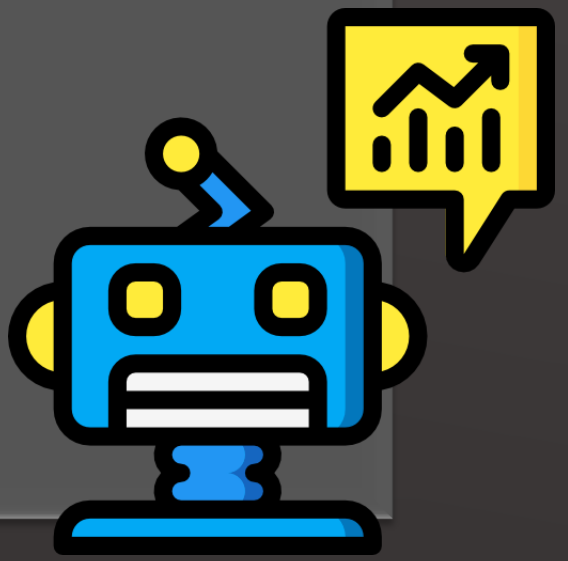
Analyzing the Impact of Car Features on Prices and Profitability

Submitted by Harshita Mundhe



PROJECT DESCRIPTION

In this project we have given a dataset and using this dataset we have to perform analysis to find out how can car manufacturer optimize pricing and product development decisions to maximize profitability while meeting consumer demand. To find out this we have to find out different patterns, relationship between the variables and price variable, analyzing trends in various car features and pricing over time and many more.

For getting better results I cleaned the data using various features available in excel and filled missing values in some columns with fill forward method.

APPROACH

For implementing this project I have used Excel. For finding insights I have used various features available in Excel such as pivot table, formulas, and I have used regression analysis to find which variable has the strongest relationship with target variable. I also used pivot table and pivot chart concepts for getting output. And to present the output in more effectively I used graphs, charts and so on as they help us to quickly analyze data and see relationships.

TECH-STACK USED

- **Excel**: I have used Microsoft Excel 2019 MSO (Version 2212 Build 16.0.15928.20196) for getting the meaningful insights from given dataset as it provides high-level visual summaries, trends and it helps us to understand the data through natural language queries that allow us to ask questions about the data without having to write complicated formulas.

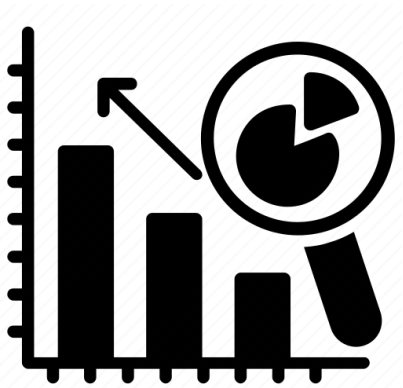
- **PowerPoint Presentation:** I have used Microsoft PowerPoint 2019 MSO (Version 2212 Build 16.0.15928.20196) 64-bit to create a report as it allow us to present the complex ideas, facts, or figures into easily digestible visuals.

INSIGHTS

- **Task 1.A:-**

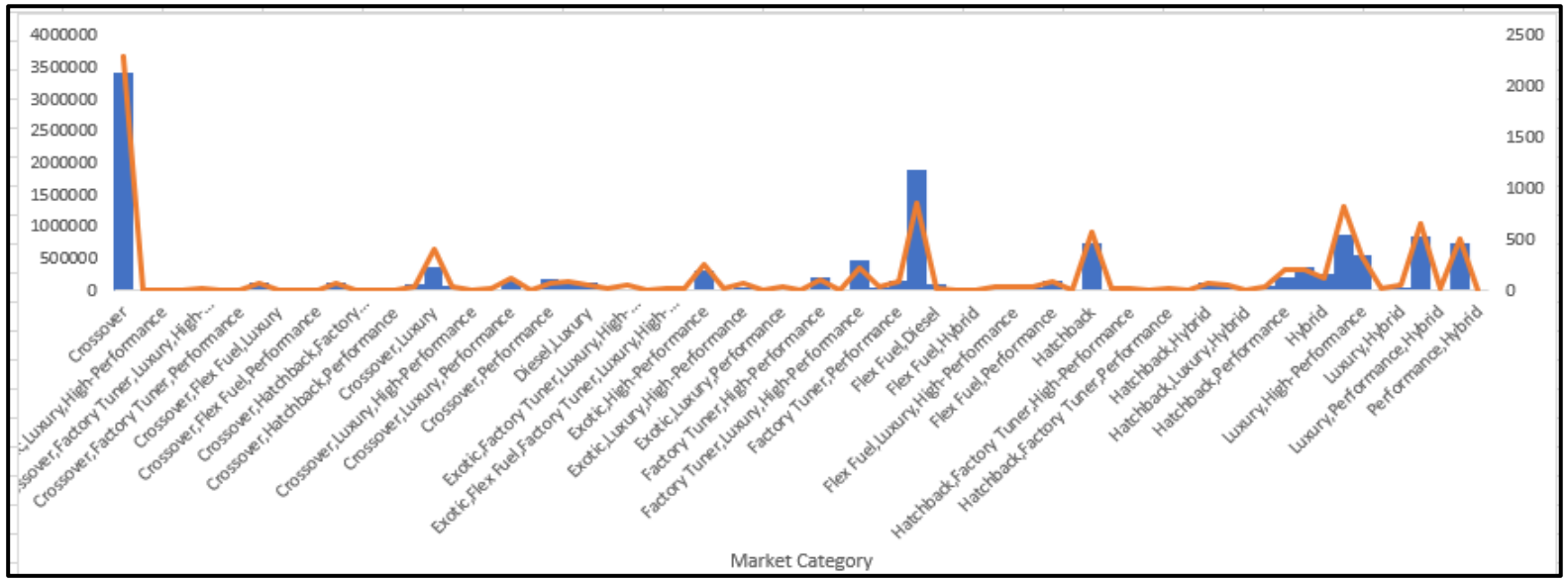
Row Labels	Sum of Popularity	Count of Model
Crossover	3412028	2303
Crossover,Diesel	6111	7
Crossover,Exotic,Luxury,High-Performance	238	1
Crossover,Exotic,Luxury,Performance	238	1
Crossover,Factory Tuner,Luxury,High-Performance	47410	26
Crossover,Factory Tuner,Luxury,Performance	13037	5
Crossover,Factory Tuner,Performance	840	4
Crossover,Flex Fuel	132720	64
Crossover,Flex Fuel,Luxury	11732	10
Crossover,Flex Fuel,Luxury,Performance	9744	6
Crossover,Flex Fuel,Performance	33942	6
Crossover,Hatchback	120650	72
Crossover,Hatchback,Factory Tuner,Performance	12054	6
Crossover,Hatchback,Luxury	1428	7
Crossover,Hatchback,Performance	12054	6
Crossover,Hybrid	107662	42
Crossover,Luxury	361021	406
Crossover,Luxury,Diesel	73080	34
Crossover,Luxury,High-Performance	9335	9
Crossover,Luxury,Hybrid	15142	24
Crossover,Luxury,Performance	151098	112
Crossover,Luxury,Performance,Hybrid	7832	2
Crossover,Performance	178431	69
Diesel	145396	84
Diesel,Luxury	113557	47
Exotic,Factory Tuner,High-Performance	21974	21
Exotic,Factory Tuner,Luxury,High-Performance	26674	51
Exotic,Factory Tuner,Luxury,Performance	1560	3
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Performanc	6760	13
Exotic,Flex Fuel,Luxury,High-Performance	5720	11
Exotic,High-Performance	316786	248
Exotic,Luxury	1352	12
Exotic,Luxury,High-Performance	36423	77
Exotic,Luxury,High-Performance,Hybrid	204	1
Exotic,Luxury,Performance	7813	36
Exotic,Performance	5564	4
Factory Tuner,High-Performance	204510	104
Factory Tuner,Luxury	1234	2

