

# ANALYZING THE IMPACT OF CAR FEATURES ON PRICE AND PROFITABILITY

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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.
- A data analyst could provide valuable insights to a car manufacturer and help them optimize their pricing and product development decisions to maximize profitability while meeting consumer demand.



## APPROACH:

To implement this project, I utilized Microsoft Office Excel. Firstly, I imported the given datasets into the software and carefully analyzed each column and its attributes. I also checked the connections between different columns. During the analysis, I identified null and duplicate values and removed them to improve the accuracy of the results. Pivot tables were very helpful in performing the project tasks as they allowed me to connect different columns and perform various analyses.

## TECH STACK USED:

- MS EXCEL
- POWERPOINT

## DATA CLEANING:

- ☐ All the rows which have blank cells are filtered out and removed.
- ☐ Few columns like “MODEL” which are having values like both numbered and text are converted into text using built-in features.



# INSIGHTS REQUIRED: How does the popularity of a car model vary across different market categories?

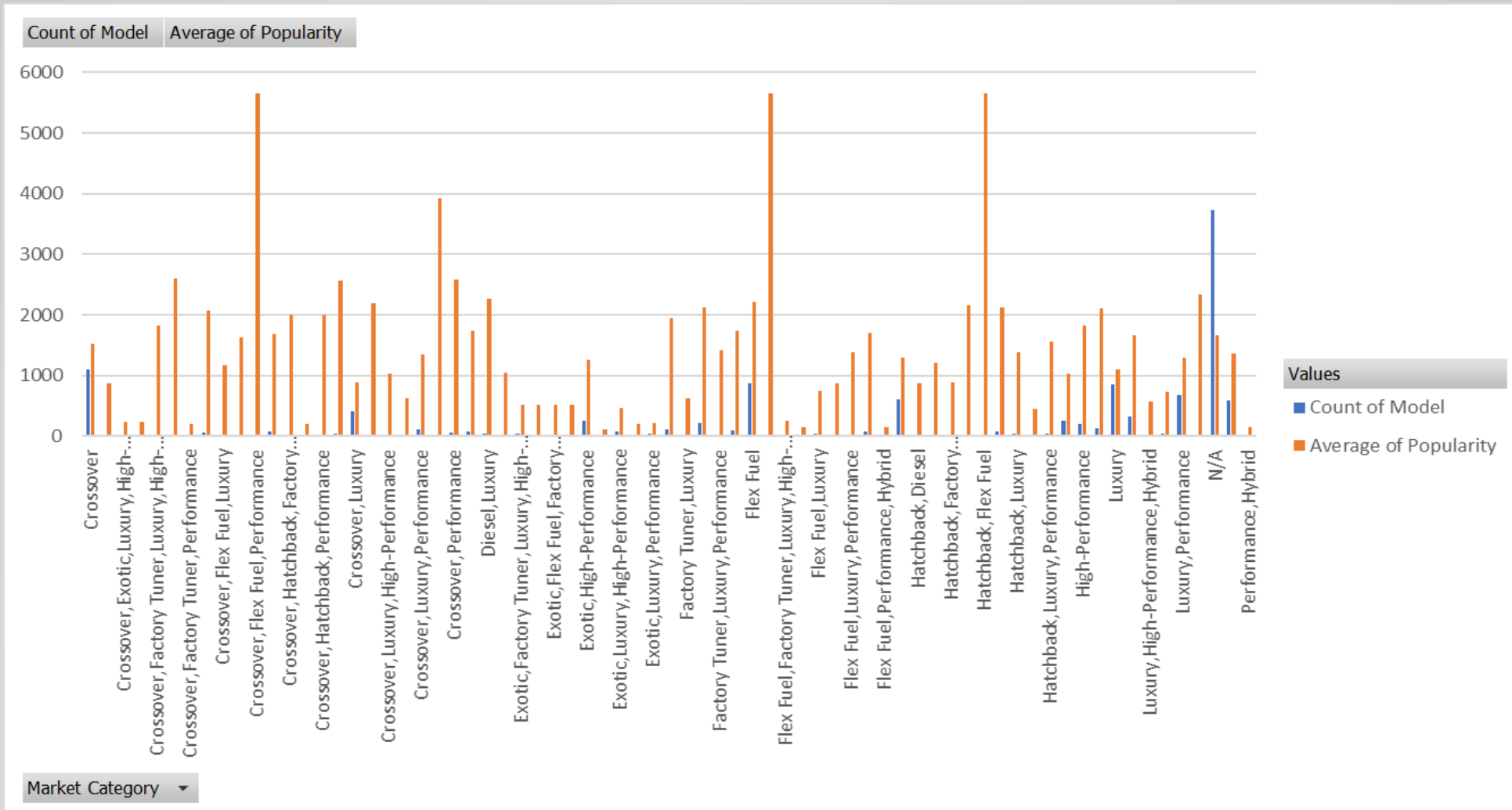
**Task 1.A:** Create a pivot table that shows the number of car models in each market category and their corresponding popularity scores.

Row Labels	Count of Model	Average of Popularity
Crossover	1103	1529.030825
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	33	2195.848485
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

Flex Fuel,Luxury,Performance	28	1380.071429
Flex Fuel,Performance	81	1702.358025
Flex Fuel,Performance,Hybrid	2	155
Hatchback	614	1292.998371
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	851	1107.553467
Luxury,High-Performance	334	1668.017964
Luxury,High-Performance,Hybrid	12	568.8333333
Luxury,Hybrid	48	724.6875
Luxury,Performance	673	1292.615156
Luxury,Performance,Hybrid	11	2333.181818
N/A	3728	1671.388144
Performance	584	1371.080479
Performance,Hybrid	1	155
Grand Total	11812	1553.679902

