Analyzing the Impact of Car Features on Price and Profitability

Agenda

- Project Description
- Approach
- Tech-Stack Used
- Insights
- Result

PROJECT DESCRIPTION

- The project focuses on examining car-related data to extract significant insights. The automobile industry's success heavily depends on evaluating a car's performance and market value, which are influenced by attributes like specifications, pricing, and customer preferences.
- Analyzing engine details, fuel economy, brand image, market trends, and pricing patterns can offer valuable perspectives, aiding smarter choices in manufacturing and car sales.
- The provided dataset is in an Excel file and requires cleaning and preparation before it can be analyzed effectively.

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TECH STACK USED

- **Software: Microsoft Excel**

A spreadsheet application by Microsoft used for data analysis, visualization, and automation with formulas, charts, and VBA.

- **Operating System: Windows**

A widely used OS by Microsoft, known for its user-friendly interface, multitasking, and software compatibility.

APPROACH

- To analyze any data, we should first clean the data like empty blanks, duplicates , null values ,design ,Outlier Detection etc.
- So I started cleaning the given data
- I followed the below steps for cleaning the data

1)Firstly I have converted the raw data into table format.

2)I analysed the given columns ,

The given dataset has 16 columns and 11,915 records

- Then I deleted all the records which have blanks in them to increase the consistency of data.
- The final dataset has 11,813 records.

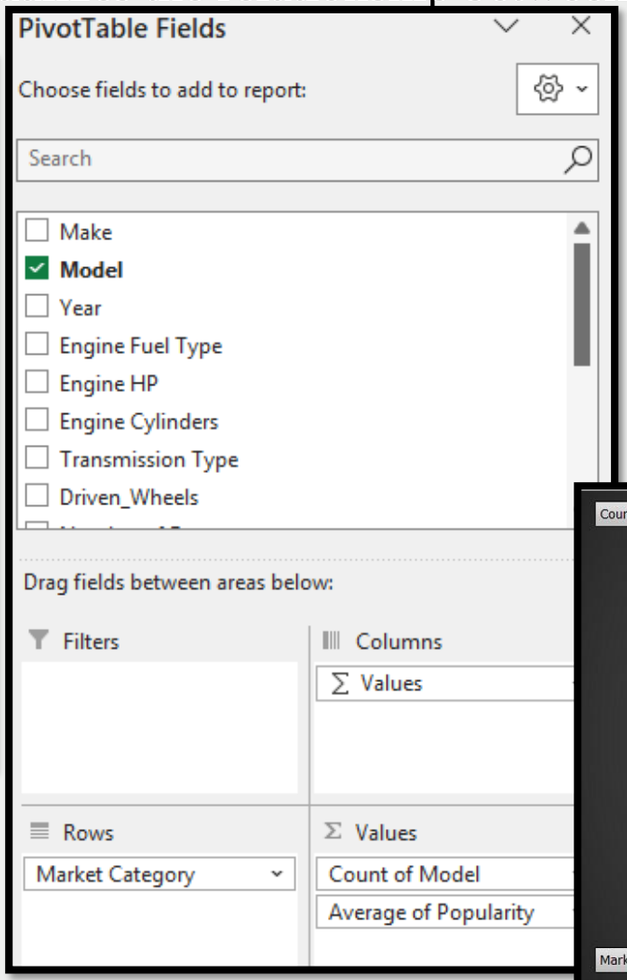
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Make	Model	Year	Engine Fuel	Engine HP	Engine Cyli	Transmissic	Driven_Wh	Number of	Market Cat	Vehicle Size	Vehicle Styl	highway MI	city mpg	Popularity	MSRP	
2	BMW	1 Series M	2011	premium u	335	6	MANUAL	rear wheel	2	Factory Tun	Compact	Coupe	26	19	3916	46135	
3	BMW	1 Series	2011	premium u	300	6	MANUAL	rear wheel	2	Luxury,Perf	Compact	Convertible	28	19	3916	40650	
4	BMW	1 Series	2011	premium u	300	6	MANUAL	rear wheel	2	Luxury,High	Compact	Coupe	28	20	3916	36350	
5	BMW	1 Series	2011	premium u	230	6	MANUAL	rear wheel	2	Luxury,Perf	Compact	Coupe	28	18	3916	29450	
6	BMW	1 Series	2011	premium u	230	6	MANUAL	rear wheel	2	Luxury	Compact	Convertible	28	18	3916	34500	
7	BMW	1 Series	2012	premium u	230	6	MANUAL	rear wheel	2	Luxury,Perf	Compact	Coupe	28	18	3916	31200	
8	BMW	1 Series	2012	premium u	300	6	MANUAL	rear wheel	2	Luxury,Perf	Compact	Convertible	26	17	3916	44100	
9	BMW	1 Series	2012	premium u	300	6	MANUAL	rear wheel	2	Luxury,High	Compact	Coupe	28	20	3916	39300	
10	BMW	1 Series	2012	premium u	230	6	MANUAL	rear wheel	2	Luxury	Compact	Convertible	28	18	3916	36900	
11	BMW	1 Series	2013	premium u	230	6	MANUAL	rear wheel	2	Luxury	Compact	Convertible	27	18	3916	37200	
12	BMW	1 Series	2013	premium u	300	6	MANUAL	rear wheel	2	Luxury,High	Compact	Coupe	28	20	3916	39600	
13	BMW	1 Series	2013	premium u	230	6	MANUAL	rear wheel	2	Luxury,Perf	Compact	Coupe	28	19	3916	31500	
14	BMW	1 Series	2013	premium u	300	6	MANUAL	rear wheel	2	Luxury,Perf	Compact	Convertible	28	19	3916	44400	
15	BMW	1 Series	2013	premium u	230	6	MANUAL	rear wheel	2	Luxury	Compact	Convertible	28	19	3916	37200	
16	BMW	1 Series	2013	premium u	230	6	MANUAL	rear wheel	2	Luxury,Perf	Compact	Coupe	28	19	3916	31500	
17	BMW	1 Series	2013	premium u	320	6	MANUAL	rear wheel	2	Luxury,High	Compact	Convertible	25	18	3916	48250	
18	BMW	1 Series	2013	premium u	320	6	MANUAL	rear wheel	2	Luxury,High	Compact	Coupe	28	20	3916	43550	
19	Audi	100	1992	regular unl	172	6	MANUAL	front wheel	4	Luxury	Midsize	Sedan	24	17	3105	2000	
20	Audi	100	1992	regular unl	172	6	MANUAL	front wheel	4	Luxury	Midsize	Sedan	24	17	3105	2000	
21	Audi	100	1992	regular unl	172	6	AUTOMATI	all wheel dr	4	Luxury	Midsize	Wagon	20	16	3105	2000	
22	Audi	100	1992	regular unl	172	6	MANUAL	front wheel	4	Luxury	Midsize	Sedan	24	17	3105	2000	
23	Audi	100	1992	regular unl	172	6	MANUAL	all wheel dr	4	Luxury	Midsize	Sedan	21	16	3105	2000	
24	Audi	100	1993	regular unl	172	6	MANUAL	front wheel	4	Luxury	Midsize	Sedan	24	17	3105	2000	
25	Audi	100	1993	regular unl	172	6	AUTOMATI	all wheel dr	4	Luxury	Midsize	Wagon	20	16	3105	2000	
26	Audi	100	1993	regular unl	172	6	MANUAL	front wheel	4	Luxury	Midsize	Sedan	24	17	3105	2000	
27	Audi	100	1993	regular unl	172	6	MANUAL	front wheel	4	Luxury	Midsize	Sedan	24	17	3105	2000	
28	Audi	100	1993	regular unl	172	6	MANUAL	all wheel dr	4	Luxury	Midsize	Sedan	21	16	3105	2000	
29	Audi	100	1994	regular unl	172	6	AUTOMATI	front wheel	4	Luxury	Midsize	Wagon	21	16	3105	2000	