42	Factory Tuner,Luxury,High-Performance	458674	215
43	Factory Tuner,Luxury,Performance	43816	31
44	Factory Tuner,Performance	148810	83
45	Flex Fuel	1902985	855
46	Flex Fuel,Diesel	90512	16
47	Flex Fuel,Factory Tuner,Luxury,High-Performance	258	1
48	Flex Fuel,Hybrid	310	2
49	Flex Fuel,Luxury	29115	39
50	Flex Fuel,Luxury,High-Performance	28746	32
51	Flex Fuel,Luxury,Performance	38642	28
52	Flex Fuel,Performance	146201	87
53	Flex Fuel,Performance,Hybrid	310	2
54	Hatchback	751167	574
55	Hatchback,Diesel	12222	14
56	Hatchback,Factory Tuner,High-Performance	15667	13
57	Hatchback,Factory Tuner,Luxury,Performance	7982	9
58	Hatchback,Factory Tuner,Performance	45438	20
59	Hatchback,Flex Fuel	39599	7
60	Hatchback,Hybrid	135114	64
61	Hatchback,Luxury	59541	45
62	Hatchback,Luxury,Hybrid	1362	3
63	Hatchback,Luxury,Performance	58761	36
64	Hatchback,Performance	212375	197
65	High-Performance	361029	198
66	Hybrid	256107	121
67	Luxury	883877	819
68	Luxury,High-Performance	557118	334
69	Luxury,High-Performance,Hybrid	6826	12
70	Luxury,Hybrid	35029	52
71	Luxury,Performance	852128	659
72	Luxury,Performance,Hybrid	25665	11
73	Performance	730635	511
74	Performance,Hybrid	155	1
75	**Grand Total**	**13549530**	**9027**

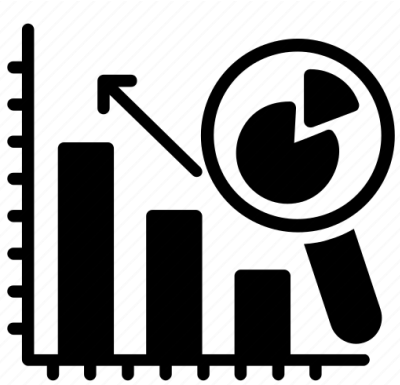


INSIGHTS

- **Task 1.B:-**

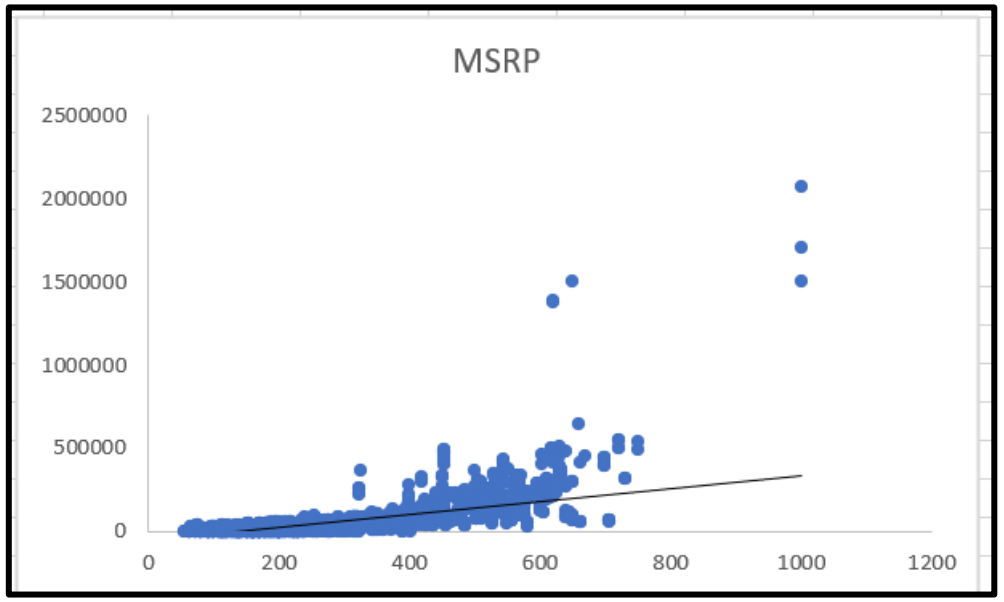


- Crossover, Flex Fuel, Luxury and Luxury performance has the highest popularity score.
- Exotic-Luxury-High-Performance-Hybrid and Performance-Hybrid has he lowest popularity score.

