Project - Impact of Car Features on Price and Profitability

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Project Description

This whole project is based automotive industry that is group of different car manufacturer like BMW, BUGATTI, CITROEN and many others, the main objective and purpose of this project is to answer the question asked by the client that is 'How can a car manufacturer optimize pricing and product development decisions to maximize profitability while meeting consumer demand? To answer such question each variable was critically analyze and insights were drawn to help manufacturer in taking accurate decision regarding pricing and product development and help in improving competitiveness in market and profitability over time. All the missing values were replaced by the median of that particular variable and this raw dataset was collected and made available on Kaggle by Cooper Union; a private college located in New York City.

Approach

Began the project by applying filter on all columns to look out for the missing values and replaced missing values in numerical column like engine hp by median value of the particular numerical column and also replaced missing value of categorial variables like, engine fuel type, engine cylinder, number of doors by mode value of that particular categorial variable and then using functions like pivot table and pivot chart analyzed each variable in context to pricing derived critical and important insights to address the question of client.

Tech – stack used

Tech stack used to complete this project is Microsoft Excel 365 provided with its wide range capabilities and functionality made tasks much easier to perform that is to derive important and critical insight to address the question of client also with wide range of options in visualization panel, visual presentation of insights for the client were accomplished easily.

Result

After completing this project, there were important and critical insights such as Market Category such as 1.Exotic and luxury has lowest average popularity, 2.Market Category of Cross over, Flex Fuel and Performance has highest average popularity of 5657 among all other market category of market, 3.Market Category of Flex, diesel has the average of popularity equal to the market category of Cross over, 4.Flex Fuel and Performance, Market Category of hatchback flex fuel has the average of popularity equal to the market category of Cross over, Flex Fuel and Performance, 5.There is a positive correlation between engine power(hp) and price,6. According to the trendline of scatter plot, engine power (hp) has direct relation with pricing, 7.An increase in engine power directly leads to increase in price, 8.Number of cylinder has the strongest relation with pricing, 9.Number of doors has weakest relation towards pricing with coefficient in negative, 10.Bugatti has the highest average price among all other brands,11. 2nd highest average price is of Maybach i.e. 546221.875, 12.Manufacturer with the least average price is Oldsmobile, 13. there is a negative correlation of -0.734 between number of cylinders and average miles per gallon, engine with more number of cylinder will have lesser average mpg

