



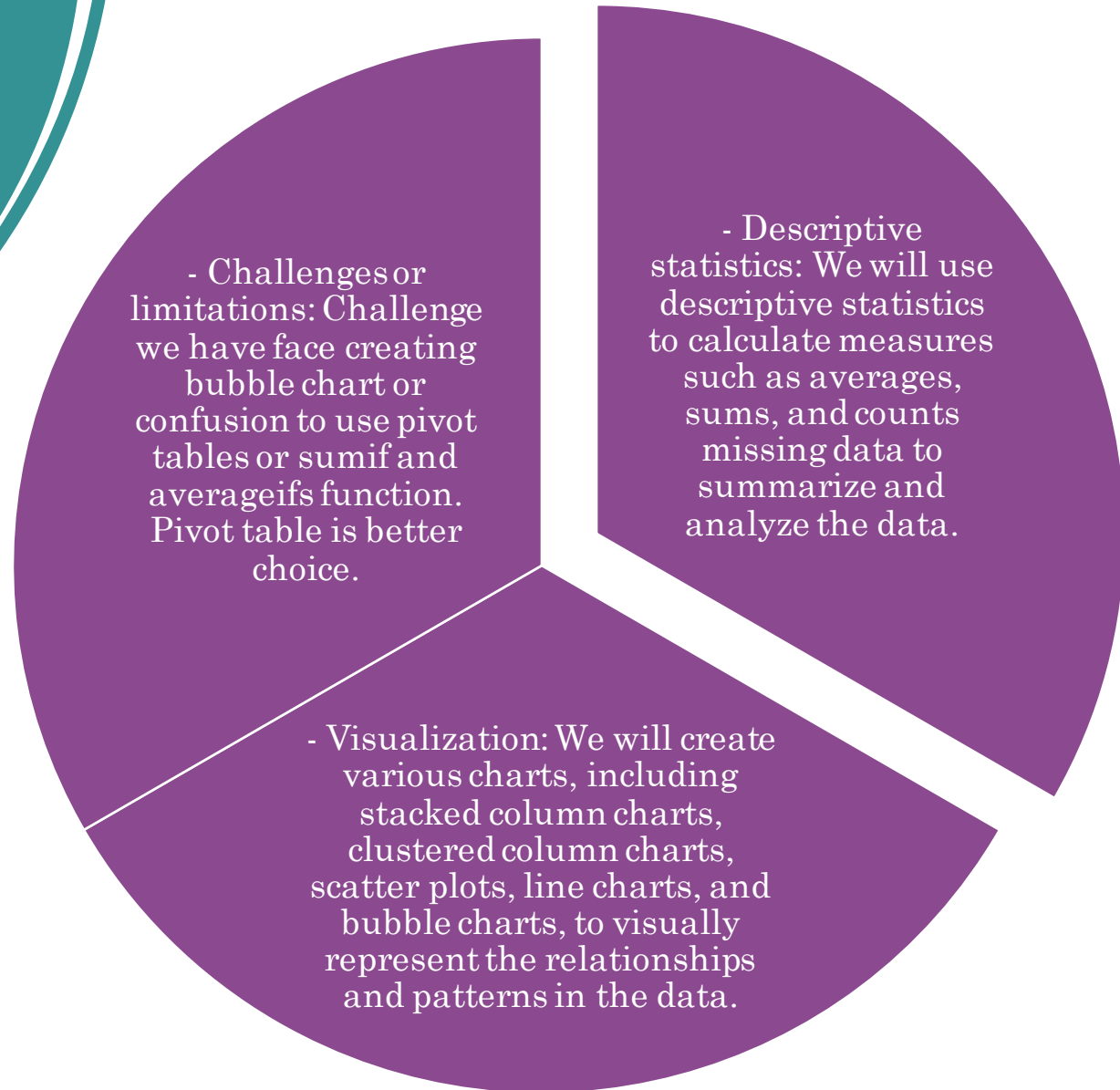
Analyzing the Impact of Car Features on Price and Profitability

By Sumit k Prajapat

Project Description

- - Overview: This project analyzes the "Car Features and MSRP" dataset to provide insights into pricing, market categories, engine power, features, and fuel efficiency for a car manufacturer.
- - Business problem: The project aims to address the manufacturer's need for insights into market category popularity, engine power and price relationship, influential features, average prices across manufacturers, and fuel efficiency variations.
- - Data sources: The dataset used is the "Car Features and MSRP" dataset from Trainity, consisting of information on 11,000+ car models and their specifications.
- - Data cleaning and preprocessing: Thorough cleaning steps were performed, including removal of duplicates, handling missing values, ensuring consistent formatting, and verifying data types.

Approach



Tech Stack Used

- - Excel: Microsoft Excel is a powerful spreadsheet software that allows for data analysis, visualization, and manipulation.
- - Python (PyCharm): Python is a versatile programming language commonly used for data analysis and scientific computing.
- Reasoning behind the choice of tech stack:
- - Excel: Excel is a widely used tool in the business and data analysis domain, known for its ease of use and familiarity among users.
- - Python (PyCharm): Python offers more advanced data analysis capabilities, such as data cleaning, statistical analysis, and machine learning. By using Python in conjunction with libraries such as Pandas, NumPy, and Matplotlib, we can perform more complex data manipulations and generate more sophisticated visualizations..



Insight

1. Car popularity varies across market categories, providing insights into customer preferences.
2. Engine power has a relationship with car price, indicating the influence of power on pricing.
3. Certain factors significantly impact car prices, guiding pricing strategies and product development.
4. Average prices differ among manufacturers, highlighting brand pricing strategies.
5. The number of cylinders affects fuel efficiency, informing engine design decisions.

Recommendations:

- Manufacturers should align product offerings with popular market categories.
- Customers can consider engine power when making purchase decisions.
- Pricing strategies should consider influential factors identified in the analysis.
- Manufacturers can differentiate pricing based on brand positioning.
- Optimizing engine design can improve fuel efficiency.