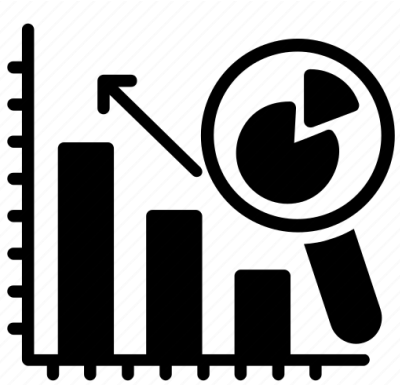


INSIGHTS

- **Task 2:-**



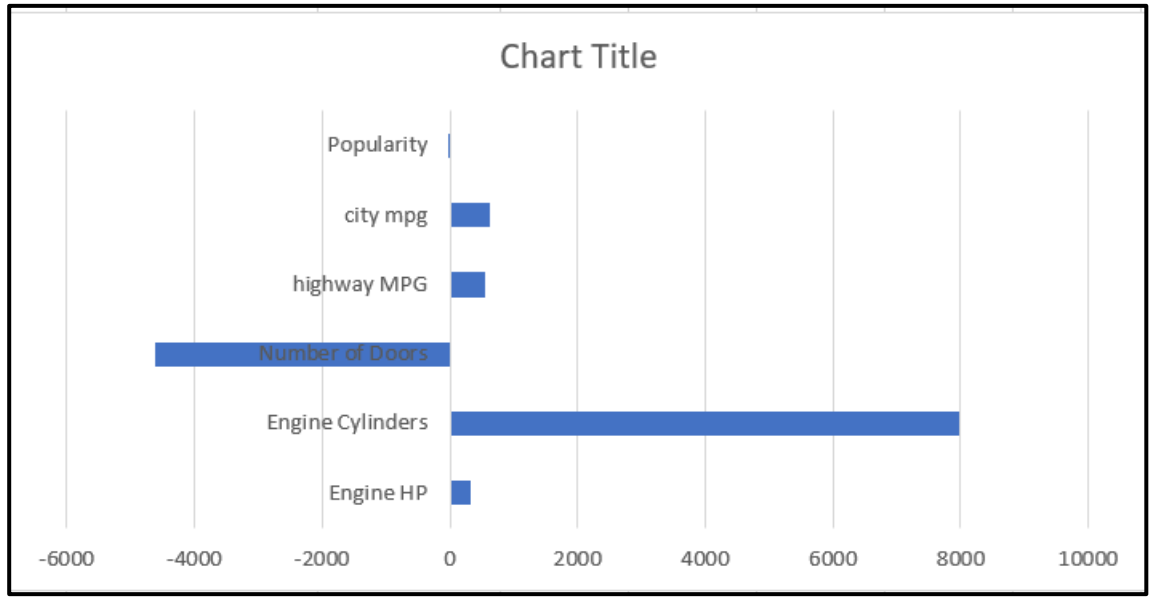
- From scatterplot we can see Engine Power has a positive correlation with car's price.



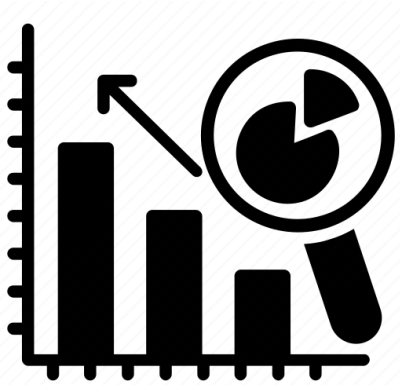
INSIGHTS

- **Task 3:-**

	Coefficients
Intercept	-88791.98861
Engine HP	319.6222657
Engine Cylinders	7970.871721
Number of Doors	-4603.733236
highway MPG	542.6035835
city mpg	623.8594602
Popularity	-3.887701121



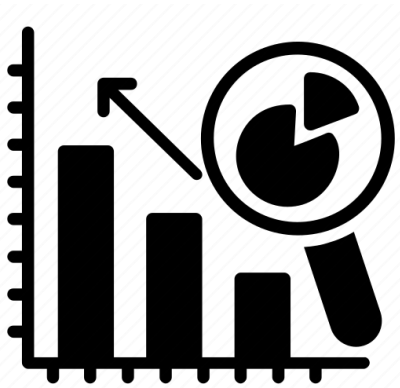
- Engine Cylinders has strongest relationship with car's price since car price increases based on number of engine cylinders.