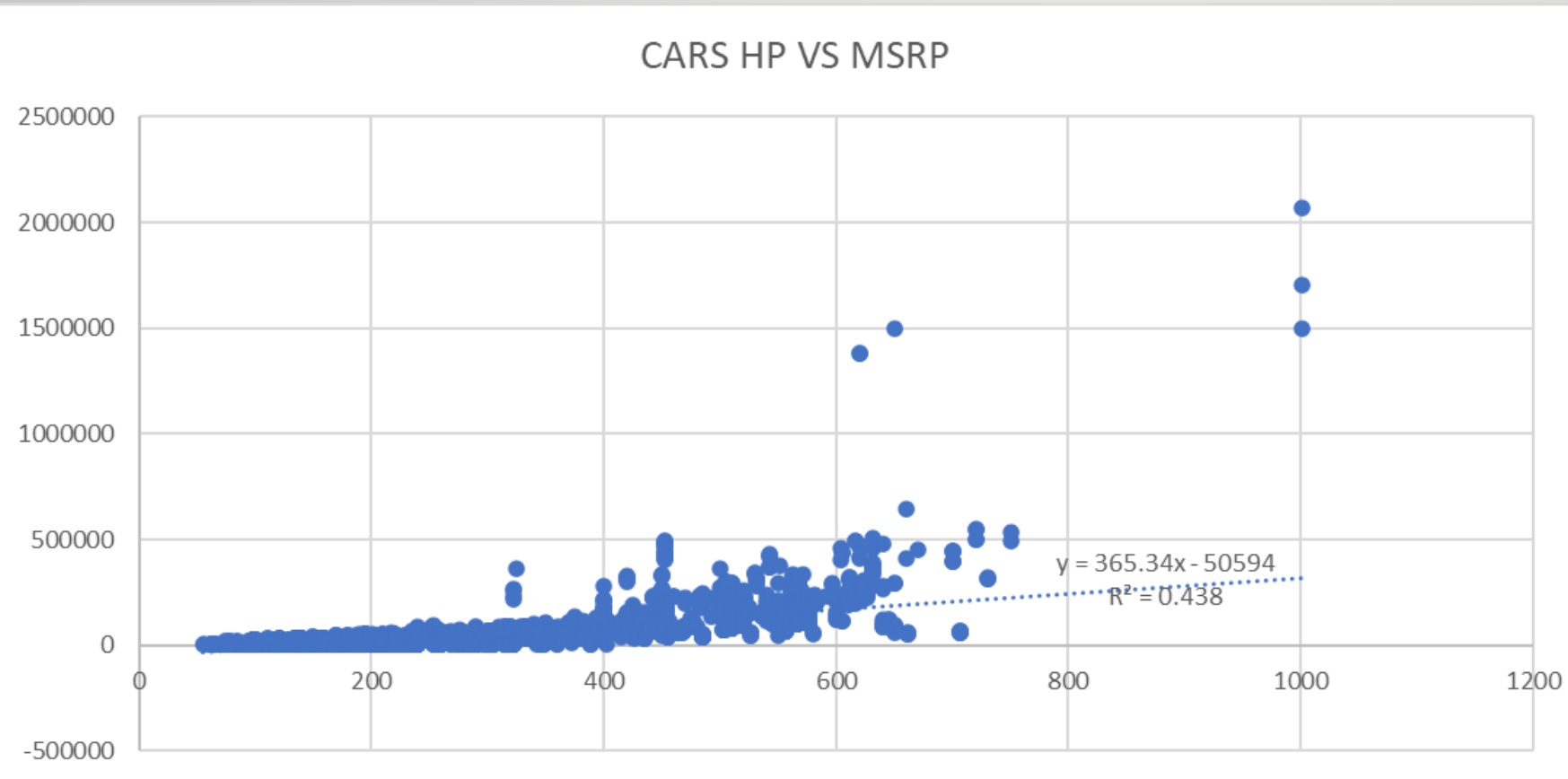


**Task 1.B:** Create a combo chart that visualizes the relationship between market category and popularity.



**INSIGHTS REQUIRED:** What is the relationship between a car's engine power and its price?

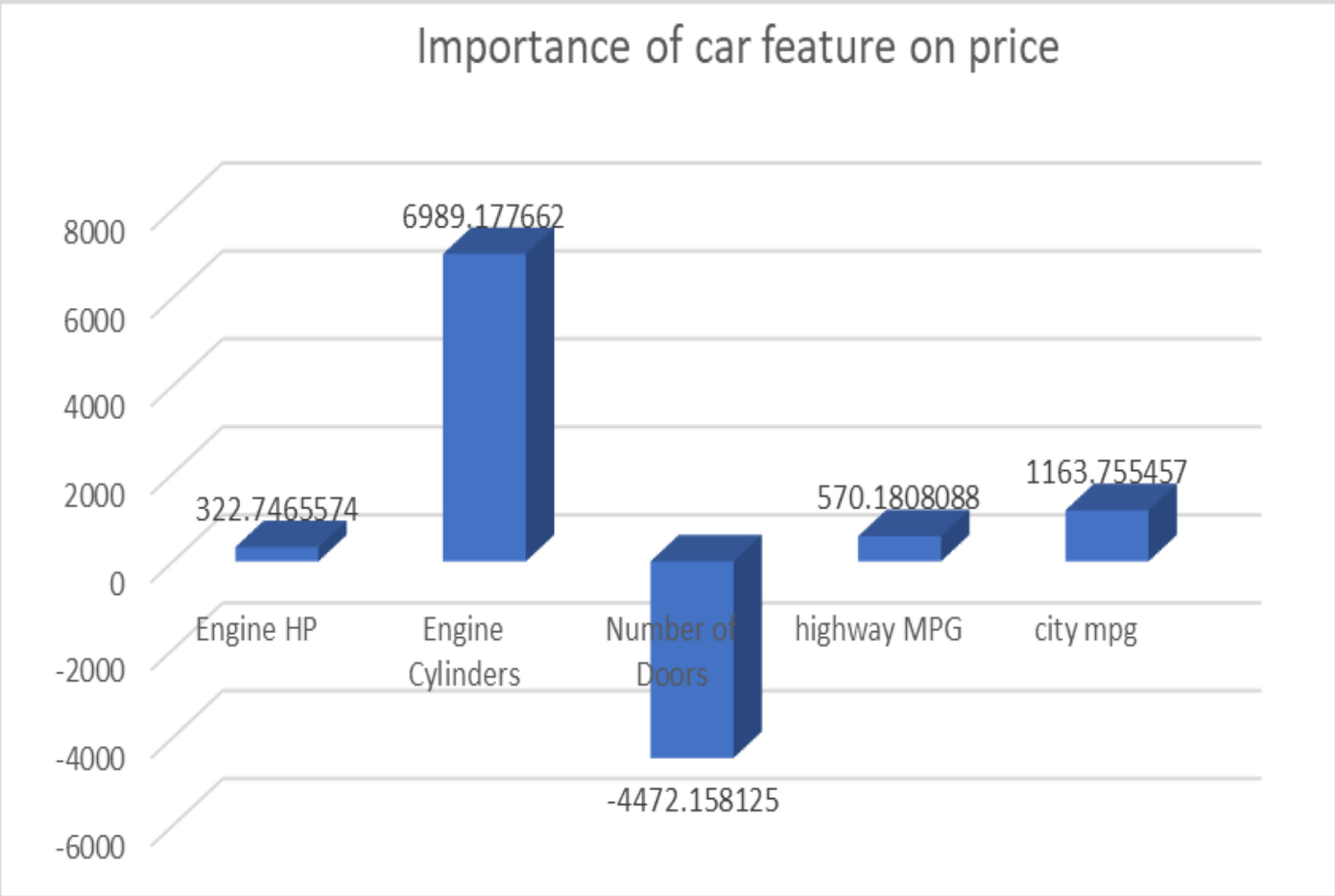
**Task 2:** Create a scatter chart that plots engine power on the x-axis and price on the y-axis. Add a trendline to the chart to visualize the relationship between these variables.



➤ **Car's is increased with respect to the car's engine HP i.e; directly proportional.**

**INSIGHTS 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	0.680708							
R Square	0.463364							
Adjusted R	0.463136							
Standard E	44170.78							
Observatic	11812							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	5	1.99E+13	3.98E+12	2038.799	0			
Residual	11806	2.3E+13	1.95E+09					
Total	11811	4.29E+13						
Coefficientsandard Error								