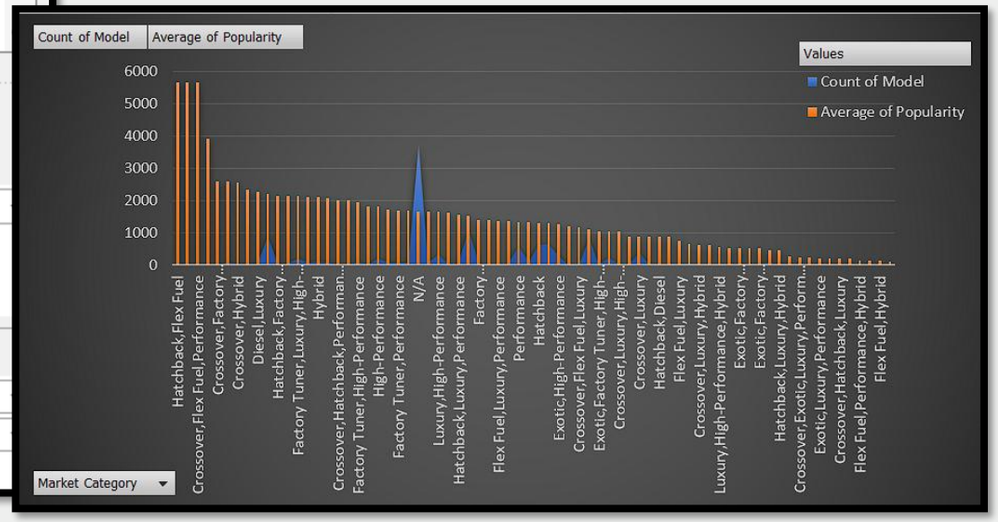
4) **Data Analytics Tasks**

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

Row Labels	Count of Model	Average of Popularity
Hatchback,Flex Fuel	7	5657
Flex Fuel,Diesel	16	5657
Crossover,Flex Fuel,Performance	6	5657
Crossover,Luxury,Performance,Hybrid	2	3916
Crossover,Factory Tuner,Luxury,Performance	5	2607.4
Crossover,Performance	69	2585.956522
Crossover,Hybrid	42	2563.380952
Luxury,Performance,Hybrid	11	2333.181818
Diesel,Luxury	51	2275
Flex Fuel	872	2217.302752
Hatchback,Factory Tuner,Performance	22	2159.045455
Crossover,Luxury,Diesel	34	2149.411765
Factory Tuner,Luxury,High-Performance	215	2133.367442
Hatchback,Hybrid	72	2121.25
Hybrid	123	2105.569106
Crossover,Flex Fuel	64	2073.75
Crossover,Hatchback,Performance	6	2009
Crossover,Hatchback,Factory Tuner,Performance	6	2009
Factory Tuner,High-Performance	106	1941.415094
Crossover,Factory Tuner,Luxury,High-Performance	26	1823.461538
High-Performance	199	1821.447236
Diesel	84	1730.904762
Factory Tuner,Performance	92	1695.695652
Flex Fuel,Performance	87	1680.471264

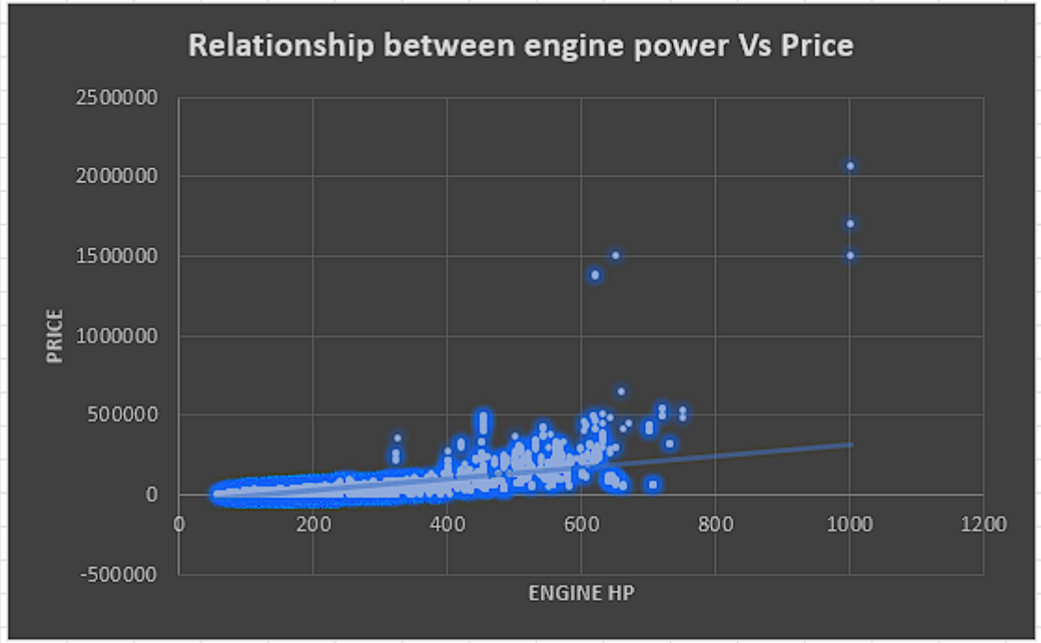




2. Insight Required: What is the relationship between a car's engine power and its price?

- **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.