INSIGHTS

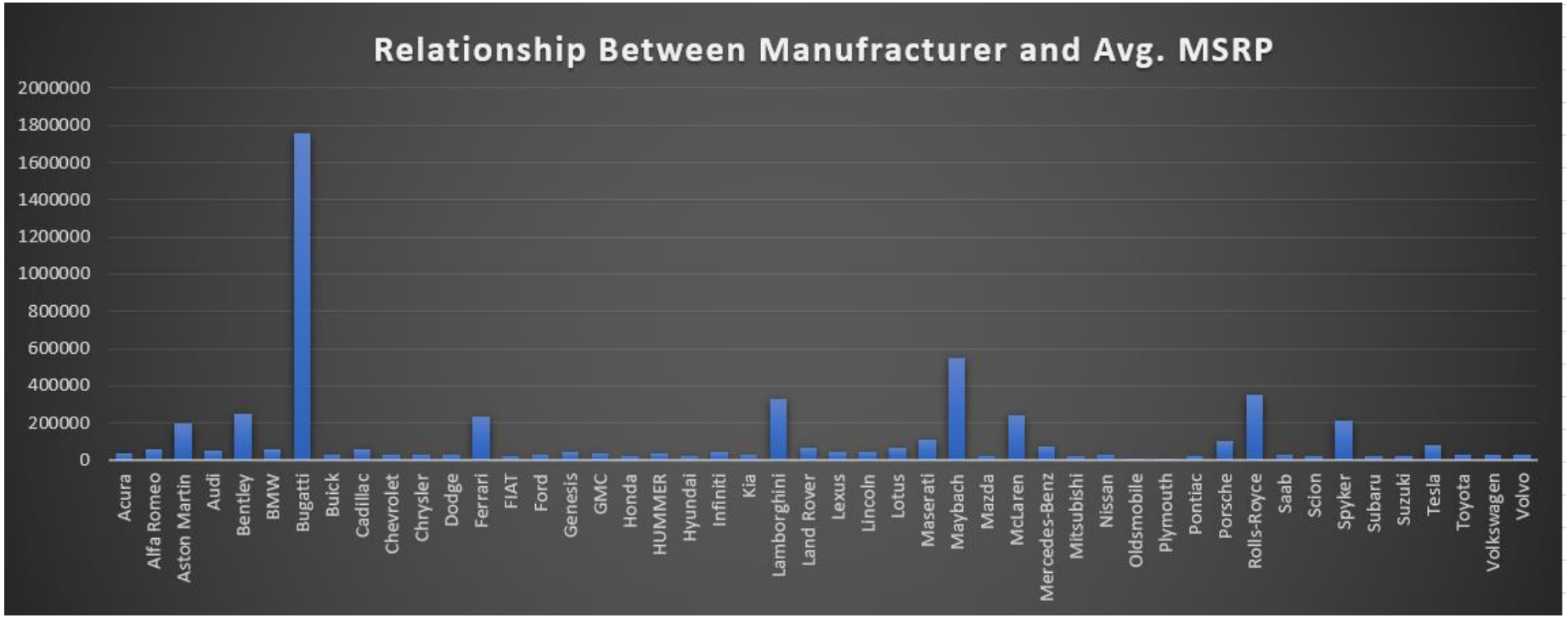
- **Task 4.A:-**

Row Labels	Average of MSRP
Acura	35087.4878
Alfa Romeo	61600
Aston Martin	198123.4615
Audi	54574.1215
Bentley	247169.3243
BMW	62162.55864
Bugatti	1757223.667
Buick	33079.37037
Cadillac	56368.26515
Chevrolet	30087.78261
Chrysler	30422.25
Dodge	28775.28535
Ferrari	238218.8406
FIAT	22670.24194
Ford	30923.79781
Genesis	46616.66667
GMC	35855.99713
Honda	26049.375
HUMMER	36464.41176
Hyundai	25591.53017
Infiniti	42640.27134
Kia	30155.49587
Lamborghini	331567.3077
Land Rover	68067.08633
Lexus	47549.06931
Lincoln	43860.825
Lotus	68377.14286
Maserati	113684.4909
Maybach	546221.875
Mazda	20790.76554
McLaren	239805
Mercedes-Benz	72069.52786
Mitsubishi	21070.05882
Nissan	32195.79063
Oldsmobile	11211.38889
Plymouth	3446.357143
Pontiac	23743.4023
Porsche	101622.3971
Rolls-Royce	351130.6452
Saab	27879.80734
Scion	20395.9375
Spyker	214990
Subaru	25831.60406
Suzuki	19460.75556
Tesla	82000
Toyota	29186.03286
Volkswagen	30300.24026
Volvo	29724.68421



INSIGHTS

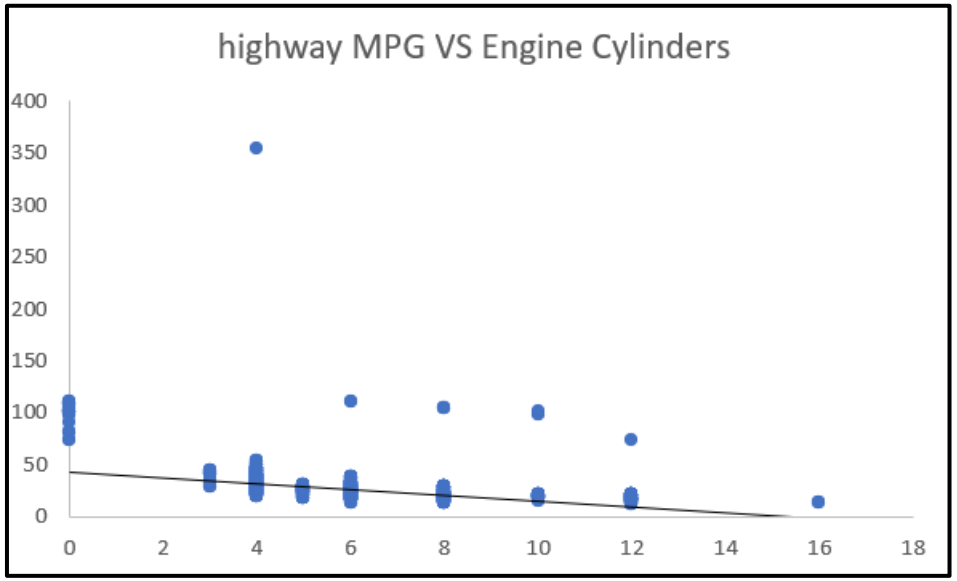
- **Task 4.B:-**



- Bugatti, Lamborghini, Maybach, Rolls-Royce, Bentley has highest average price as compare to Suzuki, Plymouth, Oldsmobile.

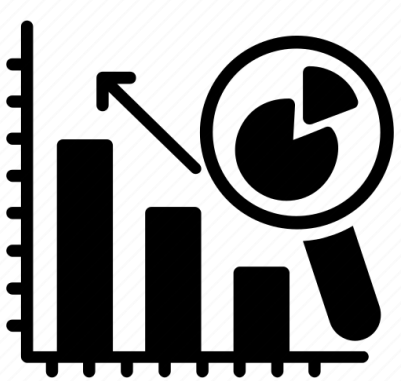
INSIGHTS

- **Task 5:-**



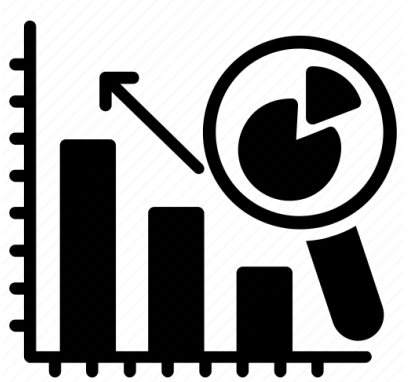
correlation
-0.56972

- Highway MPG and Engine Cylinders are negatively correlated that means Engine having less number of cylinders have higher Highway MPG.