Intercept	-101602	3684.352	-27.5766	2.8E-162	-108823.673	-94379.79896	-108823.673	-94379.79896
Engine HP	322.7466	6.017674	53.63311	0	310.9509241	334.5421906	310.9509241	334.5421906
Engine Cyl	6989.178	439.645	15.89732	2.54E-56	6127.400961	7850.954363	6127.400961	7850.954363
Number of	-4472.16	465.7181	-9.60272	9.35E-22	-5385.042338	-3559.273912	-5385.042338	-3559.273912
highway M	570.1808	105.784	5.390049	7.18E-08	362.826764	777.5348535	362.826764	777.5348535
city mpg	1163.755	121.9978	9.53915	1.72E-21	924.61962	1402.891294	924.61962	1402.891294

➤ **Engine Cylinders is most important feature in determining the car's price.**

**INSIGHTS 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	MSRP
BMW	46135
BMW	40650
BMW	36350
BMW	29450
BMW	34500
BMW	31200
BMW	44100
BMW	39300
BMW	36900
BMW	37200
BMW	39600
BMW	31500
BMW	44400
BMW	37200
BMW	31500
BMW	48250
BMW	43550
Audi	2000
Audi	2000
Audi	2000
Audi	2000
Audi	2000
Audi	2000
Audi	2000
Audi	2000
Audi	2000
Audi	2000