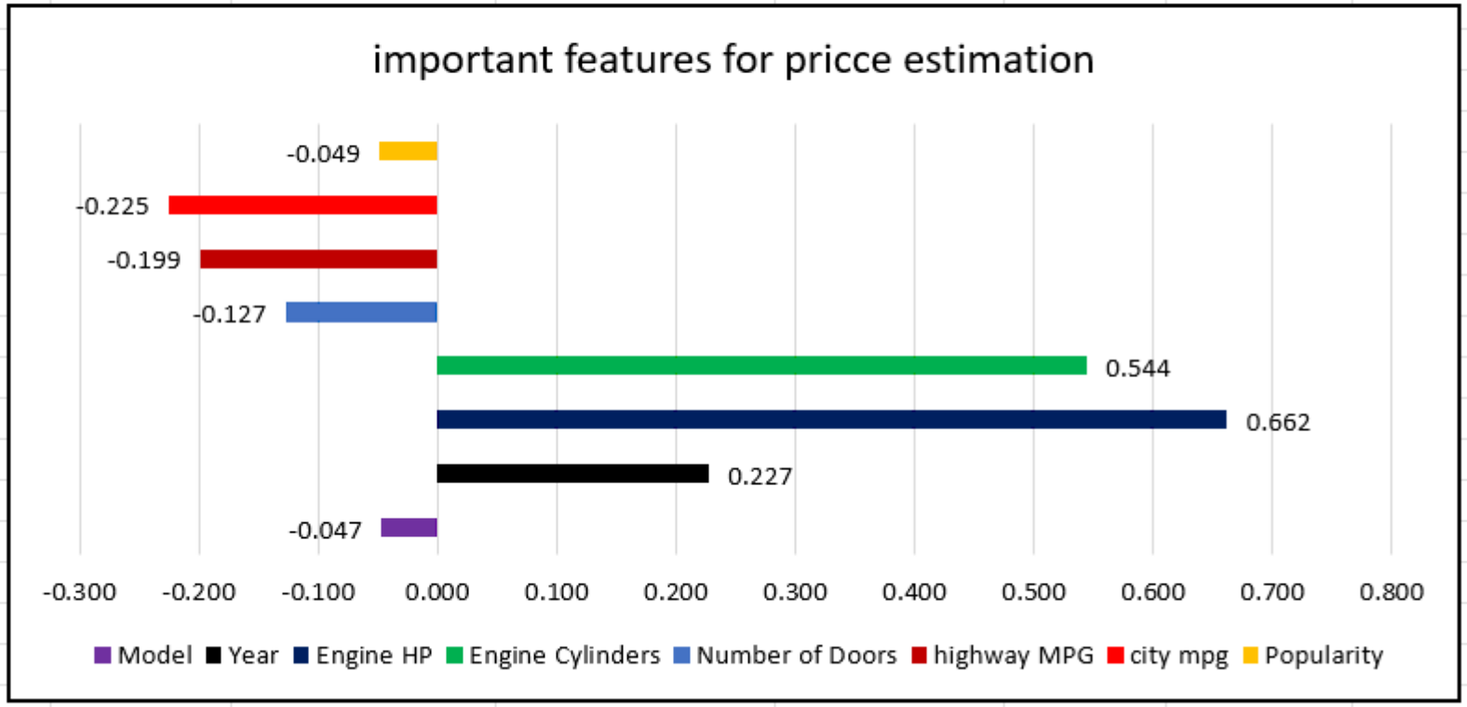
Make	Engine HP	MSRP
BMW	335	46135
BMW	300	40650
BMW	300	36350
BMW	230	29450
BMW	230	34500
BMW	230	31200
BMW	300	44100
BMW	300	39300
BMW	230	36900
BMW	230	37200
BMW	300	39600
BMW	230	31500
BMW	300	44400
BMW	230	37200
BMW	230	31500
BMW	320	48250
BMW	320	43550
Audi	172	2000
Audi	172	2000
Audi	172	2000
Audi	172	2000
Audi	172	2000
Audi	172	2000
Audi	172	2000
Audi	172	2000
Audi	172	2000



3. 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.

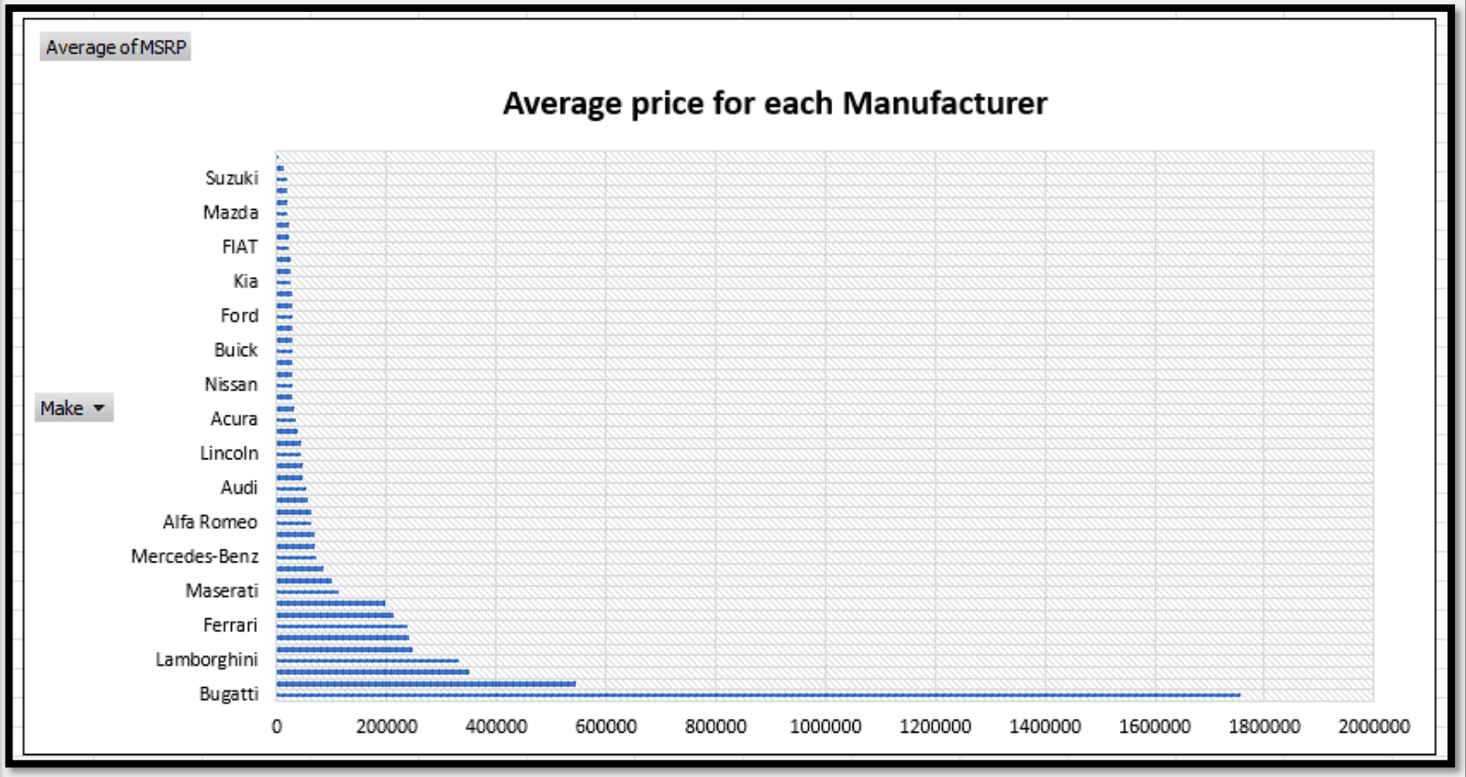
	Model	Year	Engine HP	Engine Cylinders	Number of Doors	highway MPG	city mpg	Popularity
MSRP	-0.047	0.227	0.662	0.544	-0.127	-0.199	-0.225	-0.049