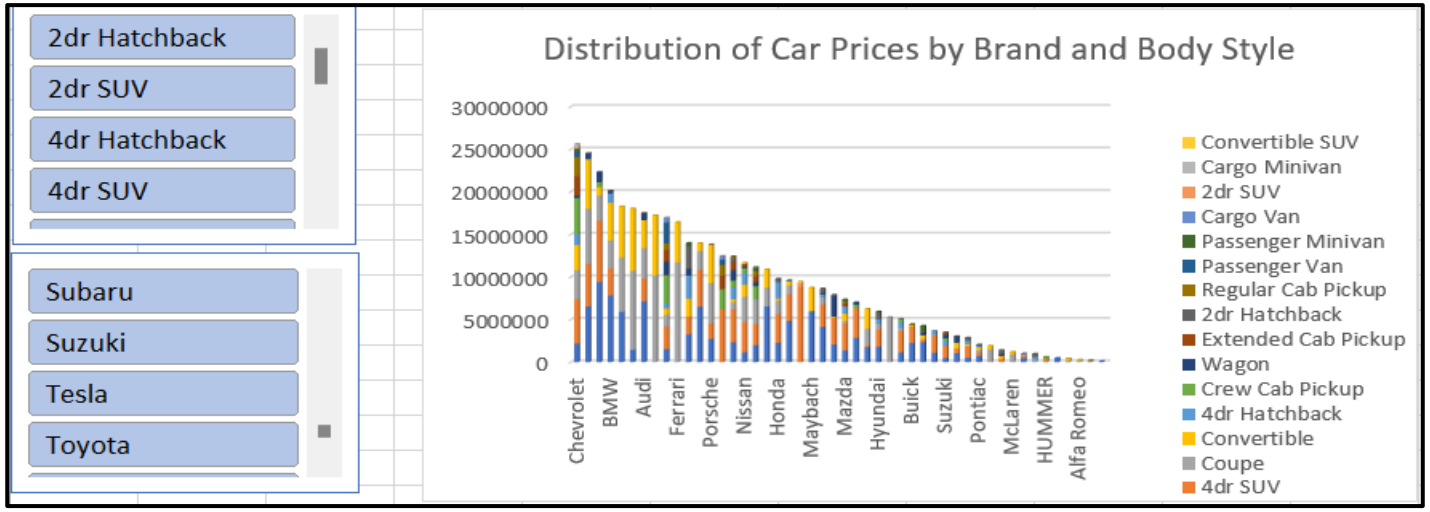
INSIGHTS

PART 2
BUILDING INTERACTIVE DASHBOARD

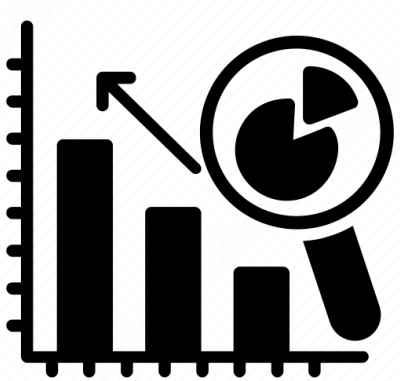


INSIGHTS

- **Task 1:-**



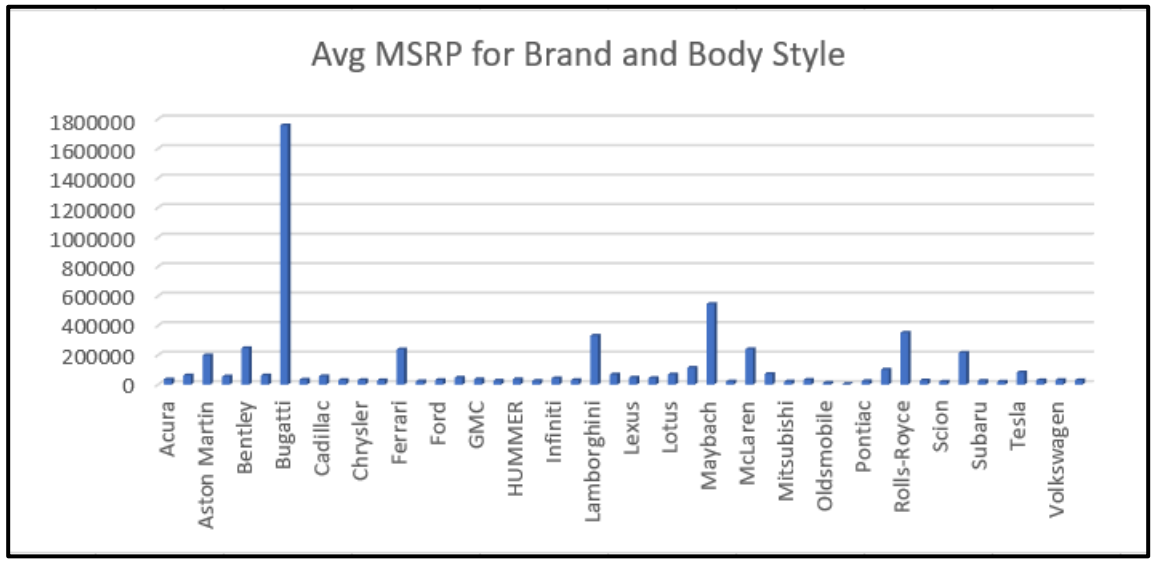
Sum of MSI Column La																	
Row Labe	Sedan	4dr SU	Coupe	Convertil	4dr Hatchb	Crew Cab Pic	Wagon	Extended Cab P	2dr Hatchb	Regular Cab Pi	Passenger	Passenger Mir	Cargo V	2dr SL	Cargo Mini	Convertible	Grand To
Chevrolet	2177015	5218250	3409195	2953245	1287260	4216785	300675	2275873	8000	2226902	591670	359040	74688	181310	324795		2560470
Mercedes-Ben	6543743	4974610	6473107	5753964	122800		646035					32500			28950		2457570
Cadillac	9416847	7182555	2953574	985607		599150	1184100										2232183
BMW	7829700	3160950	3304051	4403171	1103100		259600		80097								2014066
Bentley	5920900		6356760	6012870													1829053
Aston Martin	1448735		9258845	7321655													1802923
Audi	7144348	2674900	3556290	3291405			847350		4000								1751829
Lamborghini			1E+07	7064450													1724150
Ford	1530583	2677540	1365499	730007	567615	3321783	1619565	1341505	24000	760546	2429898	18000	556351	28273	6000		1697716
Ferrari			1.2E+07	4723811													1643710
Volkswagen	3261665	2084955		2116861	2699540		818380		2606540			410770					1399671
Infiniti	6490009	4340200	2175750	980050					28827								1398600
Porsche	2713500	1815200	4758533	4504586													1382064
GMC		6239289				2316795		1590935		1280328	591670		446085	12785			1247788
Toyota	2343765	3862960	795835	384490	1397750	772585	1237955	1005170	473750	158970							1243325
Nissan	1156770	3583040	2935632	1406552	1347320	596390	175000	332610	14683			8000				131075	1168707
Dodge	1998180	2462875	2906951	2000	16000	1524330	476340	650205	38000	613240		444945			60520		1119358
Rolls-Royce	6539010		2204675	2141365													1088505
Honda	2264390	3356875	1588705	252135	1919260				413200								973456
Lexus	4837596	3152974	1016472	472065	94700		31105										960491
Land Rover		8839200												476394		145731	946132
Maybach	5976800			2762750													873955
Acura	4134552	2663505	793748		357440		201360		480917								863152
Volvo	2072945	3131700		6000	121600		2416971		157650								790676
Mazda	1368783	3175515	266569	870505	853180			357288	18000	206071		244020					735993
Lincoln	2854855	3422570		17342		453260	269705										701773
Maserati	1782400	155000	1972294	2342963													625264
Hyundai	1817320	1994390	673920		528880				789650			133075					593723
Bugatti			5271671														527167
Subaru	1144415	2539900	348476		678060	365975			12000								508892
Buick	2254855	1944095		179325			2000					85440					446571
Chrysler	2360989	250545	108510	418885			360240		98805			661141					425911
Kia	1107650	2049645	84560		406960												364881
Suzuki	491968	1406621			584397	304131	411674	259659	44496								350293
Saab	1066500	541905		632628	34586		751280		12000								303889
Mitsubishi	528863	1352762		209893	403835				370169								286552
Pontiac	703835	401550	307965	336569	162975		4000		148782								206567
Lotus			1501300	413260													191456
FIAT		369305		327965			287570		420715								140555
McLaren			918800	280225													119902
Oldsmobile	480860	238150	268015	2000			20000										100902
Scion			330210		282470				366325								97900
HUMMER		377490				242405											61983
Tesla	492000																49200
Spyker			209990	219990													42998
Alfa Romeo			178200	129800													30800
Plymouth	18000		4000	85631	14000		16000		40000			15365					19299
Genesis	139850																13985