Result

Result

- The analysis provided valuable insights on car popularity, pricing, features, and fuel efficiency. These insights can inform decision-making for manufacturers and customers in the automotive industry

Discussion:

- The findings help identify market trends, pricing strategies, and the impact of features on car prices and fuel efficiency. They provide guidance for businesses and customers in making informed decisions.

Limitations and Future Directions:

- The analysis focused on BMW cars, limiting its generalizability. Expanding the dataset and considering additional variables would enhance the analysis. Exploring external data sources can provide a broader perspective.

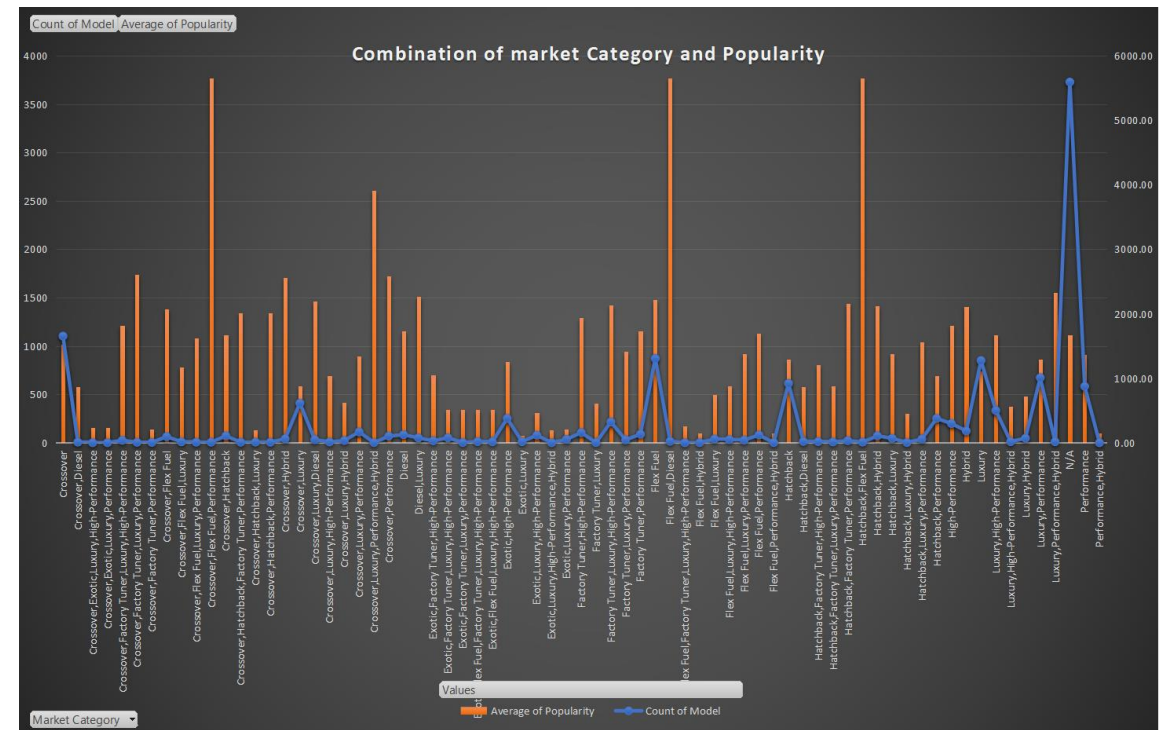
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Make	Model	Year	Engine Fuel Type	Engine HP	Engine Cyl	Transmission	Driven_Wheel	Number o	Market Category	Vehicle S	Body Style	highway	city mp	Popolari	MSRP
2	BMW	1 Series M	2011	premium unleaded (required)	335	6	MANUAL	rear wheel drive	2	Factory Tuner,Luxury,High-Performance	Compact	Coupe	26	19	3916	46135
3	BMW	1 Series	2011	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible	28	19	3916	40650
4	BMW	1 Series	2011	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe	28	20	3916	36350
5	BMW	1 Series	2011	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe	28	18	3916	29450
6	BMW	1 Series	2011	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	28	18	3916	34500
7	BMW	1 Series	2012	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe	28	18	3916	31200
8	BMW	1 Series	2012	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Convertible	26	17	3916	44100
9	BMW	1 Series	2012	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe	28	20	3916	39300
10	BMW	1 Series	2012	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	28	18	3916	36900
11	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	27	18	3916	37200
12	BMW	1 Series	2013	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe	28	20	3916	39600
13	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe	28	19	3916	31500
14	BMW	1 Series	2013	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible	28	19	3916	44400
15	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible	28	19	3916	37200
16	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe	28	19	3916	31500
17	BMW	1 Series	2013	premium unleaded (required)	320	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Convertible	25	18	3916	48250
18	BMW	1 Series	2013	premium unleaded (required)	320	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe	28	20	3916	43550
19	Audi	100	1992	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	24	17	3105	2000
20	Audi	100	1992	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	24	17	3105	2000
21	Audi	100	1992	regular unleaded	172	6	AUTOMATIC	all wheel drive	4	Luxury	Midsize	Wagon	20	16	3105	2000
22	Audi	100	1992	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	24	17	3105	2000
23	Audi	100	1992	regular unleaded	172	6	MANUAL	all wheel drive	4	Luxury	Midsize	Sedan	21	16	3105	2000
24	Audi	100	1993	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	24	17	3105	2000
25	Audi	100	1993	regular unleaded	172	6	AUTOMATIC	all wheel drive	4	Luxury	Midsize	Wagon	20	16	3105	2000
26	Audi	100	1993	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	24	17	3105	2000
27	Audi	100	1993	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	24	17	3105	2000
28	Audi	100	1993	regular unleaded	172	6	MANUAL	all wheel drive	4	Luxury	Midsize	Sedan	21	16	3105	2000
29	Audi	100	1994	regular unleaded	172	6	AUTOMATIC	front wheel drive	4	Luxury	Midsize	Wagon	21	16	3105	2000
30	Audi	100	1994	regular unleaded	172	6	MANUAL	all wheel drive	4	Luxury	Midsize	Sedan	22	16	3105	2000
31	Audi	100	1994	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan	22	17	3105	2000
32	Audi	100	1994	regular unleaded	172	6	AUTOMATIC	front wheel drive	4	Luxury	Midsize	Sedan	22	16	3105	2000
33	Audi	100	1994	regular unleaded	172	6	AUTOMATIC	all wheel drive	4	Luxury	Midsize	Wagon	21	16	3105	2000
34	FIAT	124 Spider	2017	premium unleaded (recommended)	160	4	MANUAL	rear wheel drive	2	Performance	Compact	Convertible	35	26	819	27495
35	FIAT	124 Spider	2017	premium unleaded (recommended)	160	4	MANUAL	rear wheel drive	2	Performance	Compact	Convertible	35	26	819	24995
36	FIAT	124 Spider	2017	premium unleaded (recommended)	160	4	MANUAL	rear wheel drive	2	Performance	Compact	Convertible	35	26	819	28195
37	Mercedes-Benz	190-Class	1991	regular unleaded	130	4	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan	26	18	617	2000
38	Mercedes-Benz	190-Class	1991	regular unleaded	158	6	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan	25	17	617	2000
39	Mercedes-Benz	190-Class	1992	regular unleaded	158	6	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan	25	17	617	2000
40	Mercedes-Benz	190-Class	1992	regular unleaded	130	4	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan	26	18	617	2000
41	Mercedes-Benz	190-Class	1993	regular unleaded	130	4	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan	26	18	617	2000
42	Mercedes-Benz	190-Class	1993	regular unleaded	158	6	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan	25	17	617	2000
43	BMW	2 Series	2016	premium unleaded (required)	240	4	AUTOMATIC	rear wheel drive	2	Luxury,Performance	Compact	Coupe	35	23	3916	32850
44	BMW	2 Series	2016	premium unleaded (required)	240	4	AUTOMATIC	rear wheel drive	2	Luxury	Compact	Convertible	34	23	3916	38650
45	BMW	2 Series	2016	premium unleaded (required)	320	6	AUTOMATIC	rear wheel drive	2	Factory Tuner,Luxury,High-Performance	Compact	Convertible	31	20	3916	48750