TOP 10 MANUFACTURERS

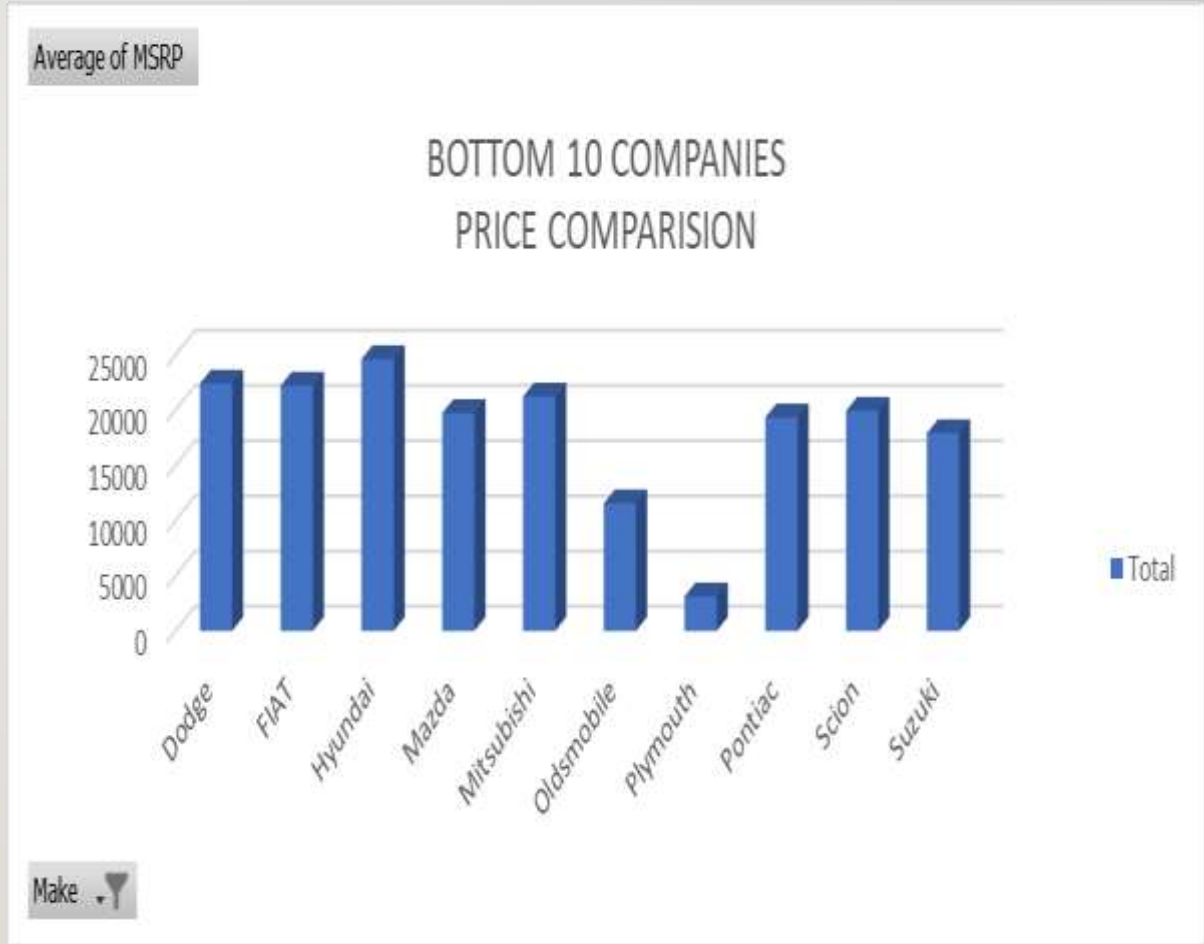
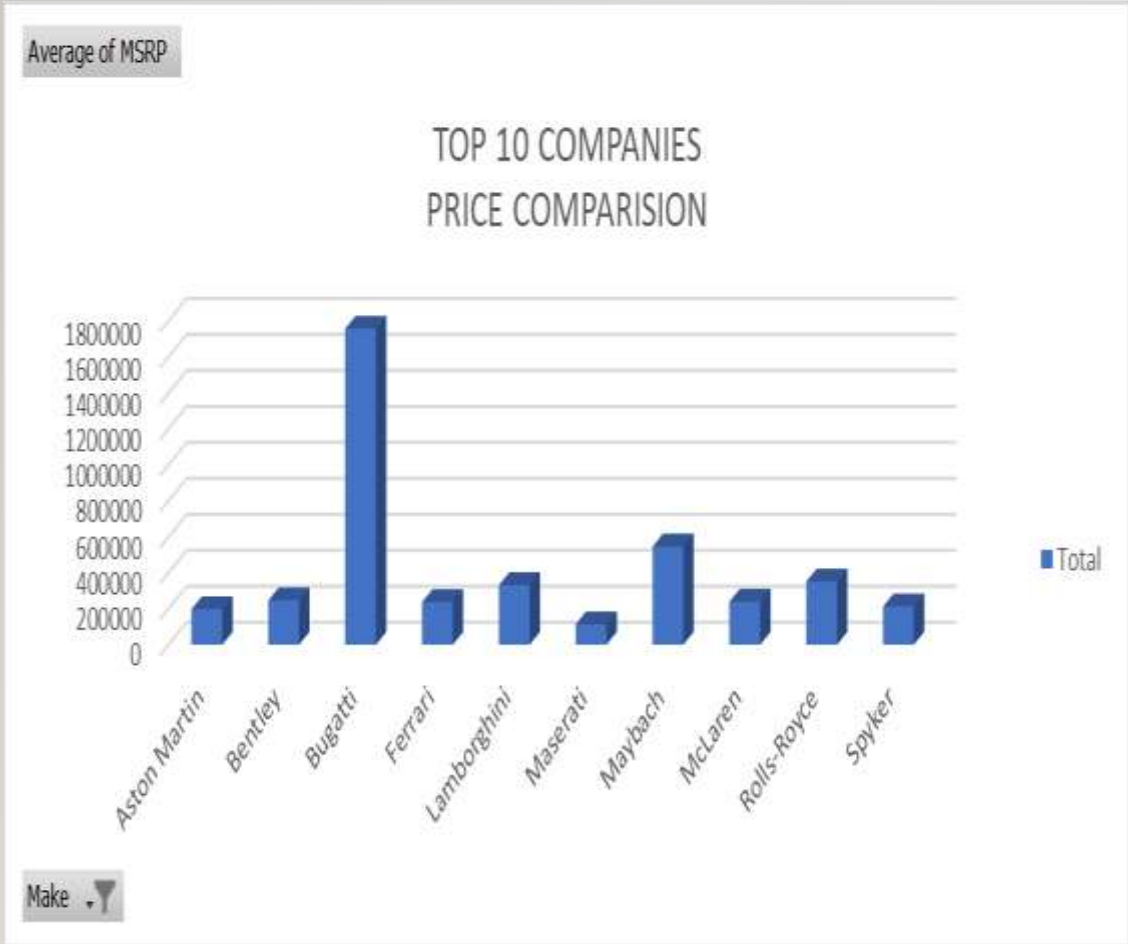
Row Labels	Average of MSRP
Aston Martin	197910.3763
Bentley	247169.3243
Bugatti	1757223.667
Ferrari	237383.8235
Lamborghini	331567.3077
Maserati	114207.7069
Maybach	546221.875
McLaren	239805
Rolls-Royce	351130.6452
Spyker	213323.3333
Grand Total	256672.7246

BOTTOM 10 MANUFACTURERS

Row Labels	Average of MSRP
Dodge	22390.05911
FIAT	22206.01695
Hyundai	24597.0363
Mazda	19719.05707
Mitsubishi	21215.47143
Oldsmobile	11542.54
Plymouth	3122.902439
Pontiac	19321.54839
Scion	19932.5
Suzuki	17900.9569
Grand Total	19854.97033