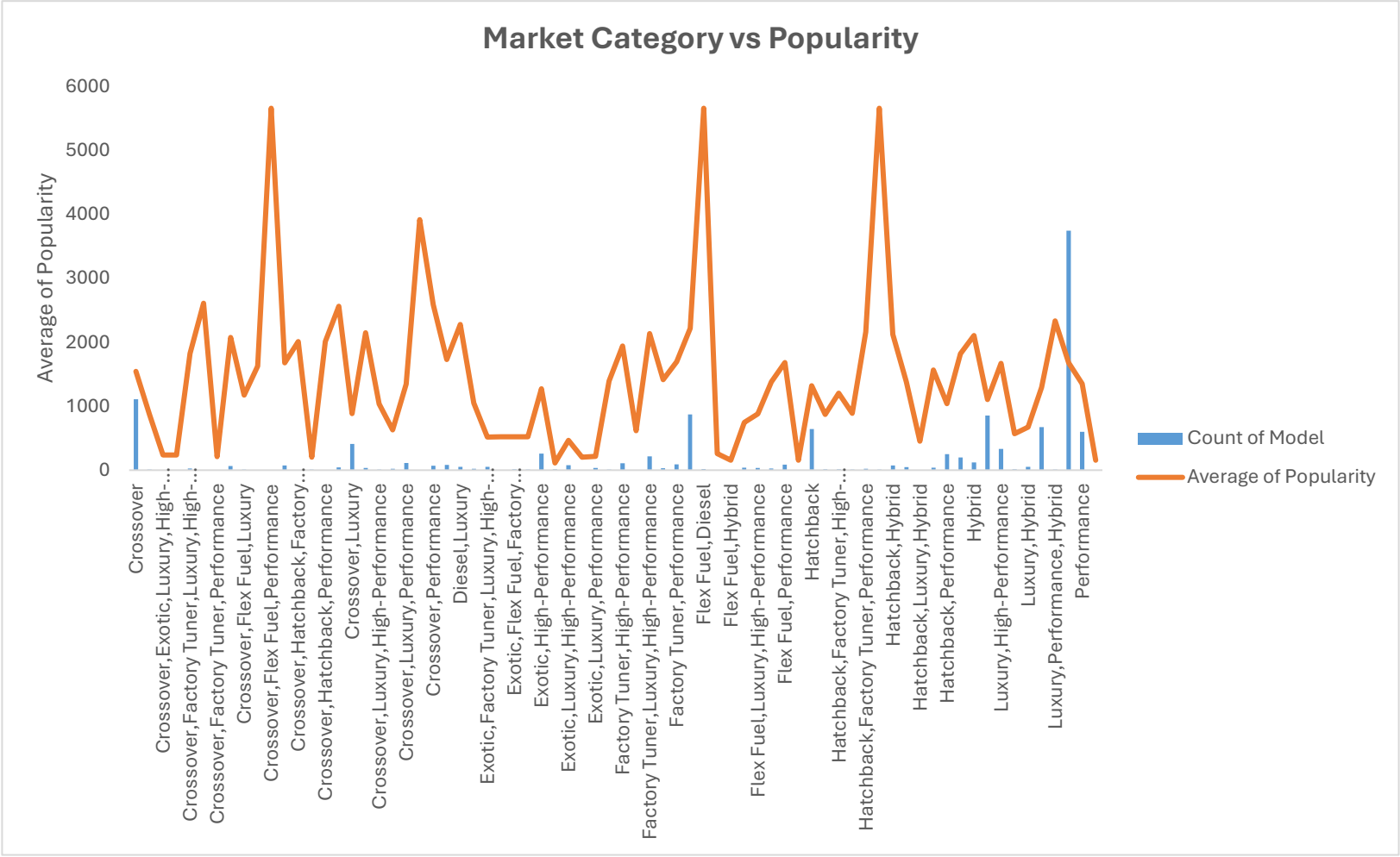
Company should start production of vehicle with less engine hp and number of cylinders to optimize price and for profitability purpose cars from market category of crossover/flex fuel/performance.

TASK -1 How does the popularity of a car model vary across different market categories?

- Details about market category, number of cars of each market category and their popularity

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	3742	1676.889364
Performance	601	1348.873544
Performance,Hybrid	1	155

➢ **Visual presentation of Market category vs popularity using line chart**



➢ Market Category such as Exotic and luxury has lowest average popularity.

➢ Market Category of Cross over, Flex Fuel and Performance has highest average popularity of 5657 among all other market category of market.

➢ Market Category of Flex, diesel has the average of popularity equal to the market category of Cross over, Flex Fuel and Performance.

➢ Market Category of hatchback flex fuel has the average of popularity equal to the market category of Cross over, Flex Fuel and Performance.