Data Cleaning

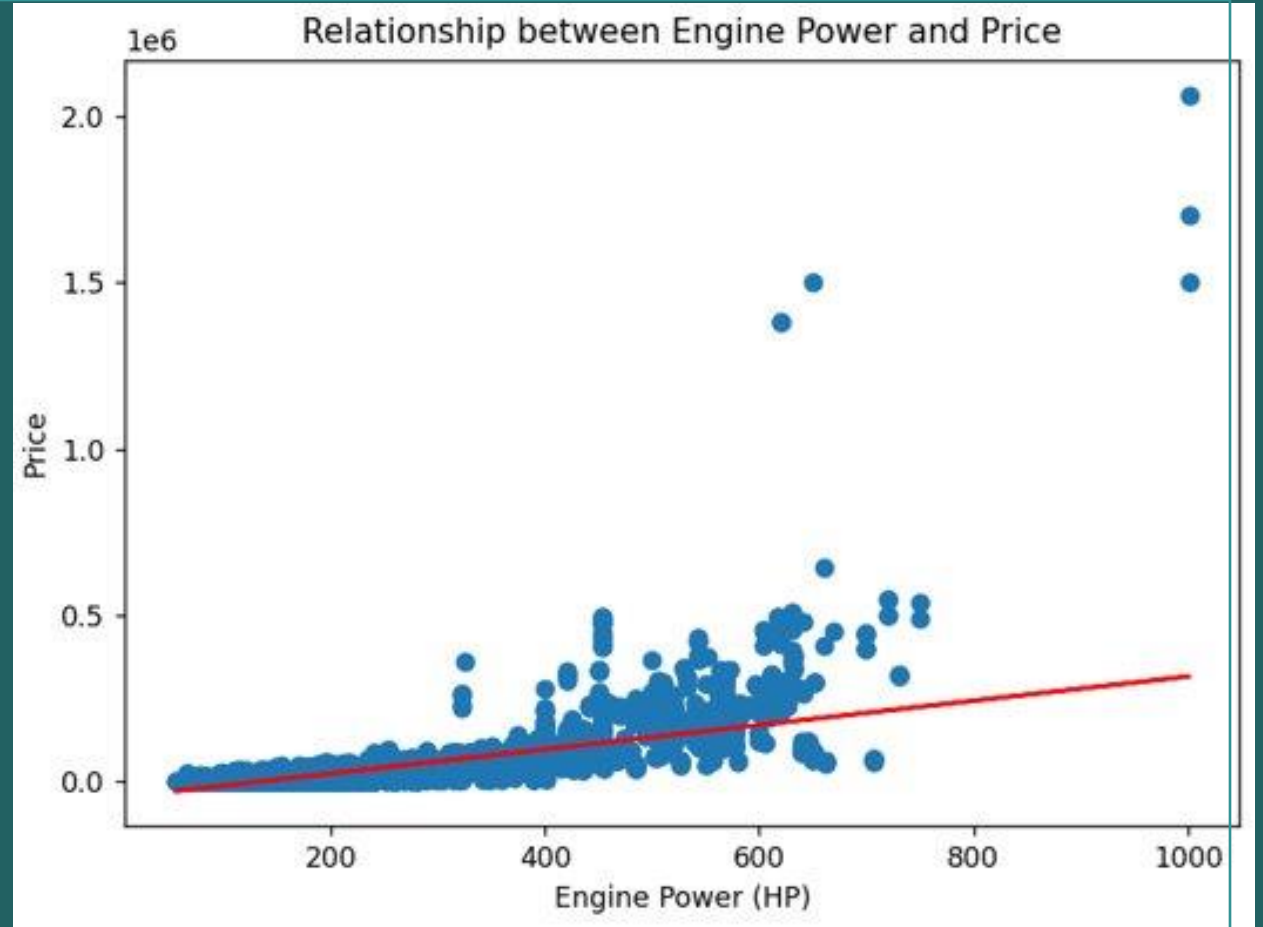
- Most Important Task for a Data Analyst