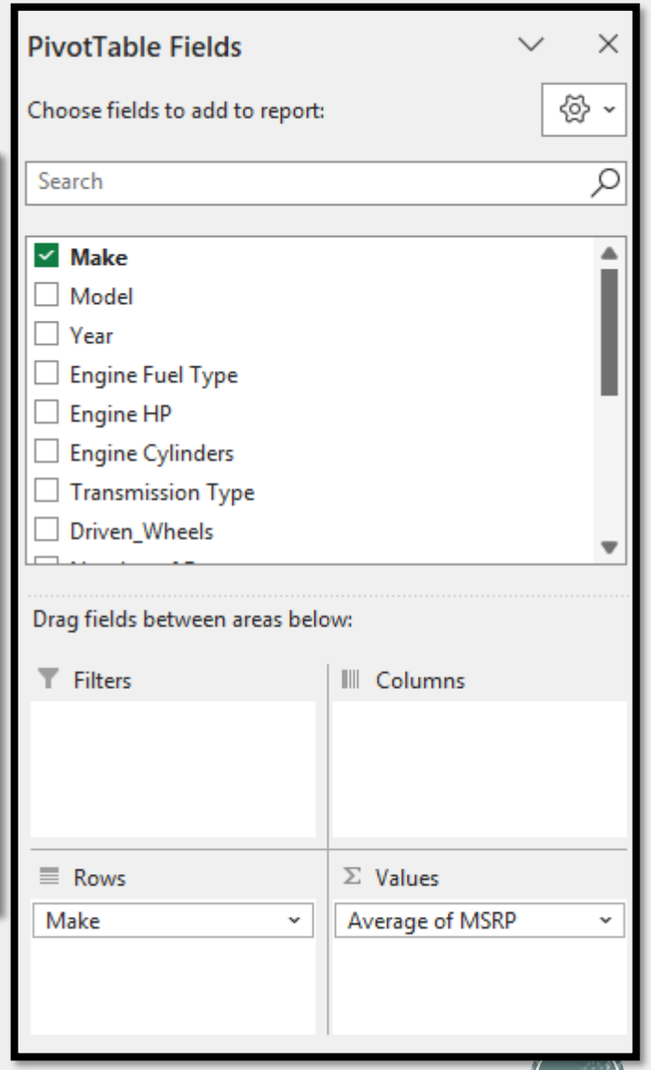


4.Insight Required: How does the average price of a car vary across different manufacturers?

- **Task 4.A:** Create a pivot table that shows the average price of cars for each manufacturer.
- **Task 4.B:** Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.

Manufacturer	Average of MSRP
Bugatti	1757223.667
Maybach	546221.875
Rolls-Royce	351130.6452
Lamborghini	331567.3077
Bentley	247169.3243
McLaren	239805
Ferrari	238218.8406
Spyker	213323.3333
Aston Martin	197910.3763
Maserati	114207.7069
Porsche	101622.3971
Tesla	85255.55556
Mercedes-Benz	71476.22946
Lotus	69188.27586
Land Rover	67823.21678
Alfa Romeo	61600
BMW	61546.76347
Cadillac	56231.31738
Audi	53452.1128
Lexus	47549.06931
Genesis	46616.66667
Lincoln	42839.82927
Infiniti	42394.21212
HUMMER	36464.41176
Acura	34887.5873
GMC	30493.29903
Toyota	29030.01609
Nissan	28583.4319
Volvo	28541.16014





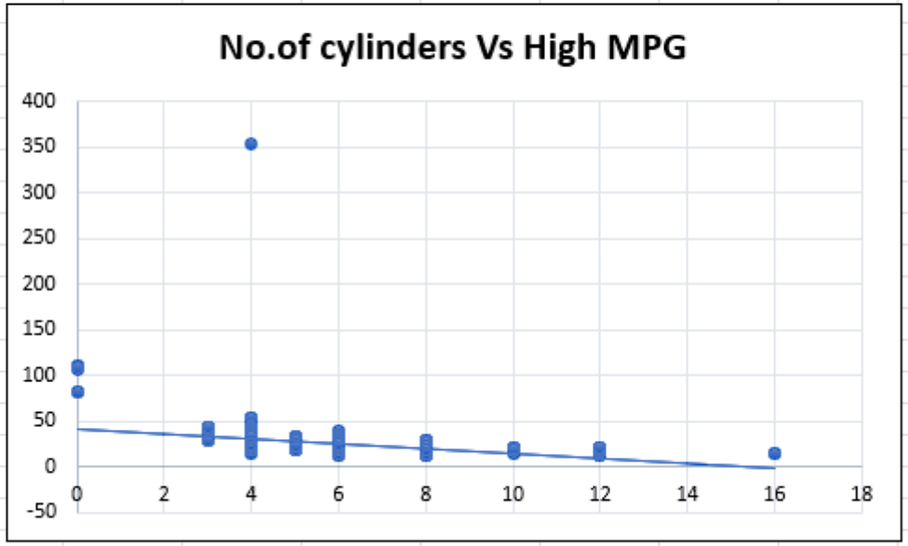
5.Insight Required: What is the relationship between fuel efficiency and the number of cylinders in a car's engine?

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

Make	Engine Cylinders	highway MPG
BMW	6	26
BMW	6	28
BMW	6	28
BMW	6	28
BMW	6	28
BMW	6	28
BMW	6	26
BMW	6	28
BMW	6	28
BMW	6	27
BMW	6	28
BMW	6	28
BMW	6	28
BMW	6	28
BMW	6	28
BMW	6	28
BMW	6	25
BMW	6	28
Audi	6	24
Audi	6	24
Audi	6	20
Audi	6	24
Audi	6	21
Audi	6	24