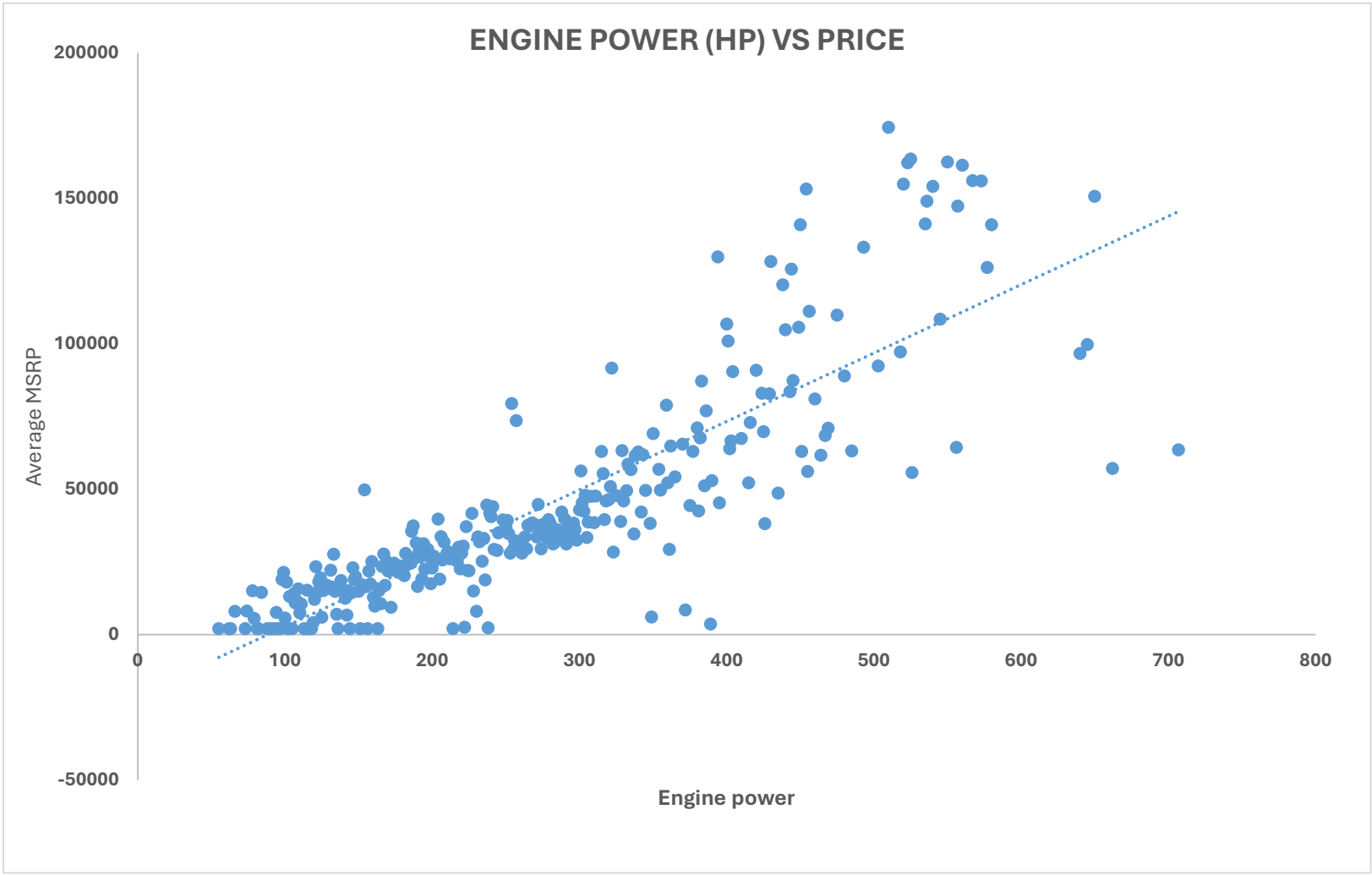
TASK – 2 What is the relationship between a car's engine power and its price?

- Details about engine power and their average MSRP.

Engine Power	Average of MSRP
55	2000
62	2000
63	2000
66	7998.571429
73	2000
74	8116.944444
78	15082.5
79	5584.25
81	2000
82	2000
84	14493.33333
88	2000
90	2000
92	2000
93	2013.535714
94	7667.5
95	2005.727273
96	2000
97	2000
98	18931.5625
99	21377.69231
100	5685.777778
101	18061.36364
102	2000
103	13152.5
105	2000
106	14055.3871
107	10857.5
108	11488.3871
109	15747.5
110	7424.21875
111	10500
113	2000
114	2000
115	15257
116	2057.4
118	2000
119	4129.5
120	12122.07463
121	23375
122	14629.325
123	18175
124	19567.5
125	5956.891892
126	15162.73333
127	15947.15517
128	17043.63636
130	15810.71765
131	22123.33333
132	16328.98462
133	27615
134	14864.84091
135	6950.533333
136	2000
137	16702.5
138	18629.9397
140	15131.75524
141	12485.16129
142	6668.75
143	15058.69767
144	2000
145	14339.53125
146	22928.33333
147	18881.47059
148	19867.07447
150	14843.52155
151	2000
152	17221.275
153	16277.21739
154	49800
155	16530.32051
156	2000
157	21887.187
158	1742
159	25157.8571
160	12872.8493
161	9797.43478
162	11077.9090
163	200
164	15178.1351
165	10638.041
166	23425.8245
167	27730.4545
168	16907.7272
169	25110.7608
170	21882.4900
171	23739.3181
172	9377.72727
173	22238.8983
174	24555.9090
175	22103.402
176	23431.3333
177	21349.1212
178	23607.812
179	22397.3684
180	20945.0148
181	20239.12
182	27928.793
184	24931.6470
185	24449.1659
186	35506.1111
187	37388.3333
188	26115.296
189	31552.8571
190	16578.4469
191	28348.3333
192	26905.8571
193	19114.8333
194	31230.6956
195	22488.58929
196	29107
197	29258.64286
198	26725
199	17488.42857
200	22895.17763
201	26964.06667
202	25838.88889
203	25797.6
204	39720
205	19093.83333
206	33706.66667
207	25654.53488
208	31813.28125
210	27990.6
211	28506.66667
212	26026.58333
214	2000
215	25981.48718
217	25236.63158
218	30024.83333
219	22589.16667
220	28005.59649
221	30385
222	2502.52381
223	37070
224	21999.28571
225	21993.01389
227	41678.89831
228	14932.125
230	8000.102273
231	33579
232	31920.9375
234	25205
235	33022.48148
236	18774.04762
237	44545