Combination of Market Category and Popularity

Row Labels	Count of Model	Average of Popularity
Crossover	1103	1529.03
Crossover,Diesel	7	873.00
Crossover,Exotic,Luxury,High-Performance	1	238.00
Crossover,Exotic,Luxury,Performance	1	238.00
Crossover,Factory Tuner,Luxury,High-Perform	26	1823.46
Crossover,Factory Tuner,Luxury,Performance	5	2607.40
Crossover,Factory Tuner,Performance	4	210.00
Crossover,Flex Fuel	64	2073.75
Crossover,Flex Fuel,Luxury	10	1173.20
Crossover,Flex Fuel,Luxury,Performance	6	1624.00
Crossover,Flex Fuel,Performance	6	5657.00
Crossover,Hatchback	72	1675.69
Crossover,Hatchback,Factory Tuner,Performe	6	2009.00
Crossover,Hatchback,Luxury	7	204.00
Crossover,Hatchback,Performance	6	2009.00
Crossover,Hybrid	42	2563.38
Crossover,Luxury	410	884.55
Crossover,Luxury,Diesel	33	2195.85
Crossover,Luxury,High-Performance	9	1037.22
Crossover,Luxury,Hybrid	24	630.92
Crossover,Luxury,Performance	113	1344.85
Crossover,Luxury,Performance,Hybrid	2	3916.00
Crossover,Performance	69	2585.96
Diesel	84	1730.90
Diesel,Luxury	51	2275.00
Exotic,Factory Tuner,High-Performance	21	1046.38
Exotic,Factory Tuner,Luxury,High-Performance	52	517.54
Exotic,Factory Tuner,Luxury,Performance	3	520.00
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Pe	13	520.00
Exotic,Flex Fuel,Luxury,High-Performance	11	520.00
Exotic,High-Performance	252	1261.57
Exotic,Luxury	12	112.67
Exotic,Luxury,High-Performance	79	467.08
Exotic,Luxury,High-Performance,Hybrid	1	204.00
Exotic,Luxury,Performance	36	217.03
Factory Tuner,High-Performance	106	1941.42
Factory Tuner,Luxury	2	617.00
Factory Tuner,Luxury,High-Performance	215	2133.37
Factory Tuner,Luxury,Performance	31	1413.42
Factory Tuner,Performance	89	1733.10



