have demonstrated a stronger focus on fuel economy gains

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

Model	Average of Engine HP	Average of highway MPG	Average of MSRP
2	100	34.5	15821.66667
3	165.9433962	38.47169811	22195
5	157	28	22183.63636
6	184	36.73333333	24761.33333
57	586.2857143	16	401357.1429
62	586.2857143	16	452471.4286
80	126.3333333	23.66666667	2000
86	202.5	30	26615
90	172	23.22222222	2000
100	172	22.26666667	2000
200	210.0344828	31.20689655	21496.2069
240	114	25.5	2000
300	294.6666667	28.83333333	38134.33333
323	82	32.8	2000
360	401.9230769	15	161978.5385
500	116.0714286	36.57142857	20449.82143
550	485	12	227170
599	621	15	334449.2
626	148.6363636	26.09090909	13786.81818
740	133.875	24.1875	2000
760	156	19.66666667	2000
780	166	19.5	2000
850	202.9230769	24.76923077	2003.5
900	173.2608696	24.82608696	2025.130435
911	426.3793103	26.15517241	123763.7931
928	345	17	7704.333333
929	193.6666667	22	2000
940	138	23.42857143	2000
944	208	24	3093.75
960	181	23.66666667	2000
968	236	24	4643
6000	132.5	27.625	2000
9000	203.5	25.2	2058.6
44994	215.71875	27.59375	37603.28125
45055	263.6363636	27.63636364	42925.90909
1 Series	267.5	27.625	37853.125



Findings:

- A comparison of the manufacturers' average horsepower shows that some have higher average horsepower than others. This pattern fits in with average MPG (miles per gallon) and manufacturers
  To put it another way, differences in average horsepower, MPG, and MSRP amongst brands show differences in the market for cars in terms of performance, economy, and cost

Result:

I was able to get the insights that are mentioned in the project requirements.

Tasks :
https://www.loom.com/share/610ee715ff404d78b993ca48f27a128f?sid=6bdc9dce-e5f3-4e77-b51c-b03f876c38be

Dashboard :
https://www.loom.com/share/abb230e81f0f49269e7255f5c3d4f3d6?sid=b7b3330e-84e3-40ca-8778-09ad051bec1b

THANK YOU