Correlation between No.of cylinders and Highway MPG

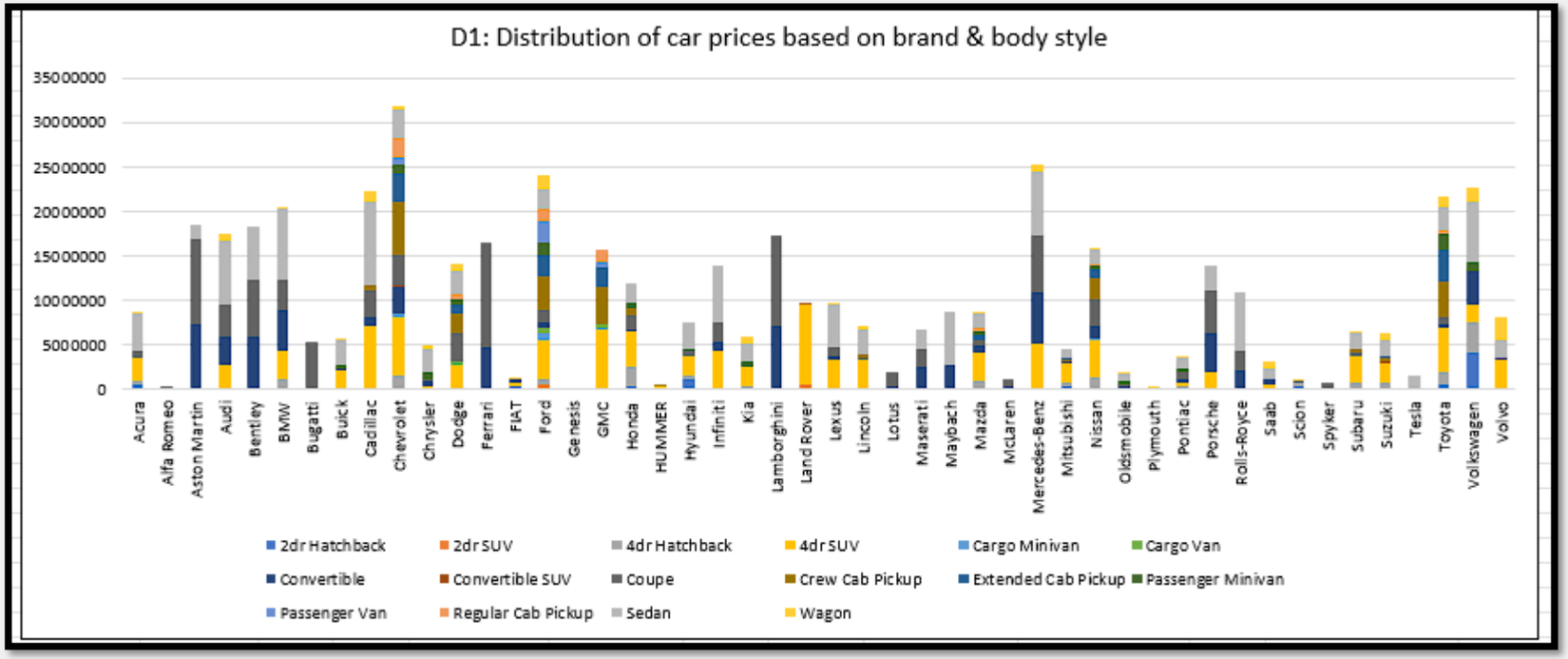
-0.62031

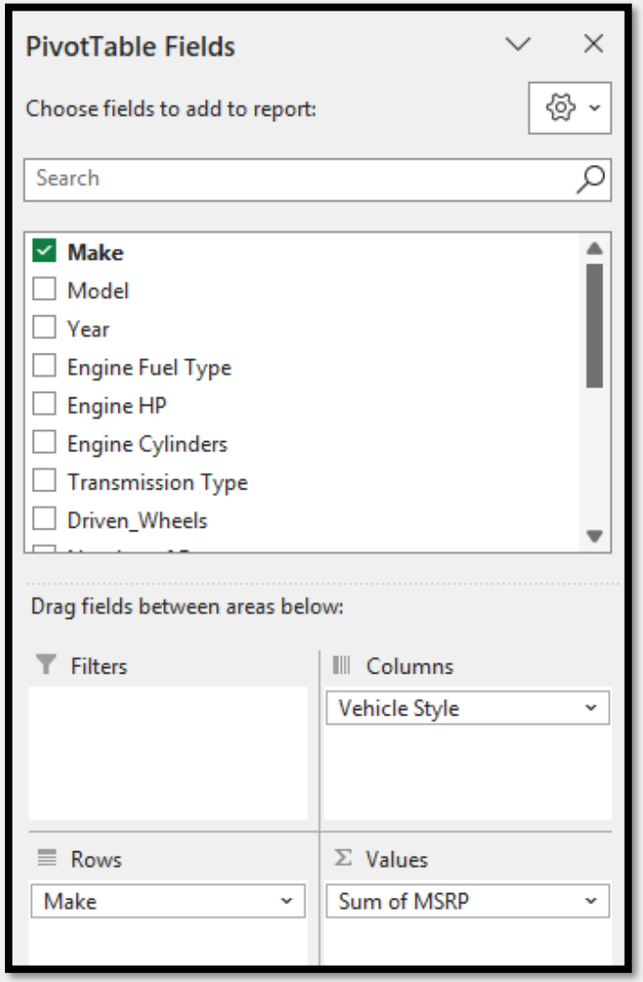


BUILDING THE DASHBOARD:

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

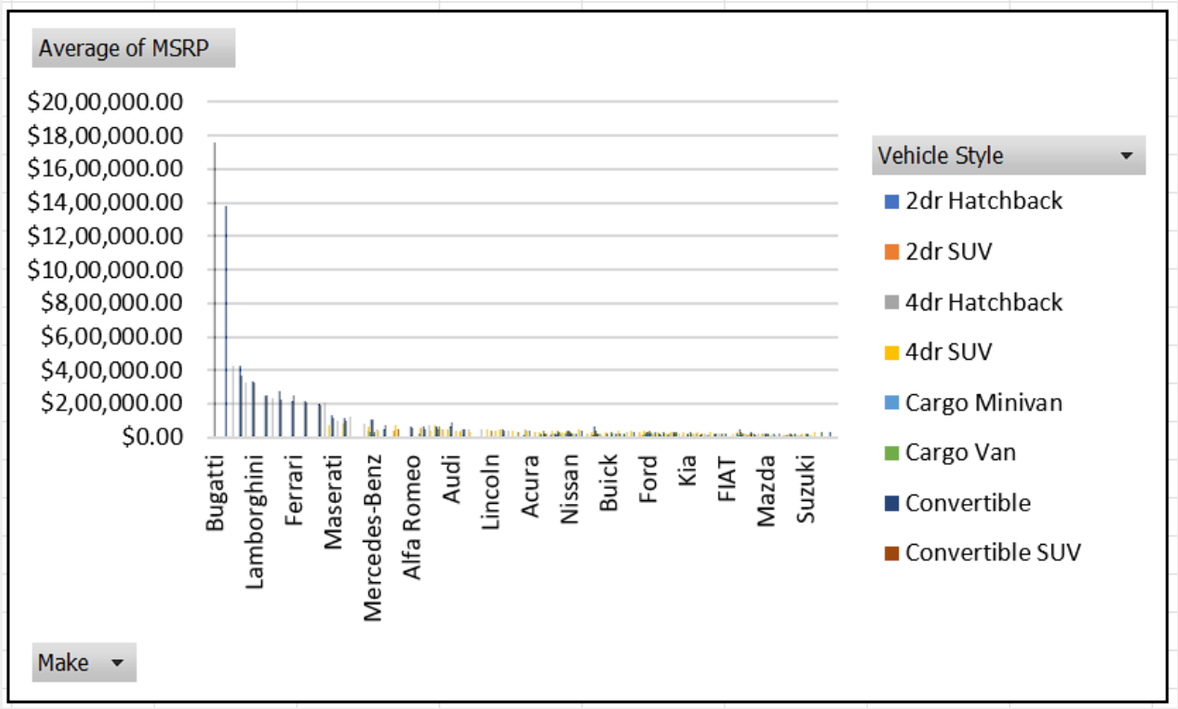
Sum of MSRP / Row Labels	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger Van	Regular Cab Pickup	Sedan	W
Acura	480917		357440	2663505					793748						4294702	
Alfa Romeo							129800		178200							
Aston Martin							7321655		9635275						1448735	
Audi	4000			2674900			3291405		3556290						7158348	
Bentley							6012870		6356760						5920900	
BMW	80097		1144950	3160950			4502671		3419051						7989300	
Bugatti									5271671							
Buick				2141770			179325		18534			330065			2850590	
Cadillac				7182555			985607		2953574	599150					9418847	
Chevrolet	8000	213310	1287260	6569568	420150	78688	2953245	106300	3504525	5927617	3117951	1178515	607670	2260032	3303977	
Chrysler	98805			250545			630105		114510			922295			2479859	
Dodge	48000	44000	18000	2572405	60520	338497	12000		3264627	2235775	864172	557425	70708	719408	2417585	
Ferrari							4723811		11713289							
FIAT	420715			369305			327965									
Ford	36000	479873	567615	4482771	702400	566351	730007		1398144	3812353	2285584	1411605	2431898	1299240	2299348	
Genesis															139850	