Relationship Between Engine Power and Price



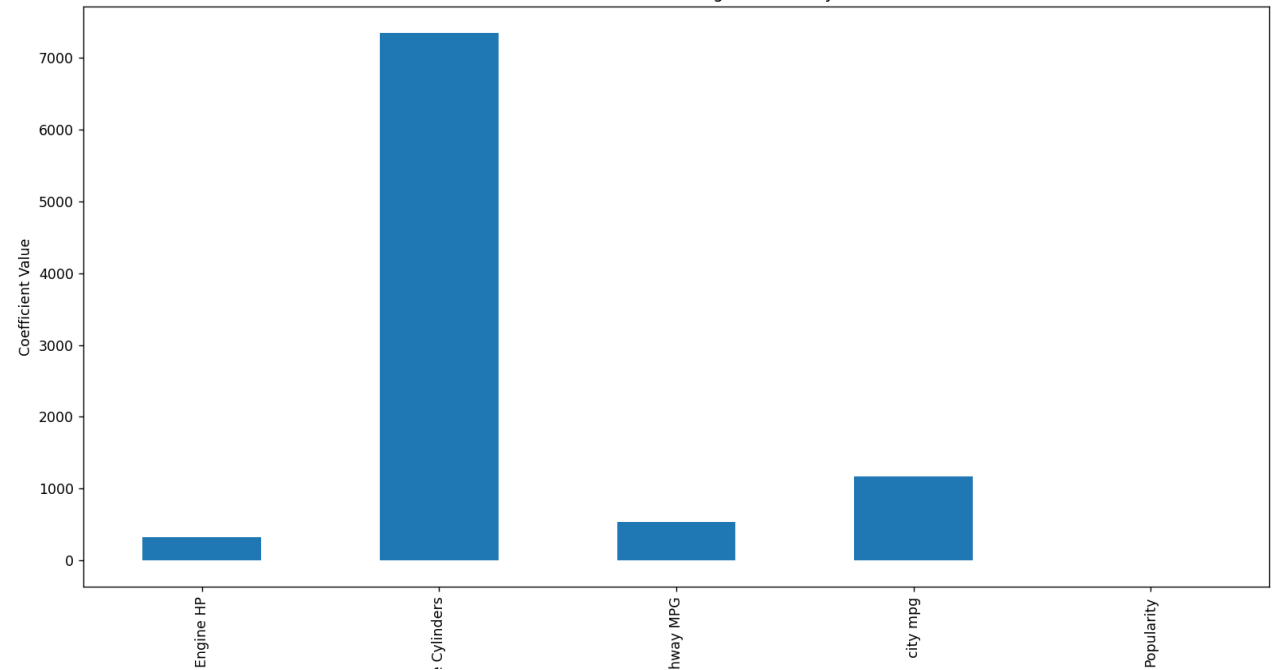
Regression analysis on python

OLS Regression Results

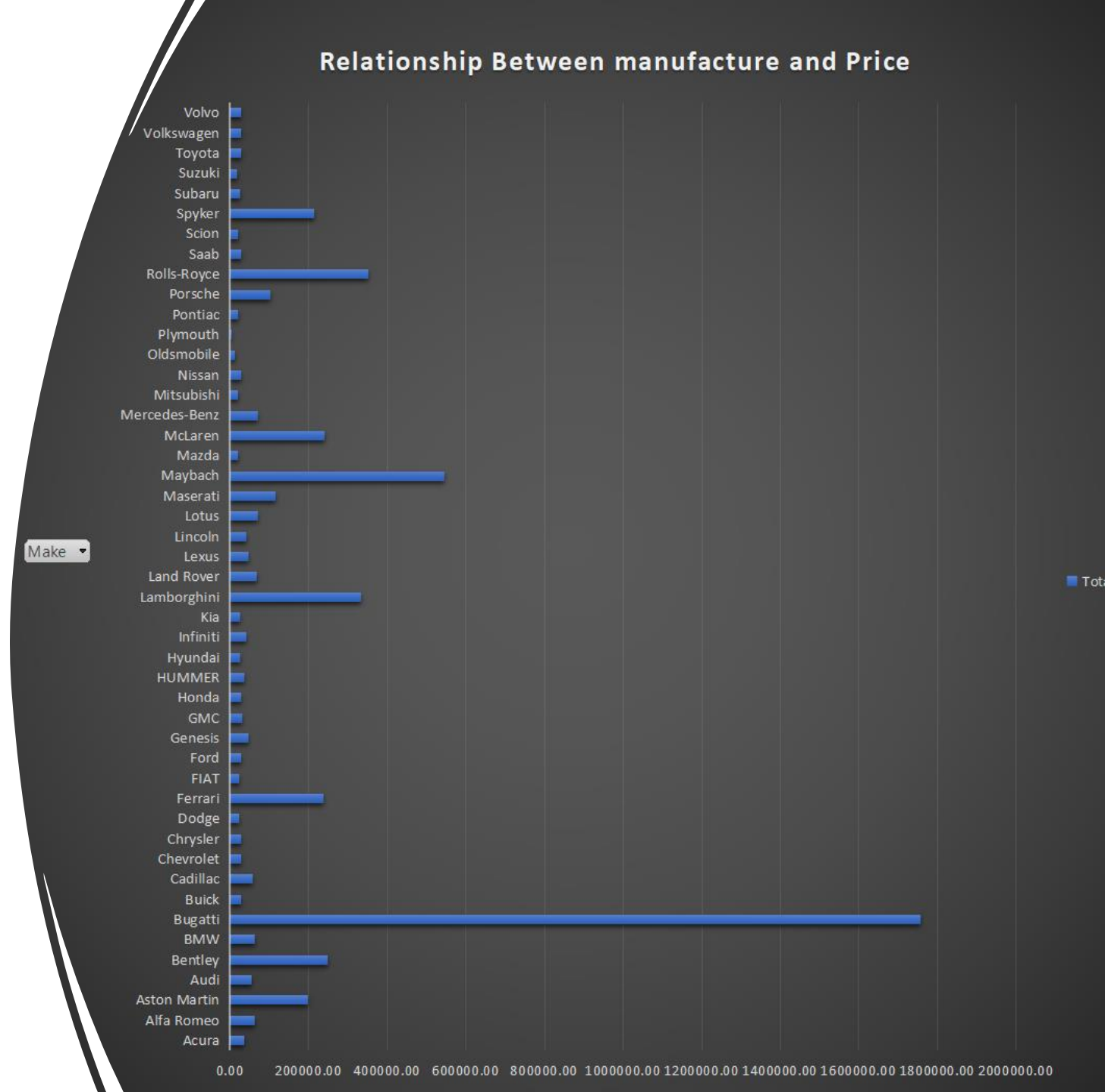
=====						
Dep. Variable:	MSRP	R-squared:	0.466			
Model:	OLS	Adj. R-squared:	0.465			
Method:	Least Squares	F-statistic:	2058.			
Date:	Tue, 18 Jul 2023	Prob (F-statistic):	0.00			
Time:	18:26:18	Log-Likelihood:	-1.4313e+05			
No. Observations:	11816	AIC:	2.863e+05			
Df Residuals:	11810	BIC:	2.863e+05			
Df Model:	5					
Covariance Type:	nonrobust					
=====						
	coef	std err	t	P> t	[0.025	0.975]

const	-1.132e+05	3323.982	-34.067	0.000	-1.2e+05	-1.07e+05
Engine HP	322.8984	6.006	53.759	0.000	311.125	334.672
Engine Cylinders	7346.5344	438.495	16.754	0.000	6487.012	8206.057
highway MPG	539.3449	105.671	5.104	0.000	332.212	746.478
city mpg	1163.9541	121.774	9.558	0.000	925.258	1402.650
Popularity	-3.1892	0.282	-11.298	0.000	-3.742	-2.636
=====						
Omnibus:	23460.814	Durbin-Watson:	0.744			
Prob(Omnibus):	0.000	Jarque-Bera (JB):	111298292.438			
Skew:	15.815	Prob(JB):	0.00			
Kurtosis:	477.407	Cond. No.	1.75e+04			
=====						

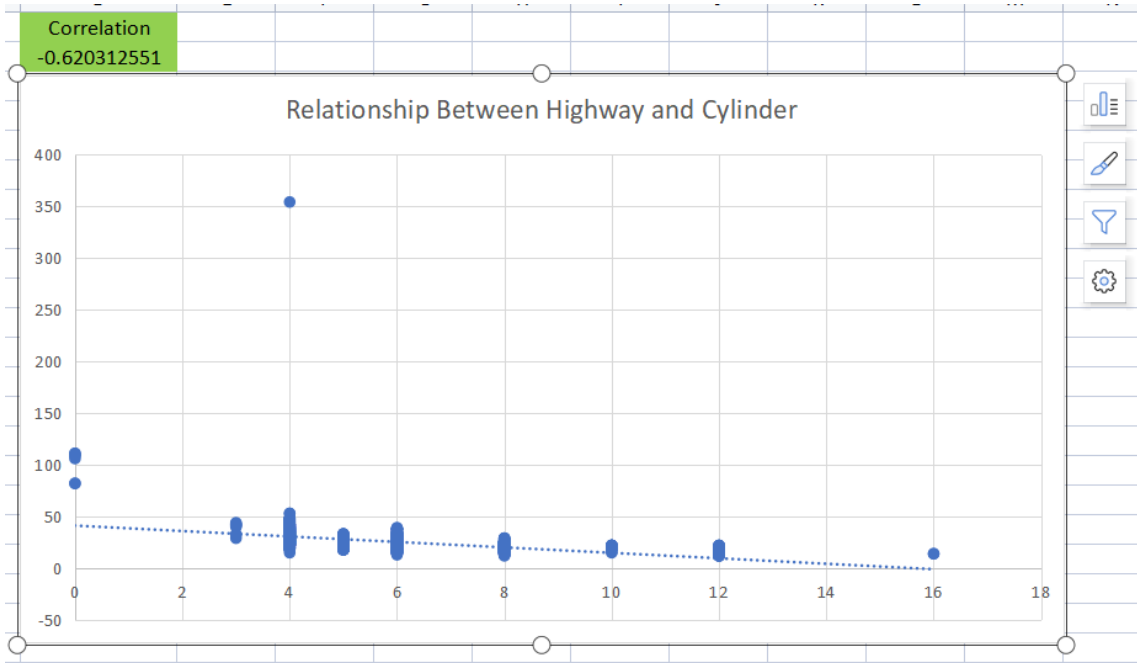
Variable Coefficients in Regression Analysis