A	B
238	2310
239	41679.6875
240	40566.82463
241	44030
242	29335.25
244	28945.66667
245	34991.11111
248	39399.48276
250	37022.28333
251	39233.33333
252	34719.34247
253	27984.07692
254	79450
255	29293.42857
256	32263.92857
257	73565
259	32062.05882
260	28919.02256
261	28033.59
263	33572.08333
264	29475.90909
265	37554.21277
266	37342.64706
268	38392.47619
270	37733.90411
271	33610
272	44745
273	34382.5
274	29517.27273
275	37859.13008
276	34174.13333
278	33241.0119
279	39550
280	38298.625
281	36850.12821
282	31179.69231
283	31522.28571
284	36205
285	33693.27236
287	34806
288	42149.88372
290	39716.58333
291	31186.73077
292	37669.32836
293	36562.5
295	33911.6
296	38333.23529
297	36045
298	32500
300	42883.92188
301	56299.16667
302	45303.21277
303	42417.69231
304	47918.61111
305	33357.40449
306	38707.09677
308	47554.80769
310	38537.19512
311	47647.33333
315	62973.88571
316	55366.66667
317	39502.5
318	45958.33333
320	46454.98551
321	50863.33333
322	91613.09091
323	28395
325	47803.70968
328	38858.57143
329	63276.95652
330	45984.03509
332	49511.1828
333	58593.24324
335	56743.33333
337	34595
338	61613.33333
340	62809.75
342	42140
343	61883.33333
345	49577.04762
348	38193.47826
349	5999
350	69126.97368
354	56850
355	49661.55063
359	78885
360	52170.36667
361	29310
362	64845
365	54265.88889
370	65478.18182
372	8488
375	44341.05263
377	62950
380	71105.27778
381	42510.52632
382	67592.85714
383	87146.66667
385	51156.2766
386	76931.42857
389	3647.333333
390	52886.40909
394	129833.3333
395	45273.85714
400	106833.6923
401	100964.6667
402	63927.33333
403	66572.22222
404	90385.75
410	67466.66667
415	52196.66667
416	72964.28571
420	90892.85714
424	83000
425	69795.69231
426	38180
429	82775
430	128269.3333
435	48635.45455
438	120313.3333
440	104875
443	83561.875
444	125636
445	87391.66667
449	105654.1667
450	140946.1111
451	62950
454	153233.25
455	56131.33333
456	111200
460	81028.46154
464	61680
467	68452.5
469	70990
475	109875
480	88900
485	63142.36842
493	133205
503	92341.66667
510	174418.1515
518	97250
520	154840
523	162261.1111
525	163500
526	55711.66667
535	141200
536	149050
540	154113.8
545	108454
550	162461.4815
556	64335
557	147300
560	161412.5
567	156050
573	156000
577	126197
580	140902
640	96675
645	99709.28571
650	150726.6667
662	57155
707	63486.66667