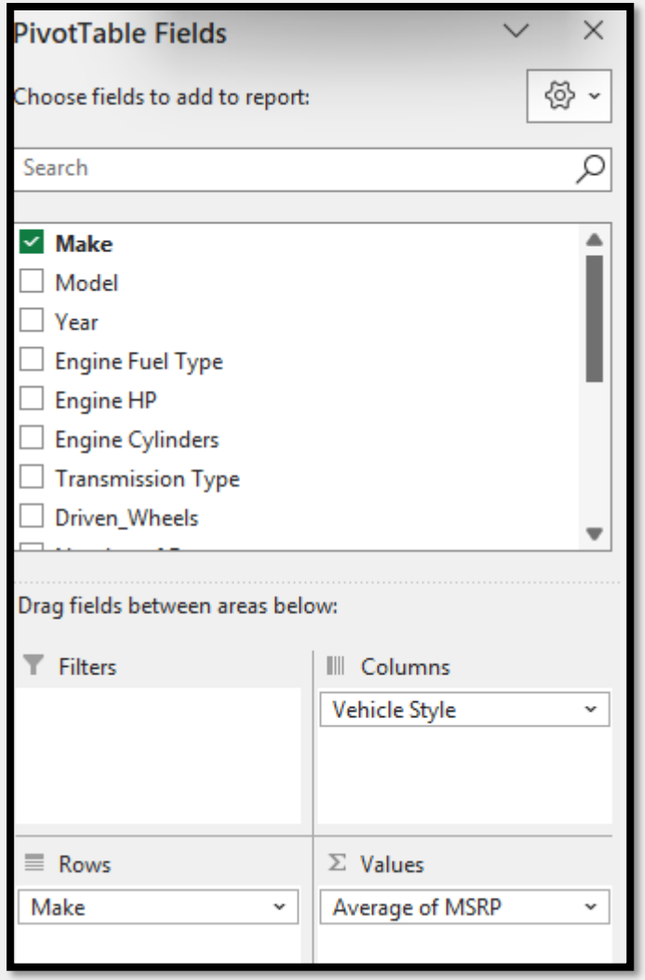




Task 2: Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?

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
Bugatti									$17,57,223.67		
Maybach							$13,81,375.00				
Rolls-Royce							$4,28,273.00		$3,67,445.83		
Lamborghini							$3,36,402.38		$3,28,291.94		
Bentley							$2,50,536.25		$2,54,270.40		
McLaren							$2,80,225.00		$2,29,700.00		
Ferrari							$2,14,718.68		$2,49,218.91		
Spyker							$2,19,990.00		$2,09,990.00		
Aston Martin							$2,03,379.31		$1,92,705.50		
Maserati				$77,500.00			$1,30,164.61		$1,16,016.71		

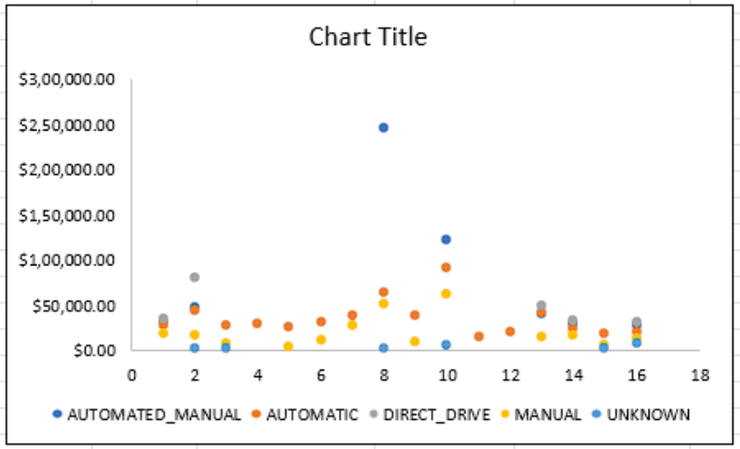


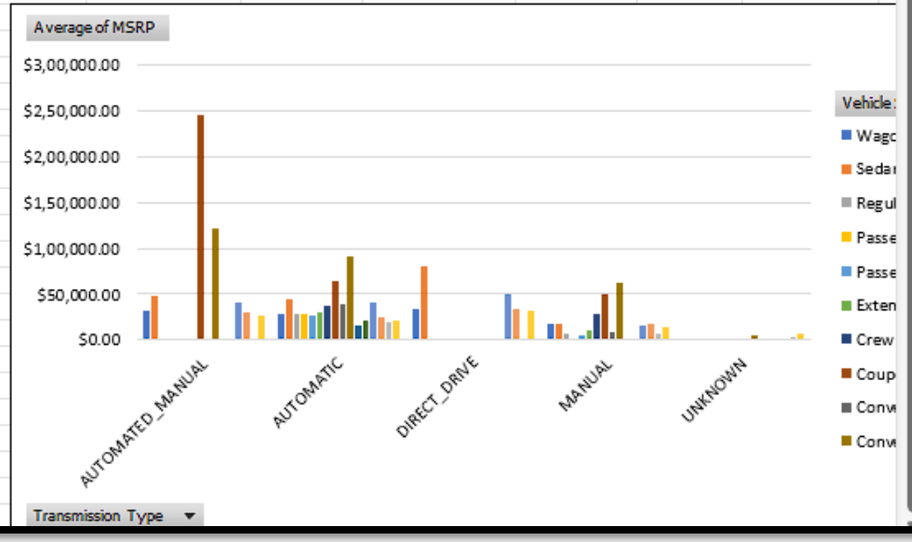


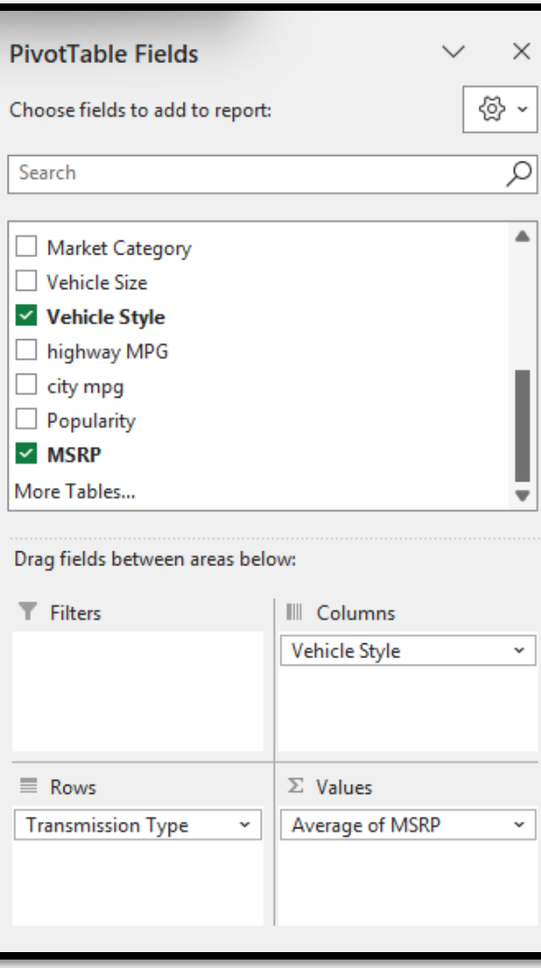
Task 3: How do the different features such as transmission type affect the MSRP, and how does this vary by body style?