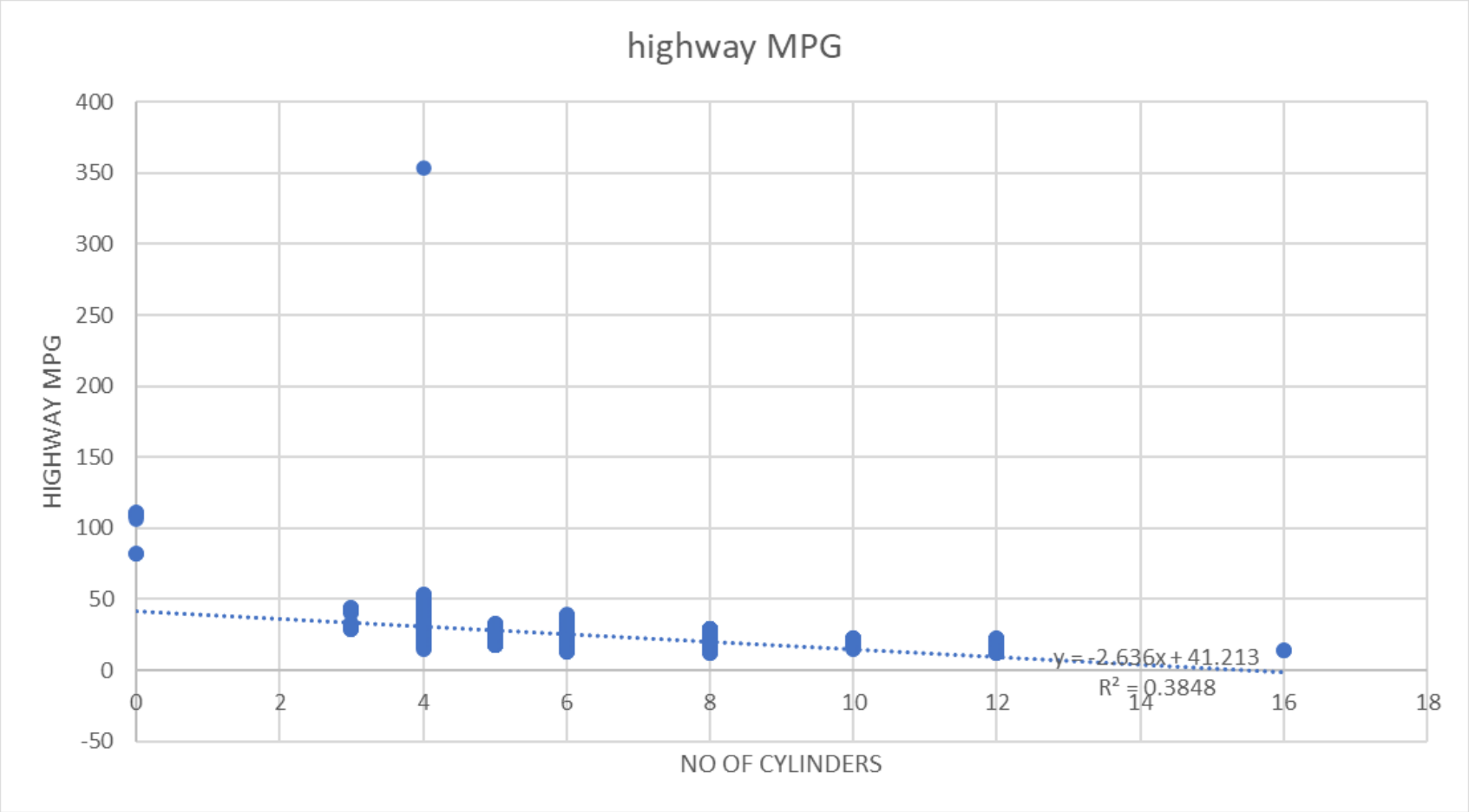


**Task 4.B:**Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.



**INSIGHTS 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.



# TASKS: ANALYSIS

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

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## CORRELATION CO-EFFICIENTS

	<i>Engine Cylinders</i>	<i>highway MPG</i>
<b>Engine Cylinders</b>	1	
<b>highway MPG</b>	-0.620312551	1

# BUILDING THE DASHBOARD:

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- Now for the Next portion of the Project, you need to create the Interactive Dashboard.
- Use filters and slicers to make the chart interactive. The client has requested these questions given below:



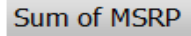
**TASK 1:**How does the distribution of car prices vary by brand and body style?

**HINTS:** Stacked column chart to show the distribution of car prices by brand and body style. Use filters and slicers to make the chart interactive. Calculate the total MSRP for each brand and body style using SUMIF or Pivot Tables.