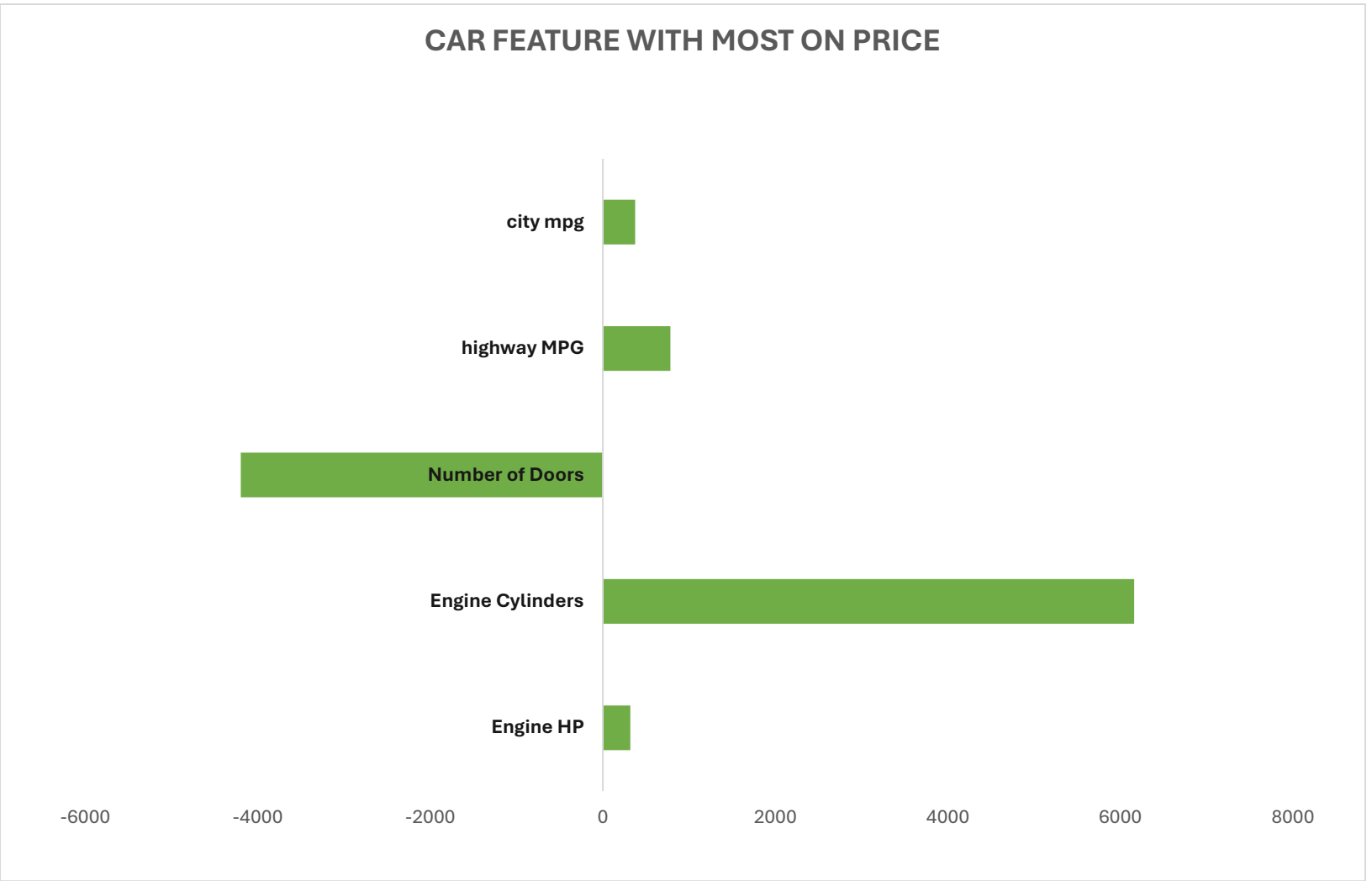
➢ **Graphical presentation of relationship between engine power and price**



- There is a positive correlation between engine power(hp) and price.
- According to the trendline of scatter plot, engine power (hp) has direct relation with pricing.
- An increase in engine power directly leads to increase in price.

TASK 3 - Which car features are most important in determining a car's price?

CAR FEATURES	*Coefficients*
Intercept	-87212.9
Engine HP	318.1934
Engine Cylinders	6160.068
Number of Doors	-4198.95
highway MPG	783.5979
city mpg	375.1691



➔ Number of cylinders has the strongest relation with pricing.