Row Labels	Wagon	Sedan	Regular Cab Pickup	Passenger Van	Passenger Minivan	Extended Cab Pickup	Crew Cab Pickup	Coupe	Convertible SUV	Convertible	Cargo Van	Cargo Minivan	4
AUTOMATED_MANUAL	$31,985.28	$47,498.71						$2,45,977.43		$1,21,256.64			$
AUTOMATIC	$27,613.19	$43,769.12	$28,536.82	$29,015.20	$26,412.68	$30,637.35	$37,744.07	$63,371.81	$38,925.50	$90,637.39	$15,280.22	$20,920.99	$
DIRECT_DRIVE	$34,250.00	$79,512.25											$
MANUAL	$17,844.14	$17,119.23	$7,557.77		$4,405.33	$10,884.19	$28,360.53	$50,484.37	$9,233.14	$62,357.76			$
UNKNOWN		$2,000.00	$2,000.00					$2,000.00		$5,783.50			
Grand Total	**$25,557.94**	**$39,270.69**	**$15,953.71**	**$29,015.20**	**$25,621.05**	**$22,488.78**	**$37,220.47**	**$76,248.32**	**$17,424.14**	**$84,224.28**	**$15,280.22**	**$20,920.99**	**$**

Row Labels	Wagon	Sedan	Regular Cab Pickup	Passenger Van	Passenger Minivan	Extended Cab Pickup	Crew Cab Pickup	Coupe	Convertible SUV	Convertible	Cargo Van	Cargo Minivan	4
AUTOMATED_MANUAL	$31,985.28	$47,498.71						$2,45,977.43		$1,21,256.64			$
AUTOMATIC	$27,613.19	$43,769.12	$28,536.82	$29,015.20	$26,412.68	$30,637.35	$37,744.07	$63,371.81	$38,925.50	$90,637.39	$15,280.22	$20,920.99	$
DIRECT_DRIVE	$34,250.00	$79,512.25											$
MANUAL	$17,844.14	$17,119.23	$7,557.77		$4,405.33	$10,884.19	$28,360.53	$50,484.37	$9,233.14	$62,357.76			$
UNKNOWN		$2,000.00	$2,000.00					$2,000.00		$5,783.50			

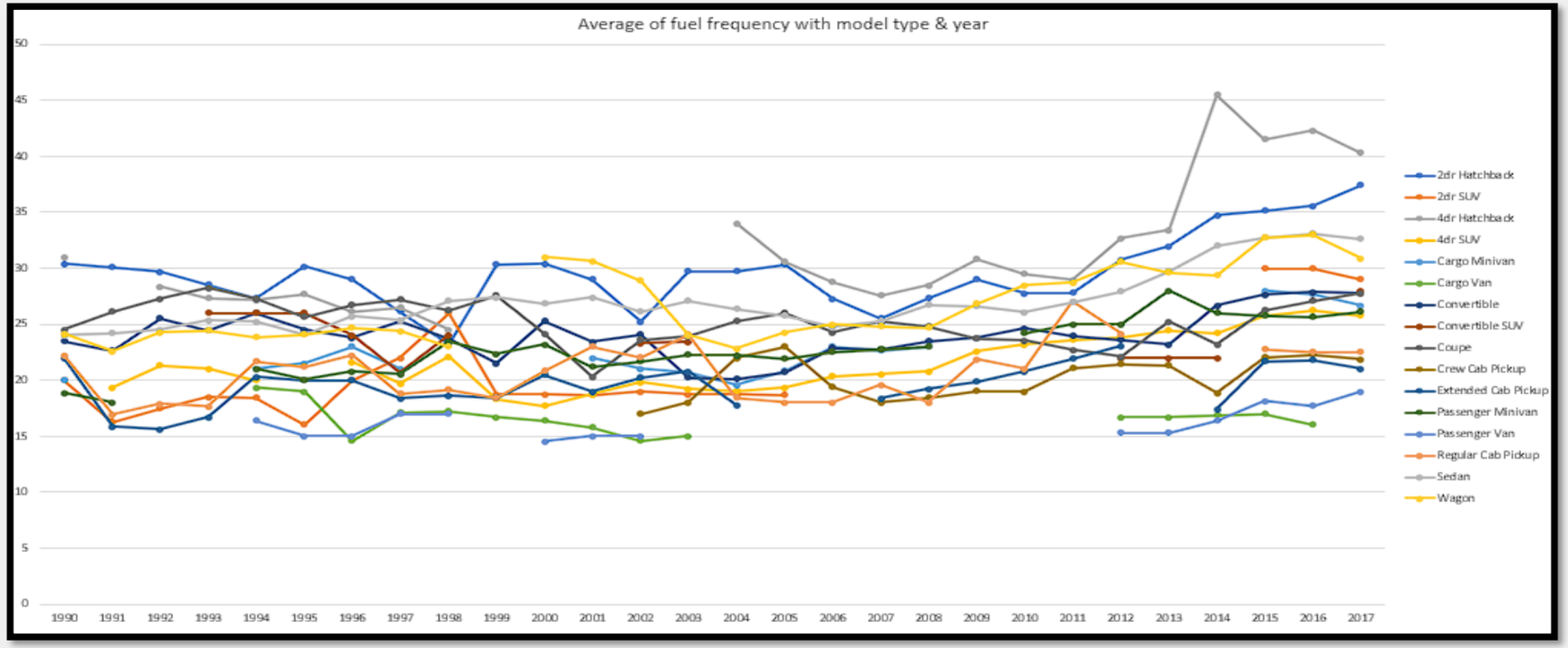


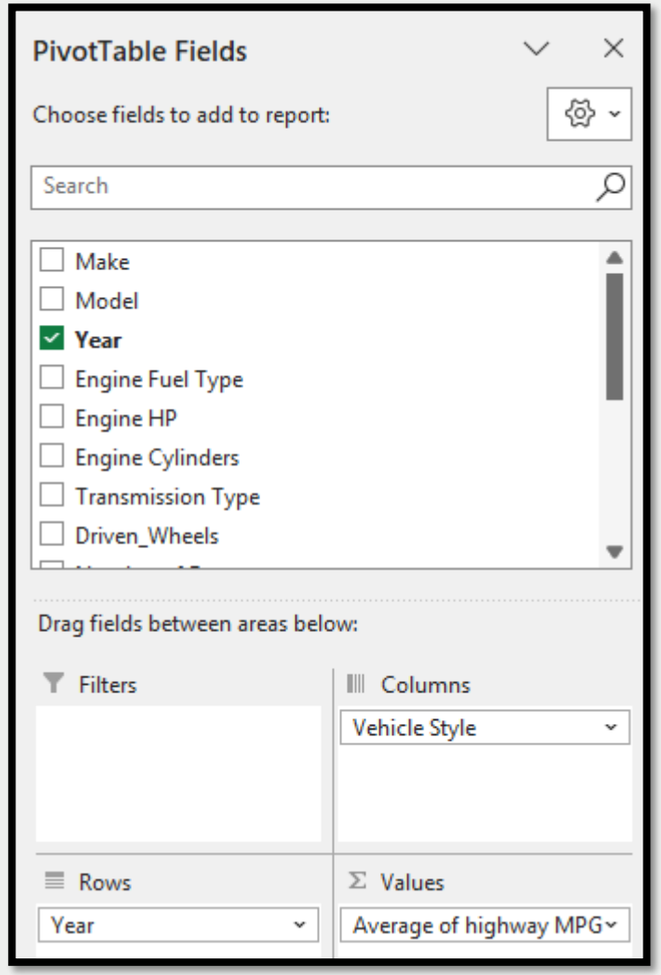




Task 4: How does the fuel efficiency of cars vary across different body styles and model years?