Relation Between Manufacture and Price

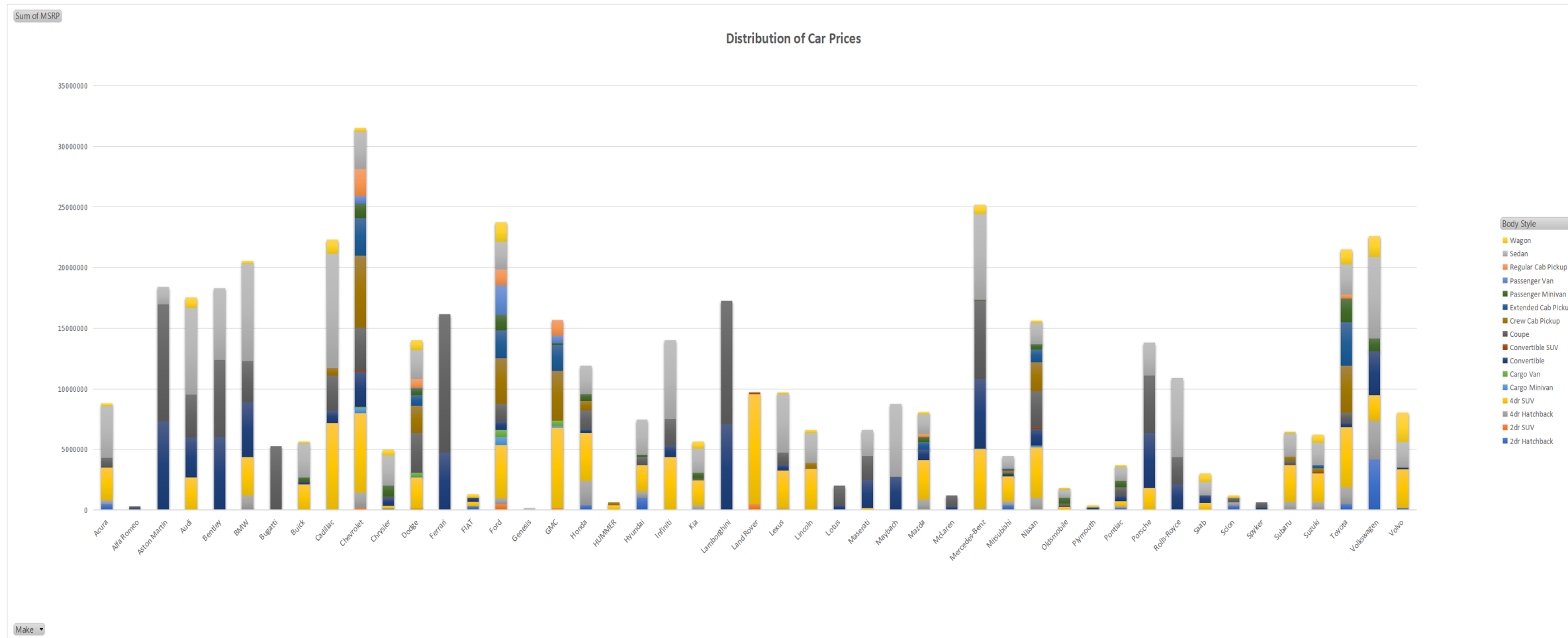


Relationship Between Highway and Cylinder

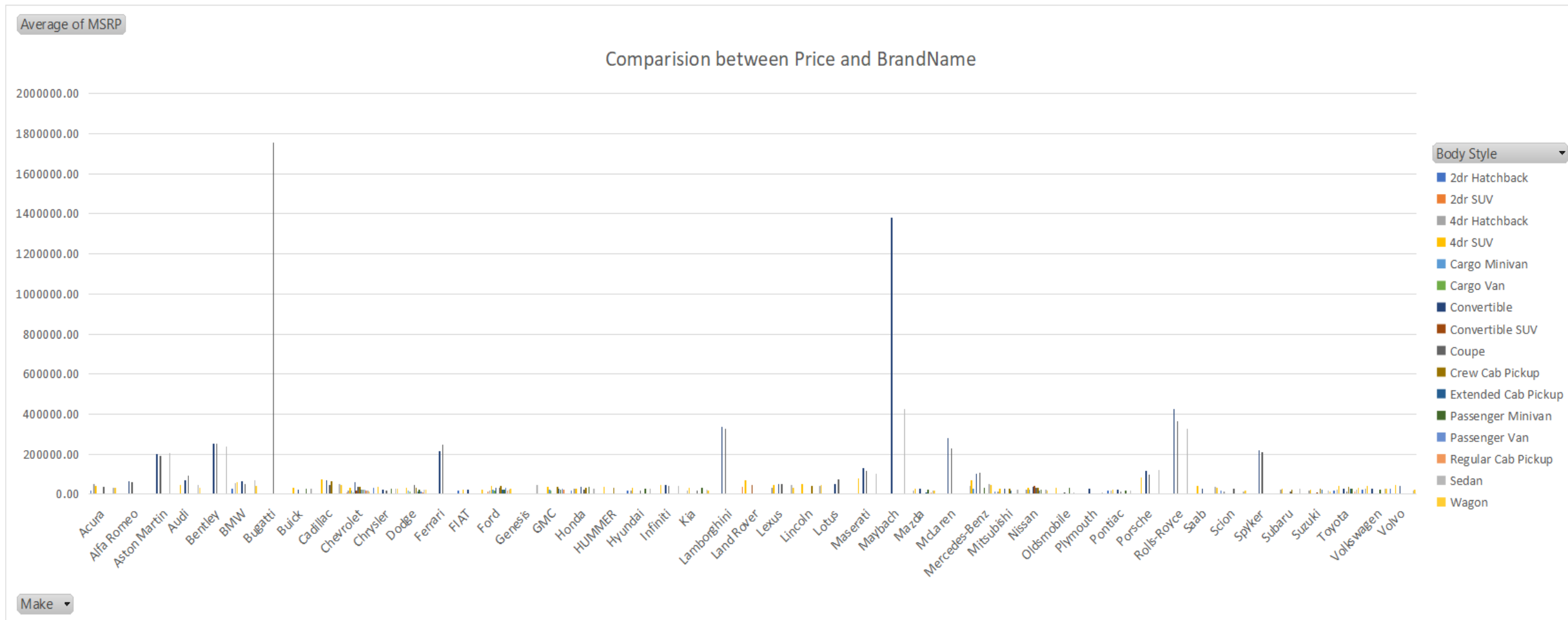