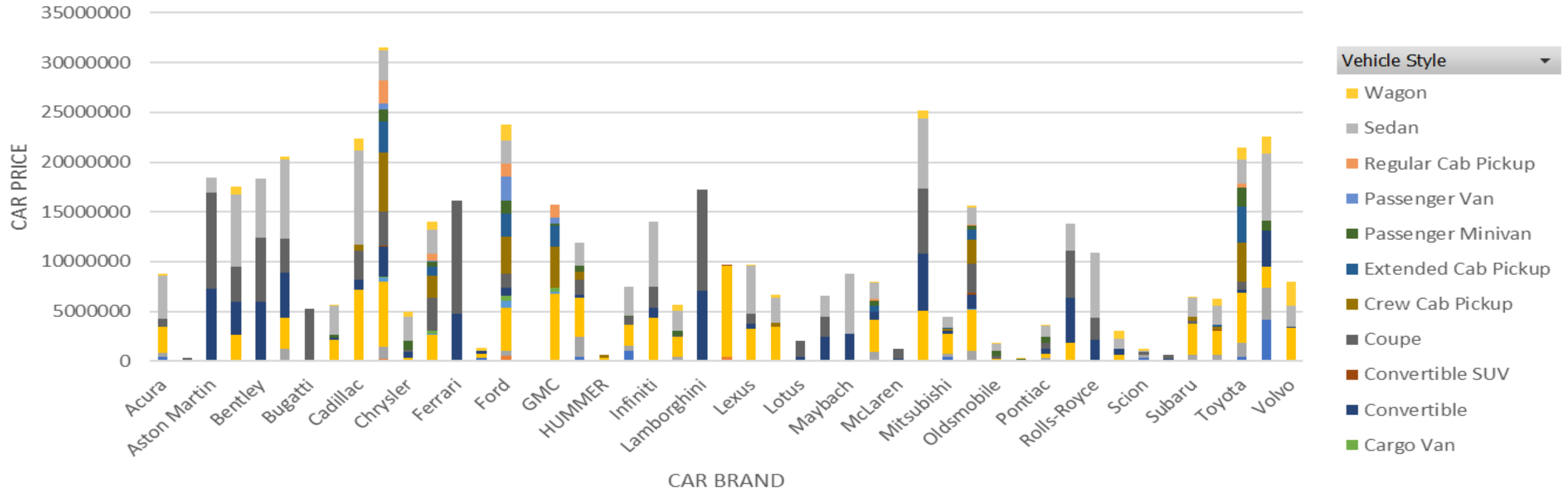
Row Label	2dr Hatchbac	2dr SU	4dr Hatchb	4dr SUV	Cargo Miniv	Cargo V	Convertil	Convertible	Coupe	Crew Cab Pi	Extended Cab Pi	Passenger Min	Passenger Regular	Cab Pi Sedan	Wagon	Grand Total
Acura	480917		357440	2663505					793748					4294702	201360	8791672
Alfa Romeo							129800		178200							308000
Aston Martin							7321655		1E+07					1448735		18405665
Audi	4000			2674900			3291405		4E+06					7158348	847350	17532293
Bentley							6012870		6E+06					5920900		18290530
BMW	80097		1144950	3160950			4502671		3E+06					7989300	259600	20556619
Bugatti									5E+06							5271671
Buick				2141770			179325		18534			330065		2850590	8212	5528496
Cadillac				7182555			985607		3E+06	599150				9418847	1E+06	22323833
Chevrolet	8000	2E+05	1209735	6569568	420150	78688	2953245	106300	4E+06	5927617	3117951	1178515	607670	2260032	3068812	31524793
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	14016177
Ferrari							4723811		1E+07							16142100
FIAT	325315			369305			327965								287570	1310155
Ford	36000	5E+05	480155	4370871	680770	566351	730007		1E+06	3812353	2285584	1271330	2431898	1299240	2299348	23777489
Genesis														139850		139850
GMC		1E+05		6641919	142750	468085				4062482	2183866	150630	603670	1306328		15704049
Honda	413200		2015270	3953209			252135		2E+06	787720		553185		2340105		11903529
HUMMER				377490						242405						619895
Hyundai	1038050		528880	2128890					724070			133075		2899937		7452902
Infiniti				4340200			980050		2E+06			6494090				13990090
Kia			406960	2049645					142630			494650		1980360	601155	5675400
Lamborghini							7064450		1E+07							17241500
Land Rover		5E+05		9076595				145731								9698720
Lexus			94700	3152974			472065		1E+06					4837596	31105	9604912
Lincoln				3422570					25342	453260				2458245	269705	6629122
Lotus							413260		2E+06							2006460
Maserati				155000			2342963		2E+06					2153800		6624047
Maybach							2762750							5976800		8739550
Mazda	22000	24000	853180	3222525			870505		14000		580033	443130		265486	1618571	7946780
McLaren							280225		918800							1199025
Mercedes-Benz			122800	4924810	28950		5753964		6E+06			32500		7080243	764935	25181309
Mitsubishi	394868		338850	2066505	2000		209893			240210	134360	2000		8000	1058563	4455249
Nissan	14683		1023090	4149630	128620		1406552	131075	3E+06	2422300	1026379	413320		21914	1769130	15625325
Oldsmobile				238150			2000		286015			492055		691161	22000	1731381
Plymouth	42000		16000				85631		14000			33688		46759	18000	256078
Pontiac	163505		162975	401550			473481		667715			1160535		22855	3593808	
Porsche	28827			1815200			4504586		5E+06			541192		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							219990		419980							639970
Subaru	12000		678060	3020230					356476	365975				1913100	10000	6355841
Suzuki	46496	14000	584387	2362141				122194		304131	259659			1850818	685707	6229533
Toyota	473750		1397750	4957050			386668		811995	3893760	3558504	1956518		373446	2459596	21506992
Volkswagen	4171275		3222275	2084955			3612631		8000			1038130		6760050	2E+06	22601341
Volvo	157550			3219000			121600		6000					2086945	2E+06	8020066
Grand Total	8439663	1E+06	14974513	1E+08	1463760	1E+06	7E+07	505300	9E+07	25347138	14010508	10543703	3713946	6253854	1E+08	5E+08

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

**HINTS:** Stacked column chart to show the distribution of car prices by brand and body style. Use filters and slicers to make the chart interactive. Calculate the total MSRP for each brand and body style using SUMIF or Pivot Tables.