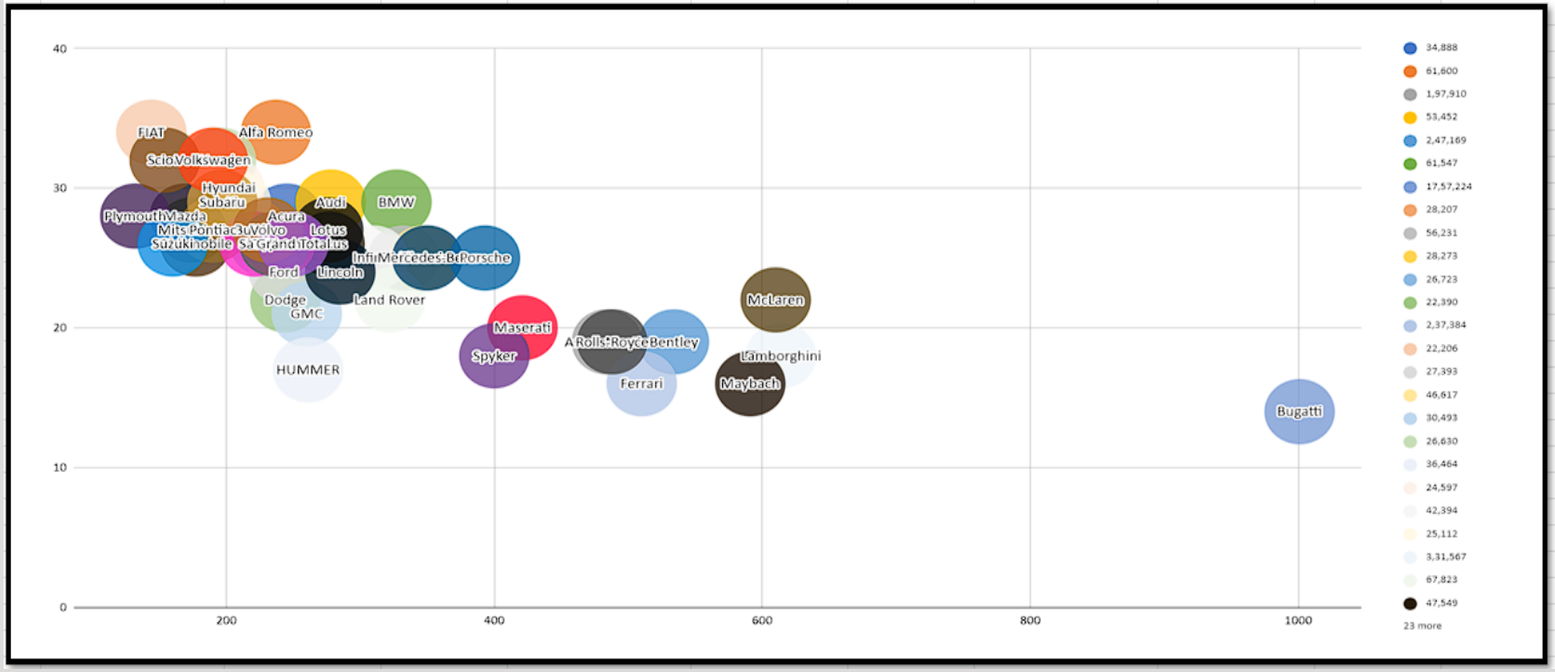
Average of highway MPG	Column Labels													
Row Labels	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger Van	Regular
1990	30.4	20	31		20		23.5		24.5		22	18.85714286		22
1991	30.06666667	16.25		19.33333333			22.625		26.15789474		15.83333333	18		16
1992	29.6969697	17.47058824	28.375	21.33333333			25.5		27.28571429		15.6			17
1993	28.53333333	18.47368421	27.3	21			24.46153846	26	28.25925926		16.71428571			17
1994	27.35	18.42857143	27.14285714	20	21	19.33333333	26	26	27.29166667		20.28571429	21	16.4	21
1995	30.14285714	16	27.66666667		21.5	19	24.5	26	25.67741935		20	20.08333333	15	
1996	29	20	26.125	21.6	23	14.55555556	23.8	24	26.72727273		20	20.77777778	15	
1997	26.11111111	22	26.5	19.7	21	17.125	25.28571429	20.66666667	27.20689655		18.35714286	20.55555556	17	18
1998	23.2	26	24.5	22.11111111		17.2	23.66666667	24	26.26666667		18.625	23.4	17	19
1999	30.33333333	18.75		18.3		16.66666667	21.5		27.55555556		18.42307692	22.33333333		18
2000	30.41666667	18.75		17.73333333		16.4	25.28571429		24.16666667		20.5	23.16666667	14.5	20
2001	29	18.66666667		18.72727273	22	15.8	23.4375		20.29411765		19	21.2	15	
2002	25.25	19		19.79411765	21	14.6	24.07142857	23.28571429	23.6	17	20.22222222	21.6875	15	22
2003	29.75	18.75		19.22857143	20.66666667	15	20.23076923	23.4	23.87878788	18	20.77777778	22.2972973		24
2004	29.71428571	18.75	34	19.04081633	19.6		20.1		25.26666667	22	17.75	22.2		18
2005	30.33333333	18.66666667	30.6	19.33333333	20.85714286		20.72727273		26	23		21.88888889		





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

Row Labels	Average of MSRP	Average of highway MPG	Average of Engine HP
Acura	34887.5873	28.11111111	244.797619
Alfa Romeo	61600	34	237
Aston Martin	197910.3763	18.89247312	484.3225806
Audi	53452.1128	28.82317073	277.695122
Bentley	247169.3243	18.90540541	533.8513514
BMW	61546.76347	29.24550898	326.9071856
Bugatti	1757223.667	14	1001
Buick	28206.61224	26.94897959	219.244898
Cadillac	56231.31738	25.23677582	332.3098237
Chevrolet	28350.38557	25.81567231	246.9722471
Chrysler	26722.96257	26.36898396	229.1390374
Dodge	22390.05911	22.34504792	244.4153355
Ferrari	238218.8406	15.72463768	511.9565217
FIAT	22670.24194	37.33870968	143.559322
Ford	27399.26674	24.00681044	243.0979263
Genesis	46616.66667	25.33333333	347.3333333
GMC	30493.29903	21.4038835	259.8446602
Honda	26674.34076	32.57461024	195.7494407
HUMMER	36464.41176	17.29411765	261.2352941
Hyundai	24597.0363	30.39273927	201.9174917
Infiniti	42394.21212	24.77878788	310.0666667
Kia	25310.17316	30.65367965	206.8274336
Lamborghini	331567.3077	18.01923077	614.0769231
Land Rover	67823.21678	22.12587413	322.0979021
Lexus	47549.06931	25.87623762	277.4158416
Lincoln	42839.82927	24.48780488	284.9102564
Lotus	69188.27586	26.55172414	275.9655172



INSIGHTS

A. Car Popularity Analysis: Looked at how popular different car models are across various market categories. This helped in understanding which types of cars attract the most consumer interest.

B. Engine Power vs. Price Analysis: Explored how a car's horsepower affects its price. By using scatter plots and trendlines, we identified whether more powerful cars tend to be more expensive.

C. Feature Importance in Pricing: Analyzed which car features play the biggest role in determining a car's price. Regression analysis was used to find out which aspects, like fuel type or transmission, impact pricing the most.

D. Manufacturer Pricing Analysis: Compared the average prices of cars from different manufacturers to see which brands position themselves as affordable, mid-range, or luxury.

E. Fuel Efficiency vs. Engine Cylinders Analysis: Studied how the number of cylinders in a car's engine affects its fuel efficiency. This helped in understanding the trade-off between power and mileage.

F. Interactive Dashboard Development: Built an Excel dashboard that makes it easy to explore insights using filters and charts. This allows users to interact with the data and see how different features impact car pricing and popularity.

RESULT

By the project, I have analyzed car feature and pricing data, including engine power, fuel efficiency, market category, and brand.

I identified how each factor influences car popularity, pricing, and profitability.

This project had a good impact on understanding consumer preferences, pricing strategies, and key features that drive market demand.

REFERENCE LINK:

The link for excel sheet file

project7_Excel_Sheet


thank
you!