- Correlation
- Find though Correlation Formula
- `=CORREL(A1:A11813,B1:B11813)`

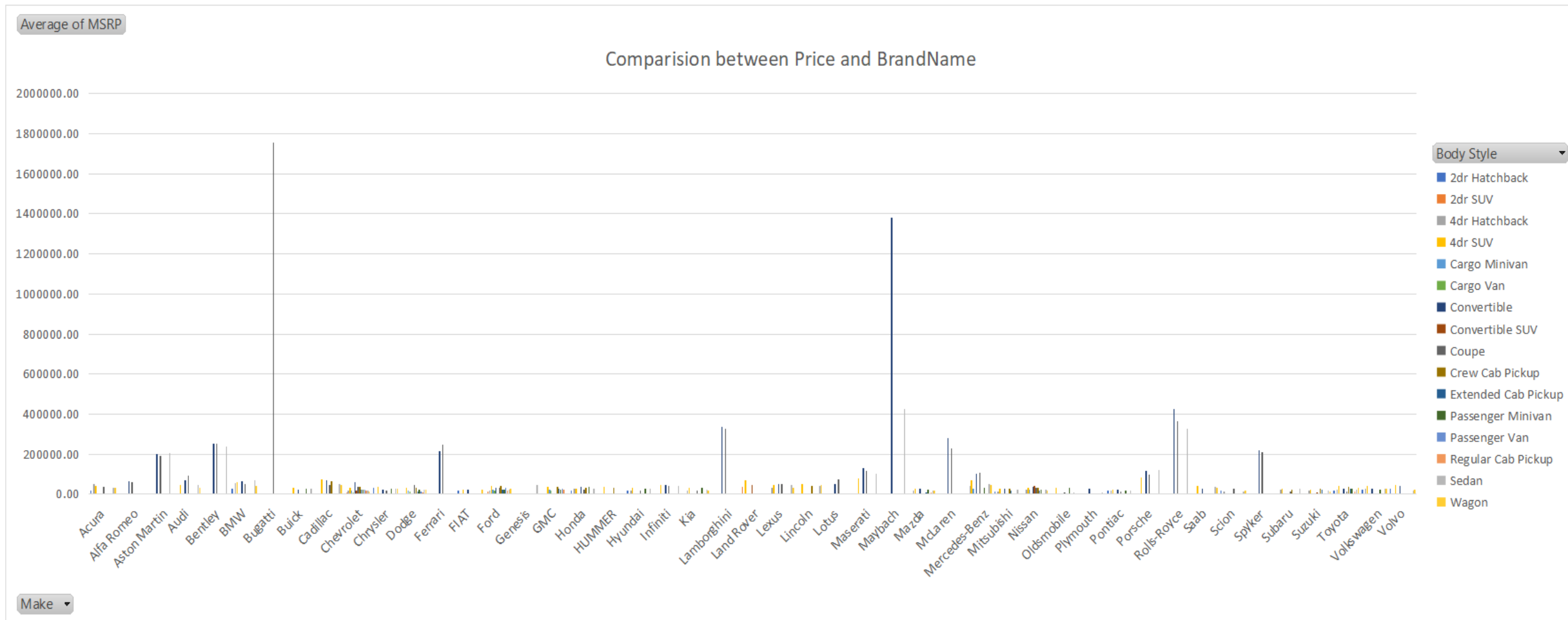
Distribution of Car Prices