## DISTRIBUTION OF CAR PRICES BY BRAND AND VEHICLE STYLE



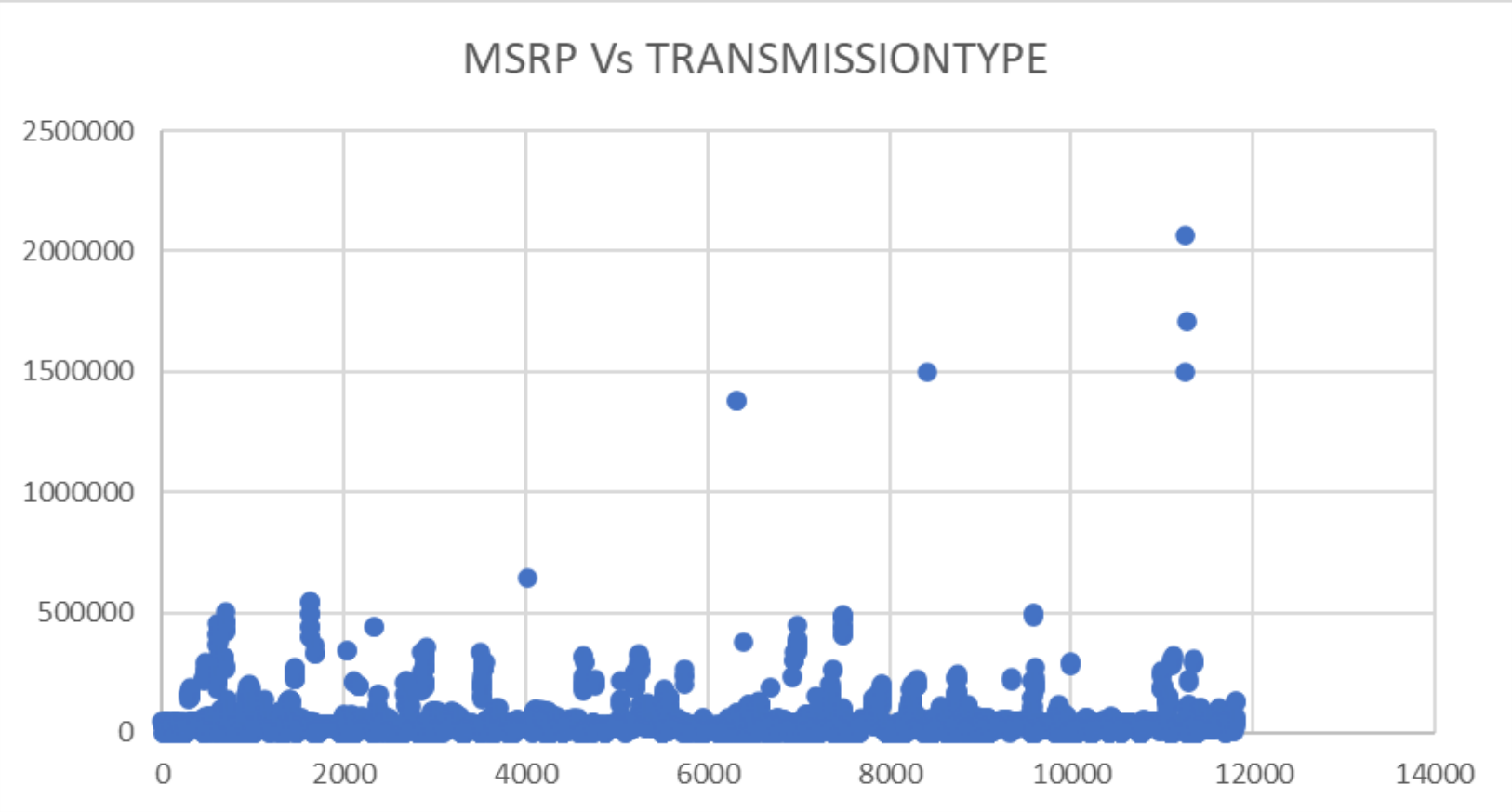
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**HINTS:** Clustered column chart to compare the average MSRPs across different car brands and body styles. Calculate the average MSRP for each brand and body style using AVERAGEIF or Pivot Tables.

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

**HINTS:** Scatter plot chart to visualize the relationship between MSRP and transmission type, with different symbols for each body style. Calculate the average MSRP for each combination of transmission type and body style using AVERAGEIFS or Pivot Tables.

Transmission Type	MSRP
MANUAL	46135
MANUAL	40650
MANUAL	36350
MANUAL	29450
MANUAL	34500
MANUAL	31200
MANUAL	44100
MANUAL	39300
MANUAL	36900
MANUAL	37200
MANUAL	39600
MANUAL	31500
MANUAL	44400
MANUAL	37200
MANUAL	31500
MANUAL	48250
MANUAL	43550
MANUAL	2000
MANUAL	2000
AUTOMATIC	2000
MANUAL	2000
MANUAL	2000
MANUAL	2000
AUTOMATIC	2000
MANUAL	2000
MANUAL	2000
MANUAL	2000
AUTOMATIC	2000
MANUAL	2000





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

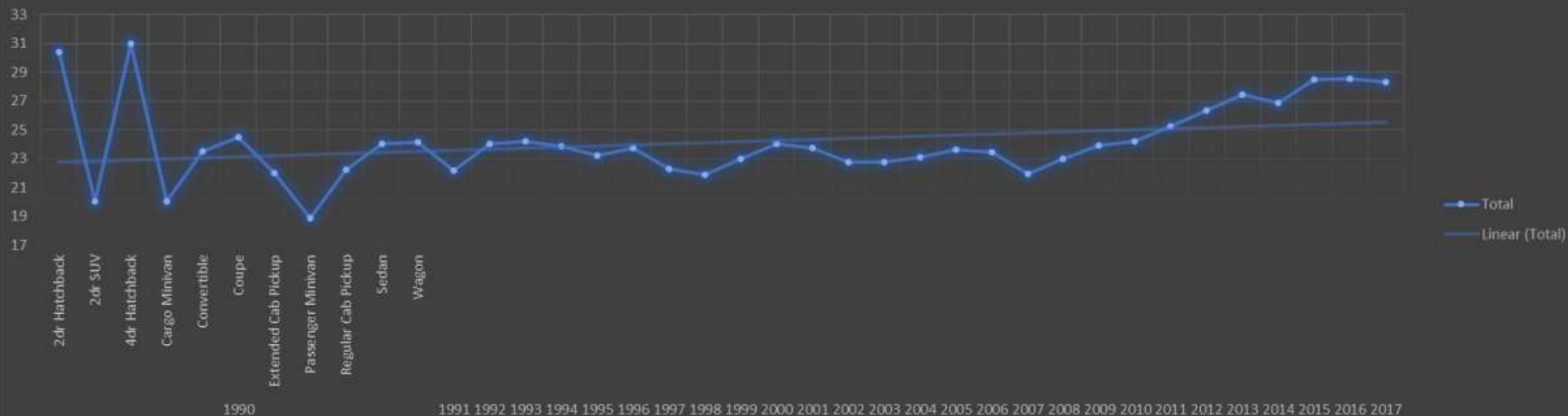
**HINTS:** Line chart to show the trend of fuel efficiency (MPG) over time for each body style. Calculate the average MPG for each combination of body style and model year using AVERAGEIFS or Pivot Tables.