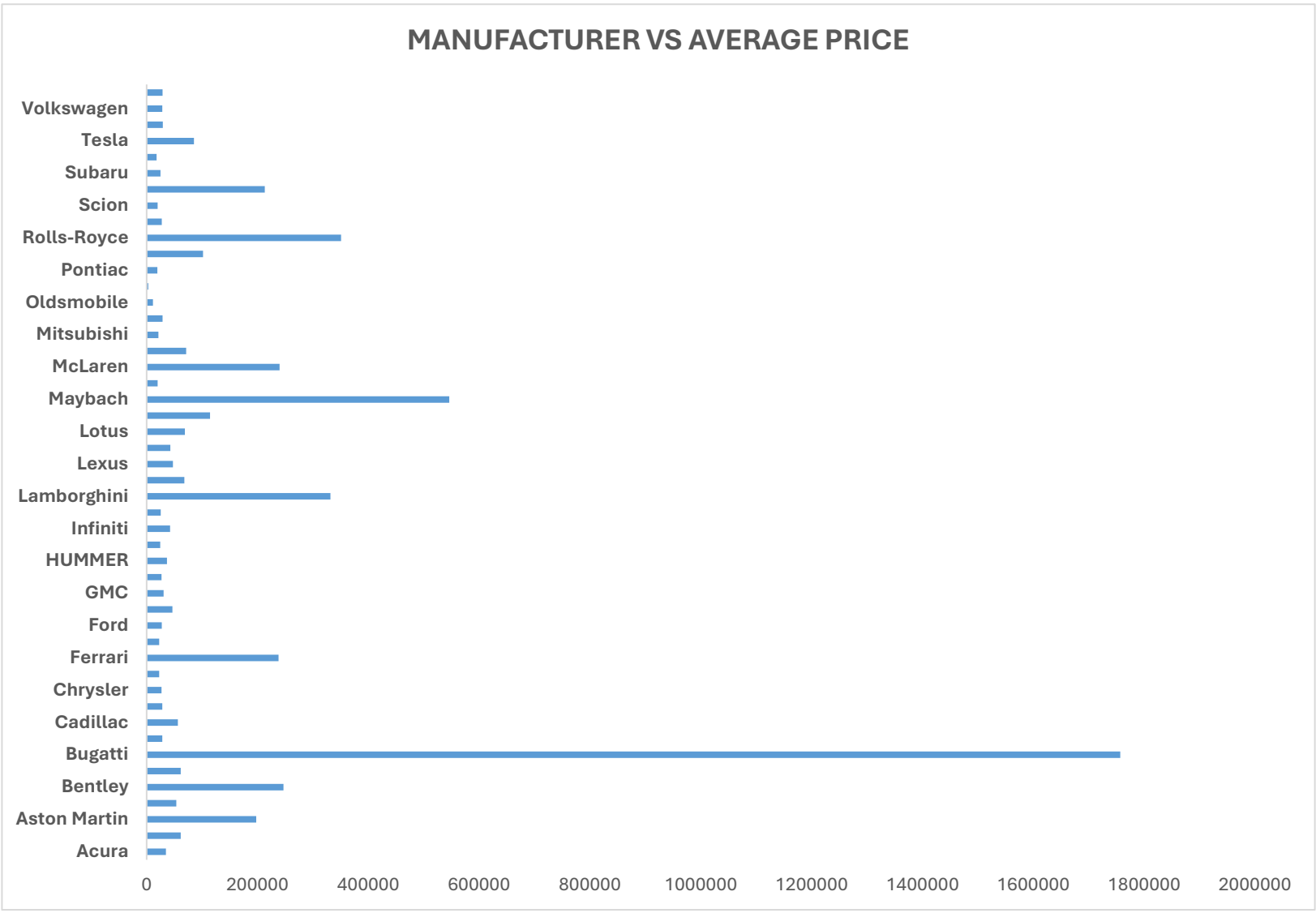
➔ Number of doors has weakest relation towards pricing with coefficient in negative.

TASK 4 - How does the average price of a car vary across different manufacturers?

Details of different manufacturer and their average MSRP

MANUFACTURER	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
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	17907.20798
Tesla	85255.55556
Toyota	29030.01609
Volkswagen	28102.38072
Volvo	28541.16014

Distribution of various manufacturer according to their average price



➔ Bugatti has the highest average price among all other brands.