INSIGHTS

- **Task 2:-**

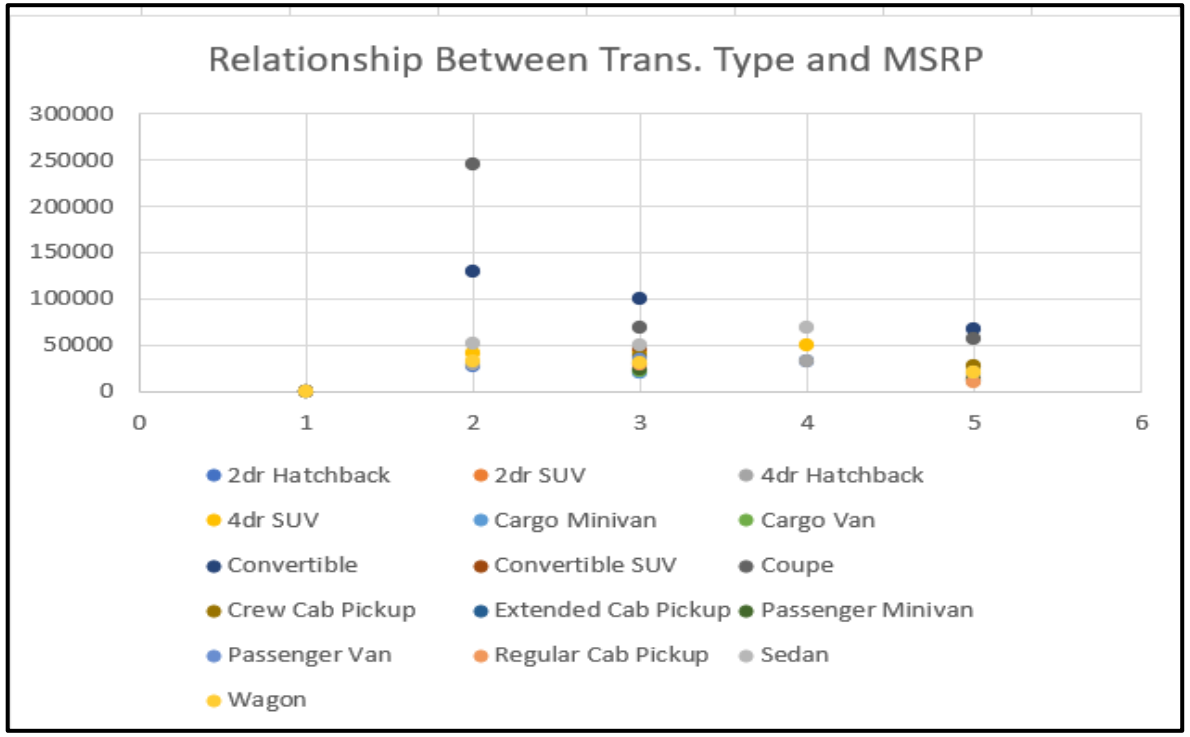
Row Labels	Average of MSR
Acura	35087.4878
Alfa Romeo	61600
Aston Marti	198123.4615
Audi	54574.1215
Bentley	247169.3243
BMW	62162.55864
Bugatti	1757223.667
Buick	33079.37037
Cadillac	56368.26515
Chevrolet	30087.78261
Chrysler	30422.25
Dodge	28775.28535
Ferrari	238218.8406
FIAT	22670.24194
Ford	30923.79781
Genesis	46616.66667
GMC	35855.99713
Honda	26049.375
HUMMER	36464.41176
Hyundai	25591.53017
Infiniti	42640.27134
Kia	30155.49587
Lamborghir	331567.3077
Land Rover	68067.08633
Lexus	47549.06931
Lincoln	43860.825
Lotus	68377.14286
Maserati	113684.4909
Maybach	546221.875
Mazda	20790.76554
McLaren	239805
Mercedes-E	72069.52786
Mitsubishi	21070.05882
Nissan	32195.79063
Oldsmobile	11211.38889
Plymouth	3446.357143
Pontiac	23743.4023
Porsche	101622.3971
Rolls-Royce	351130.6452
Saab	27879.80734
Scion	20395.9375
Spyker	214990
Subaru	25831.60406
Suzuki	19460.75556
Tesla	82000
Toyota	29186.03286
Volkswager	30300.24026
Volvo	29724.68421
Grand Total	46662.47978

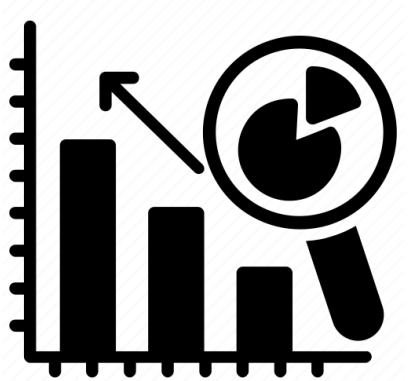


INSIGHTS

- **Task 3:-**

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						51186.21387	31985.27778
AUTOMATIC	20784.09901	29295.93333	23888.73529	42657.34588	20012.61905	21542.48	99714.41156	46134.33333	68014.94553	38081.28418	31304.73733	23447.68317	33455.90741	28987.65101	50075.22601	30135.65046
DIRECT_DRIVE	31800		32799.72973	49800											68455.625	
MANUAL	12840.65556	14406.83333	17500.36364	23131.33333			66594.00683		56640.36735	26803.68421	11210.07692	11020		10074.96739	19345.29462	19644.05319