Row Labels	Average of highway MPG
1990	23.07317073
2dr Hatchback	30.4
2dr SUV	20
4dr Hatchback	31
Cargo Minivan	20
Convertible	23.5
Coupe	24.5
Extended Cab Pickup	22
Passenger Minivan	18.85714286
Regular Cab Pickup	22.23076923
Sedan	24
Wagon	24.13333333
1991	22.15131579
1992	24.05084746
1993	24.21634615
1994	23.87037037
1995	23.23134328
1996	23.72519084
1997	22.30857143
1998	21.85064935
1999	22.975
2000	24.04237288
2001	23.70833333
2002	22.76585366
2003	22.73529412
2004	23.125
2005	23.64251208
2006	23.42439024
2007	21.93913043
2008	22.98853868
2009	23.88709677
2010	24.17406143
2011	25.225
2012	26.34974093
2013	27.44628099
2014	26.88601036
2015	28.50975836
2016	28.53957845
2017	28.33292905
Grand Total	26.3209448

In olden years fuel efficiency for Highway MPG was more compared to now for few models

Average of highway MPG

## FUEL EFFICIENCY



Year ▾ Vehicle Style ▾



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

**HINTS:** Bubble chart to visualize the relationship between horsepower, MPG, and price across different car brands. Assign different colors to each brand and label the bubbles with the car model name. Calculate the average horsepower, MPG, and MSRP for each car brand using AVERAGEIFS or Pivot Tables.

Car Brand	Average of Engine HP	Average of highway MPG	Average of MSRP
Acura	244.797619	28.11111111	34887.5873
Alfa Romeo	237	34	61600
Aston Martin	484.3225806	18.89247312	197910.3763
Audi	277.695122	28.82317073	53452.1128
Bentley	533.8513514	18.90540541	247169.3243
BMW	326.9071856	29.24550898	61546.76347
Bugatti	1001	14	1757223.667
Buick	219.244898	26.94897959	28206.61224
Cadillac	332.3098237	25.23677582	56231.31738
Chevrolet	247.0565022	25.6690583	28273.35695
Chrysler	229.1390374	26.36898396	26722.96257
Dodge	244.4153355	22.34504792	22390.05911
Ferrari	509.9117647	15.72058824	237383.8235
FIAT	143.559322	33.91525424	22206.01695
Ford	243.0979263	23.74078341	27393.42051
Genesis	347.3333333	25.33333333	46616.66667
GMC	259.8446602	21.4038835	30493.29903
Honda	195.7494407	32.25055928	26629.81879
HUMMER	261.2352941	17.29411765	36464.41176
Hyundai	201.9174917	30.39273927	24597.0363
Infiniti	310.0666667	24.77878788	42394.21212
Kia	206.8274336	29.29646018	25112.38938
Lamborghini	614.0769231	18.01923077	331567.3077

Land Rover	322.0979021	22.12587413	67823.21678
Lexus	277.4158416	25.87623762	47549.06931
Lincoln	284.9102564	24.1025641	42494.37179
Lotus	275.9655172	26.55172414	69188.27586
Maserati	420.7931034	20.29310345	114207.7069
Maybach	590.5	16	546221.875
Mazda	169.191067	28.11662531	19719.05707
McLaren	610.4	22.2	239805
Mercedes-Benz	350.1818182	24.81818182	71537.80966
Mitsubishi	174.452381	26.50952381	21215.47143
Nissan	239.9215328	26.46350365	28513.36679
Oldsmobile	177.4666667	26.23333333	11542.54
Plymouth	131.5609756	27.96341463	3122.902439
Pontiac	190.2956989	27.06989247	19321.54839
Porsche	392.7941176	25.36764706	101622.3971
Rolls-Royce	487.5483871	19.12903226	351130.6452
Saab	220.5225225	26.35135135	27413.5045
Scion	154.4333333	32.3	19932.5
Spyker	400	18	213323.3333
Subaru	197.3085938	28.68359375	24827.50391
Suzuki	160.3333333	26.04310345	17900.9569
Toyota	236.2584118	26.26110363	28946.15343
Volkswagen	190.1291925	31.76645963	28076.2
Volvo	230.9715302	27.20284698	28541.16014
Grand Total	249.504487	26.3209448	40559.93532

## Relationship between Horsepower, Average Highway MPG, Average MSRP and CAR BRAND





# RESULTS:

The interactive dashboard created in Excel allows stakeholders to explore various aspects of the dataset. They can visualize the distribution of car prices by brand and body style, compare average MSRPs across different brands and body styles, analyze the impact of transmission type on MSRP by body style, observe the trend of fuel efficiency across different body styles and model years, and understand the relationships between horsepower, MPG, and price across different car brands.

The insights gained from the analysis provide valuable information for car manufacturers to make informed decisions regarding pricing, product development, marketing, and competitiveness in the market. By optimizing these factors, manufacturers can maximize profitability while meeting consumer demand.

## DRIVE LINK FOR PROJECT:

[https://drive.google.com/drive/folders/1IZmgM9vfkFBslanN3fI7MkrnhUlecVoz?usp=drive\\_link](https://drive.google.com/drive/folders/1IZmgM9vfkFBslanN3fI7MkrnhUlecVoz?usp=drive_link)