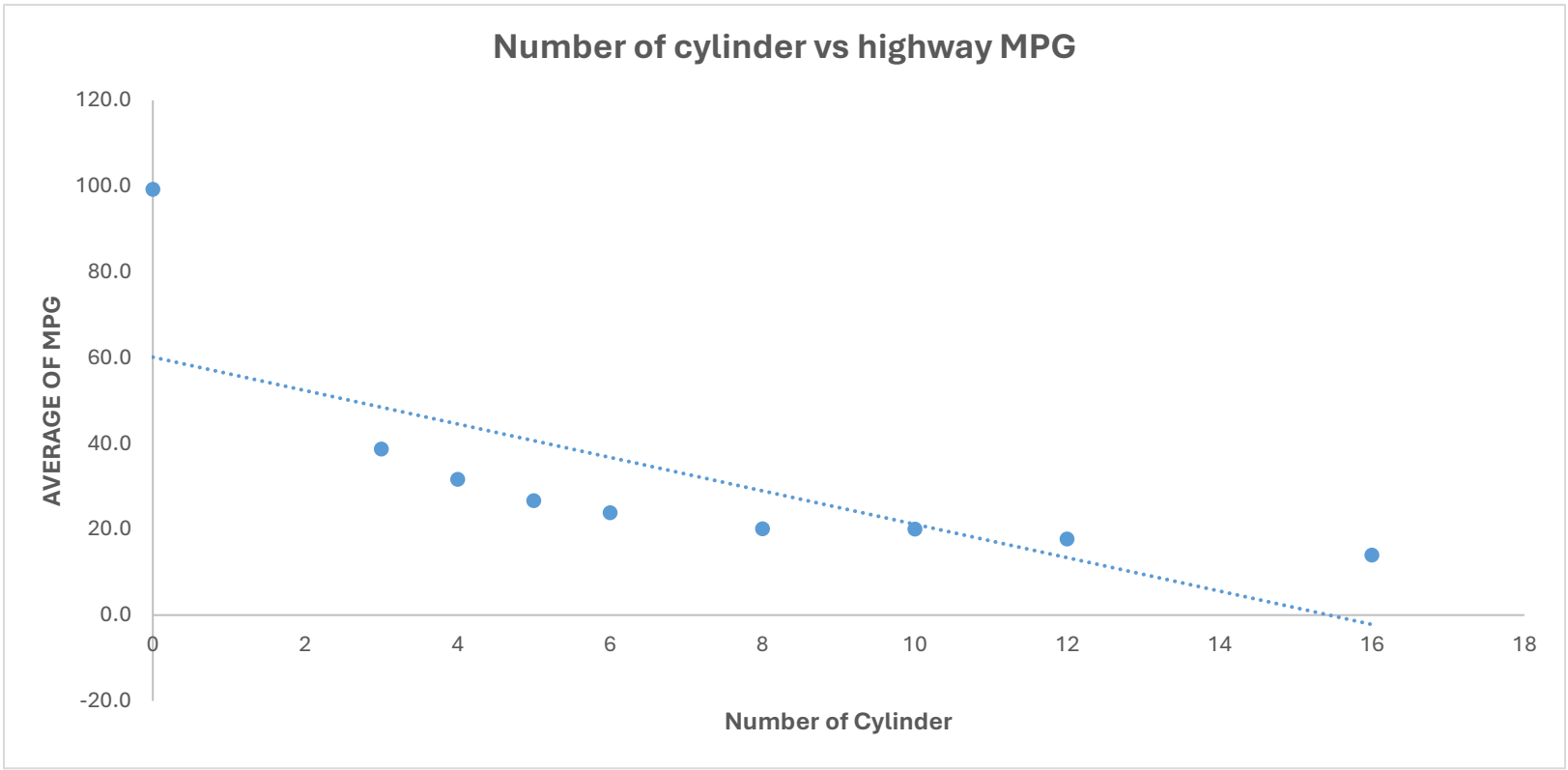
➔ 2nd highest average price is of Maybach i.e. 546221.875

➔ Manufacturer with the least average price is Oldsmobile

TASK 5 What is the relationship between fuel efficiency and the number of cylinders in a car's engine?

NUMBER OF CYLINDERS	Average of highway MPG
0	99.3
3	38.7
4	31.6
5	26.7
6	23.9
8	20.1
10	20.0
12	17.7
16	14

Correlation	**-0.734961938**



➔ According to trendline, there is a negative correlation of -0.734 between number of cylinders and average miles per gallon.

➔ As per negative correlation between number of cylinder and miles per gallon, engine with a greater number of cylinders will have lesser average mpg.

DASHBOARD

Link to the excel file -
https://docs.google.com/spreadsheets/d/1AVho54l8xSjd0LKhtefYoBoQdd9k9Zno/edit?usp=sharing&ouid=116598383154898349386&rtpof=true&sd=true