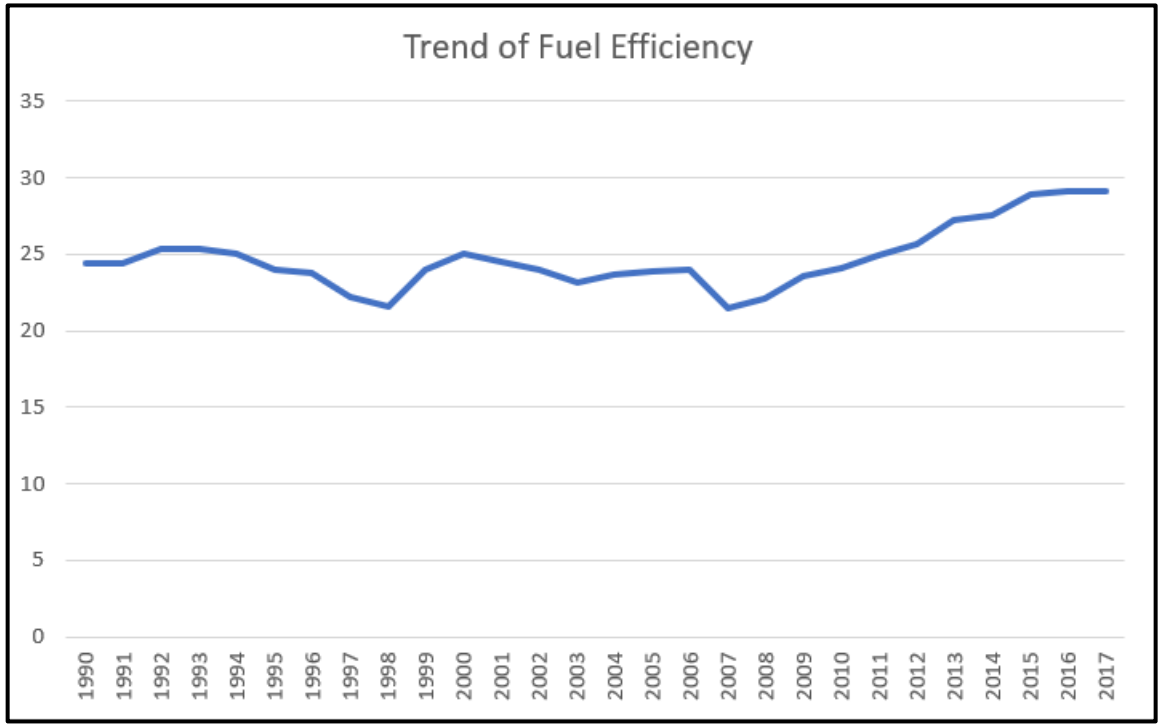


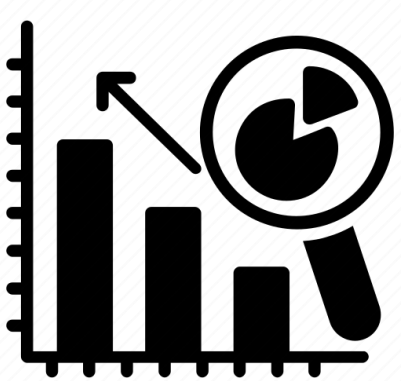


INSIGHTS

- **Task 4:-**

Row Labels	Average of highway MPG
1990	24.41071429
1991	24.4057971
1992	25.30952381
1993	25.34313725
1994	25
1995	23.95833333
1996	23.78666667
1997	22.24038462
1998	21.61290323
1999	24
2000	25
2001	24.48181818
2002	23.94736842
2003	23.13076923
2004	23.71641791
2005	23.87234043
2006	24.03053435
2007	21.48627451
2008	22.1557377
2009	23.61311475
2010	24.12601626
2011	24.91803279
2012	25.63384615
2013	27.24232082
2014	27.49903288
2015	28.86111111
2016	29.1530782
2017	29.07720588
Grand Total	27.01229644

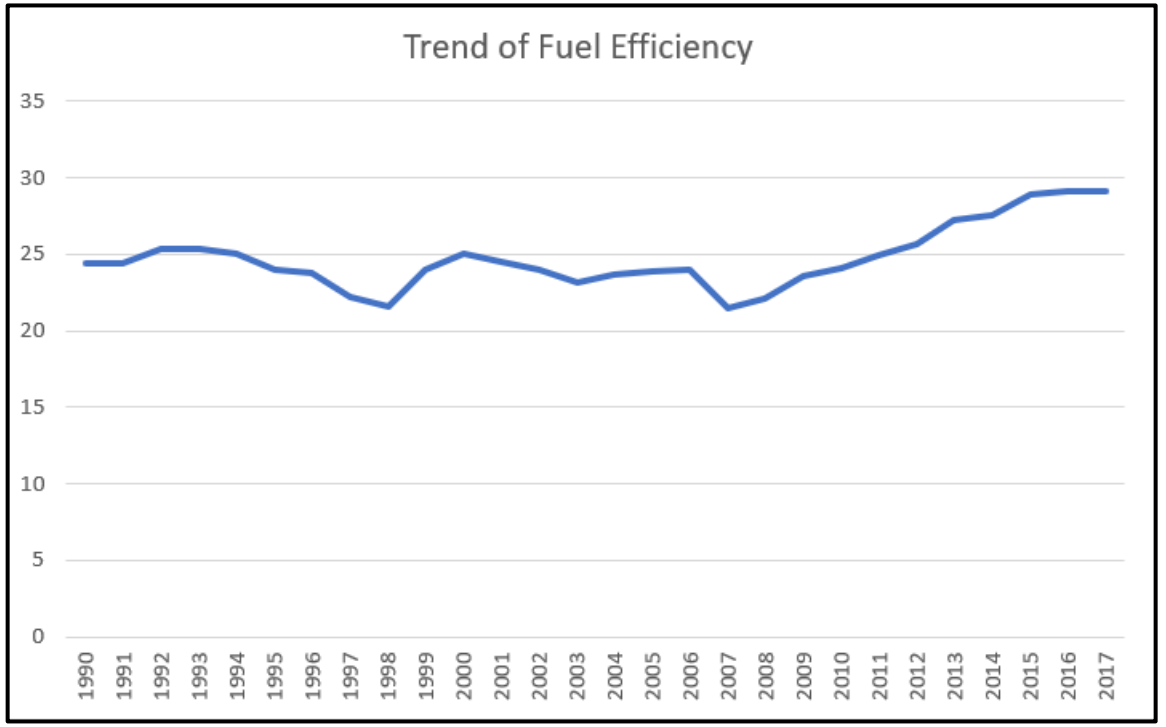


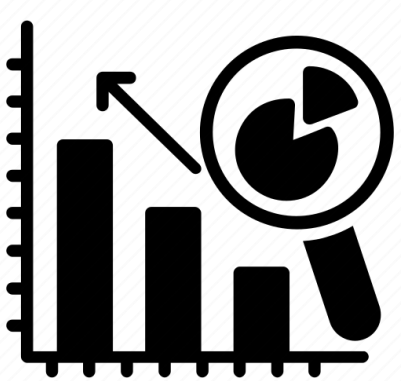


INSIGHTS

- **Task 4:-**

Row Labels	Average of highway MPG
1990	24.41071429
1991	24.4057971
1992	25.30952381
1993	25.34313725
1994	25
1995	23.95833333
1996	23.78666667
1997	22.24038462
1998	21.61290323
1999	24
2000	25
2001	24.48181818
2002	23.94736842
2003	23.13076923
2004	23.71641791
2005	23.87234043
2006	24.03053435
2007	21.48627451
2008	22.1557377
2009	23.61311475
2010	24.12601626
2011	24.91803279
2012	25.63384615
2013	27.24232082
2014	27.49903288
2015	28.86111111
2016	29.1530782
2017	29.07720588
Grand Total	27.01229644

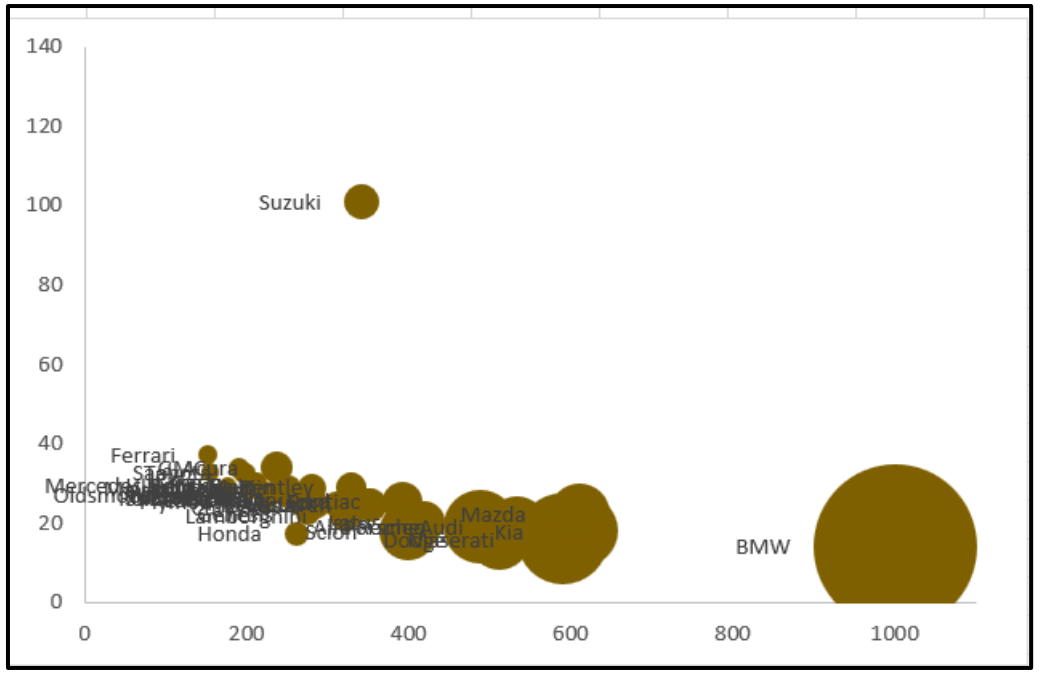


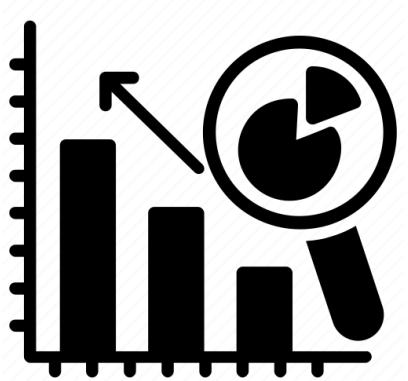


INSIGHTS

- **Task 5:-**

Row Labe	Average of Engi	Average of highway	Average of MS
Acura	244.9634146	28.2195122	35087.4878
Alfa Romeo	237	34	61600
Aston Martin	483.7582418	18.93406593	198123.4615
Audi	280	28.92834891	54574.1215
Bentley	533.8513514	18.90540541	247169.3243
BMW	329.6203704	29.12654321	62162.55864
Bugatti	1001	14	1757223.667
Buick	224.7703704	27.41481481	33079.37037
Cadillac	332.7954545	25.24494949	56368.26515
Chevrolet	256.4970623	26.42068155	30087.78261
Chrysler	247.5142857	26.63571429	30422.25
Dodge	271.2930591	24.05398458	28775.28535
Ferrari	511.9565217	15.72463768	238218.8406
FIAT	151.8548387	37.33870968	22670.24194
Ford	264.6156648	24.83060109	30923.79781
Genesis	347.3333333	25.33333333	46616.66667
GMC	274.9712644	22.27298851	35855.99713
Honda	190.2367021	33.80319149	26049.375
HUMMER	261.2352941	17.29411765	36464.41176
Hyundai	209.4655172	29.57327586	25591.53017
Infiniti	310.6768293	24.79573171	42640.27134
Kia	239.3471074	28.30578512	30155.49587
Lamborghini	614.0769231	18.01923077	331567.3077
Land Rover	322.5179856	21.97841727	68067.08633
Lexus	277.4158416	25.87623762	47549.06931
Lincoln	285.48125	24.5375	43860.825
Lotus	271.5357143	26.10714286	68377.14286
Maserati	419.5454545	20.16363636	113684.4909
Maybach	590.5	16	546221.875
Mazda	173.2344633	28.63276836	20790.76554
McLaren	610.4	22.2	239805
Mercedes-Ber	353.3489736	24.56891496	72069.52786
Mitsubishi	176.7132353	29.5	21070.05882
Nissan	252.6584022	29.23966942	32195.79063
Oldsmobile	171.6111111	26.74444444	11211.38889
Plymouth	130.8571429	27.16071429	3446.357143
Pontiac	223.3563218	25.59770115	23743.4023
Porsche	392.7941176	25.36764706	101622.3971
Rolls-Royce	487.5483871	19.12903226	351130.6452
Saab	221.1743119	26.37614679	27879.80734
Scion	155.7083333	32.8125	20395.9375
Spyker	400	18	214990
Subaru	203.5685279	28.30456853	25831.60406
Suzuki	173.5111111	26.23888889	19460.75556
Tesla	342	101	82000
Toyota	212.1549296	30.32394366	29186.03286
Volkswagen	197.7164502	32.55411255	30300.24026
Volvo	234.5601504	27.26315789	29724.68421
Grand Total	**264.4585133**	**27.01229644**	**46662.47978**

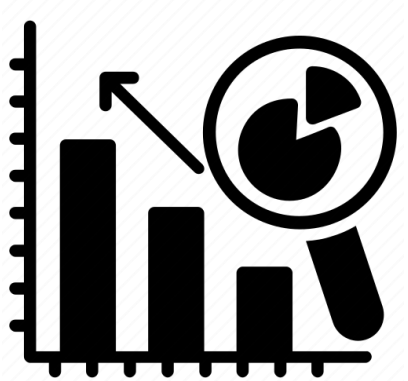




INSIGHTS

- **Conclusion:-**

- Engine Power, Engine Cylinders affects car’s price as they are increasing car price is also increasing.
- Cars having less number of Cylinders are more likely to have high MPG.
- Car brand with transmission type - automatic is the highest selling one , followed by manual type and then automated manual.
- Vehicle style- Cargo Minivan, Cargo Van, Convertible SUV and Passenger SUV are the lowest selling car brands.



RESULTS

From these project I understood how to clean the data and extract the exact data which is required to find out the root cause of defined problem. I also understood how to use excel formulas to get the desired output. I got to learn various excel formulas like mean,min, max, avg, count and so on. I got to learn what is pivot table, how to create it and importance of the same. I got to learn about how to perform regression analysis using excel. I also got to learn how to represent the data using graphs/charts to make the data / insights quickly and easily understandable.

Drive link:
https://docs.google.com/spreadsheets/d/1CYB-yYgA1PHmh--GVBWAJ9gzeAoHU659/edit?usp=sharing&ouid=107724859837928146273&rtpof=true&sd=true

THANK YOU