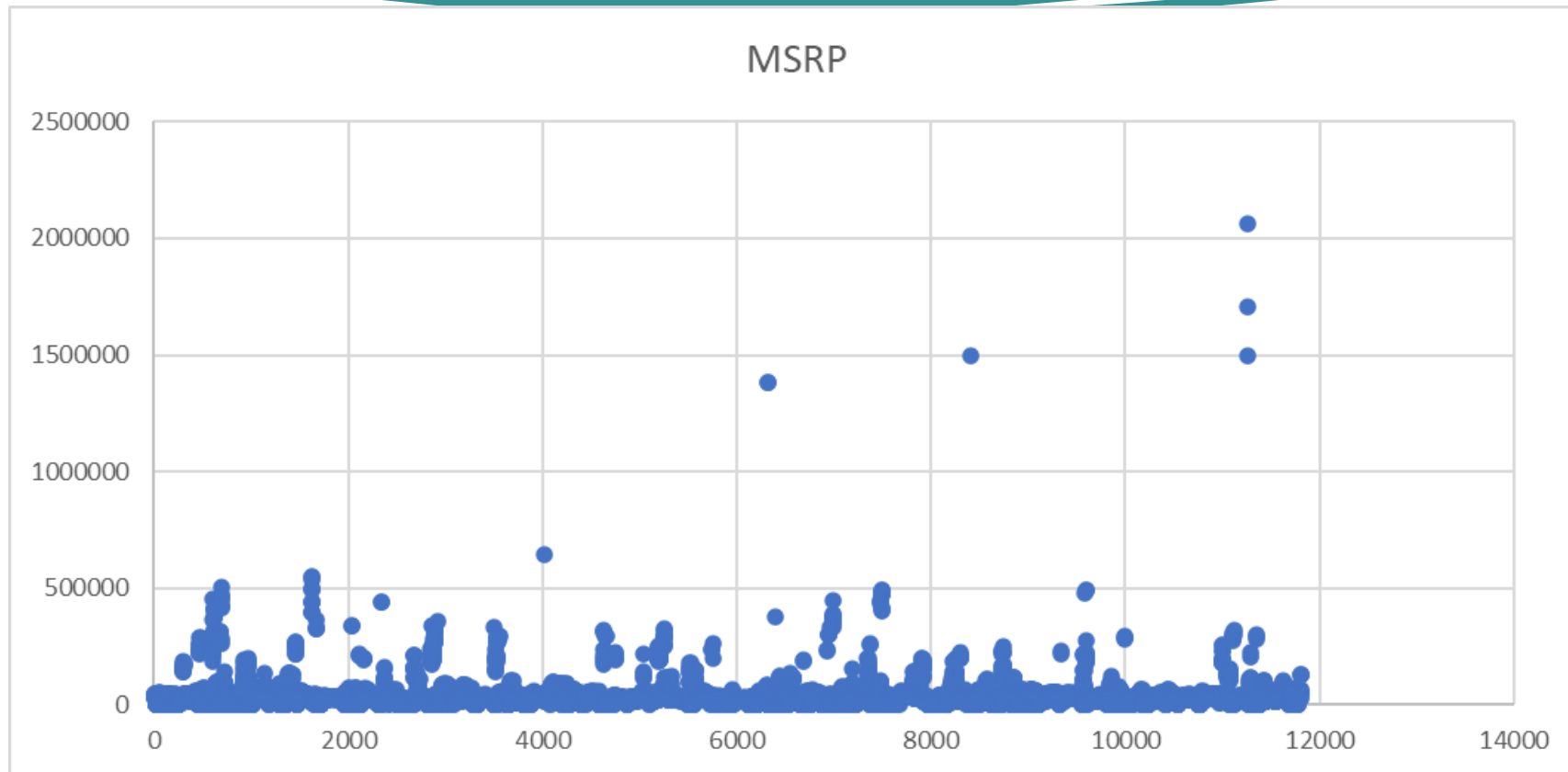
Comparison of Price and Brand



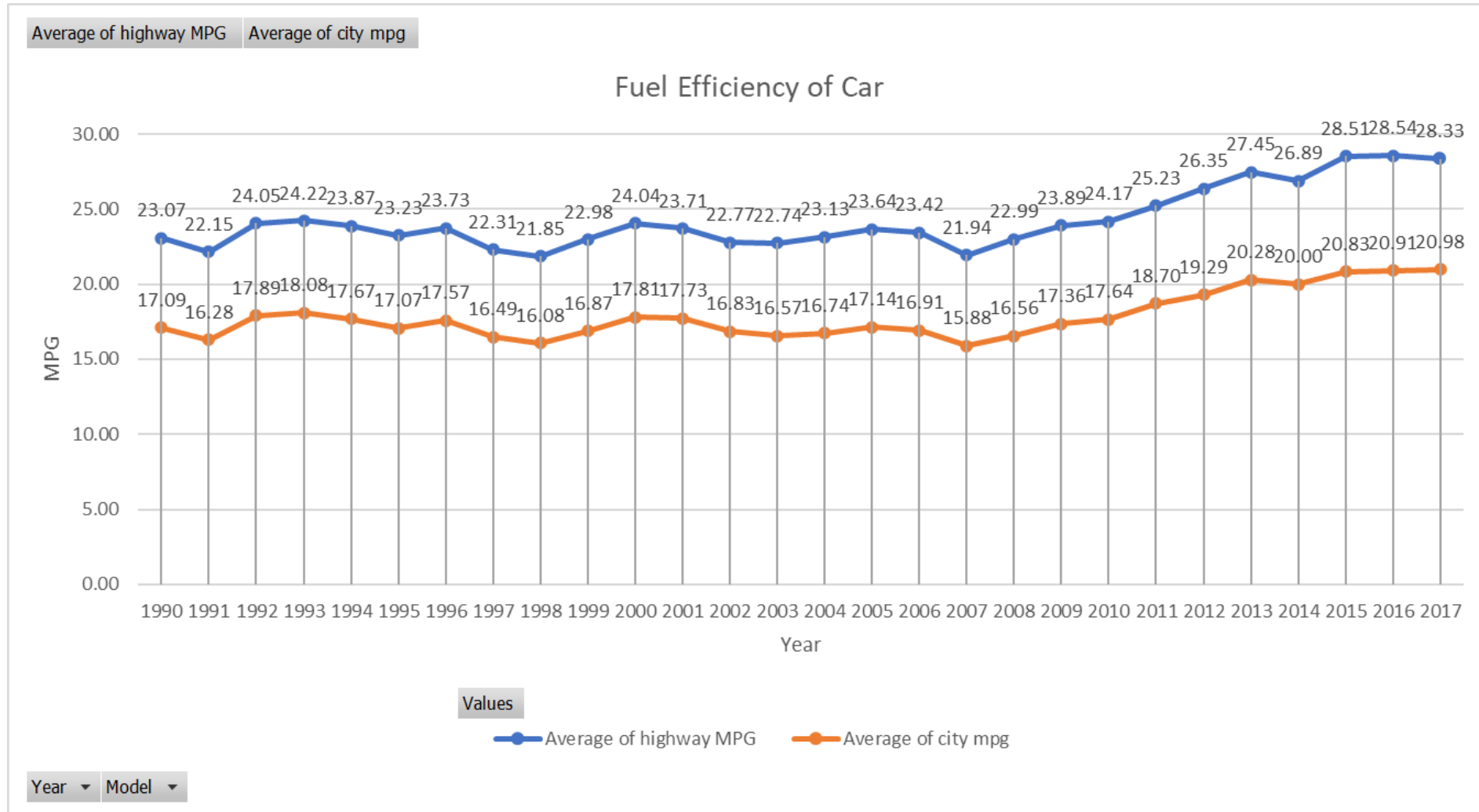
Comparison of Price and Brand



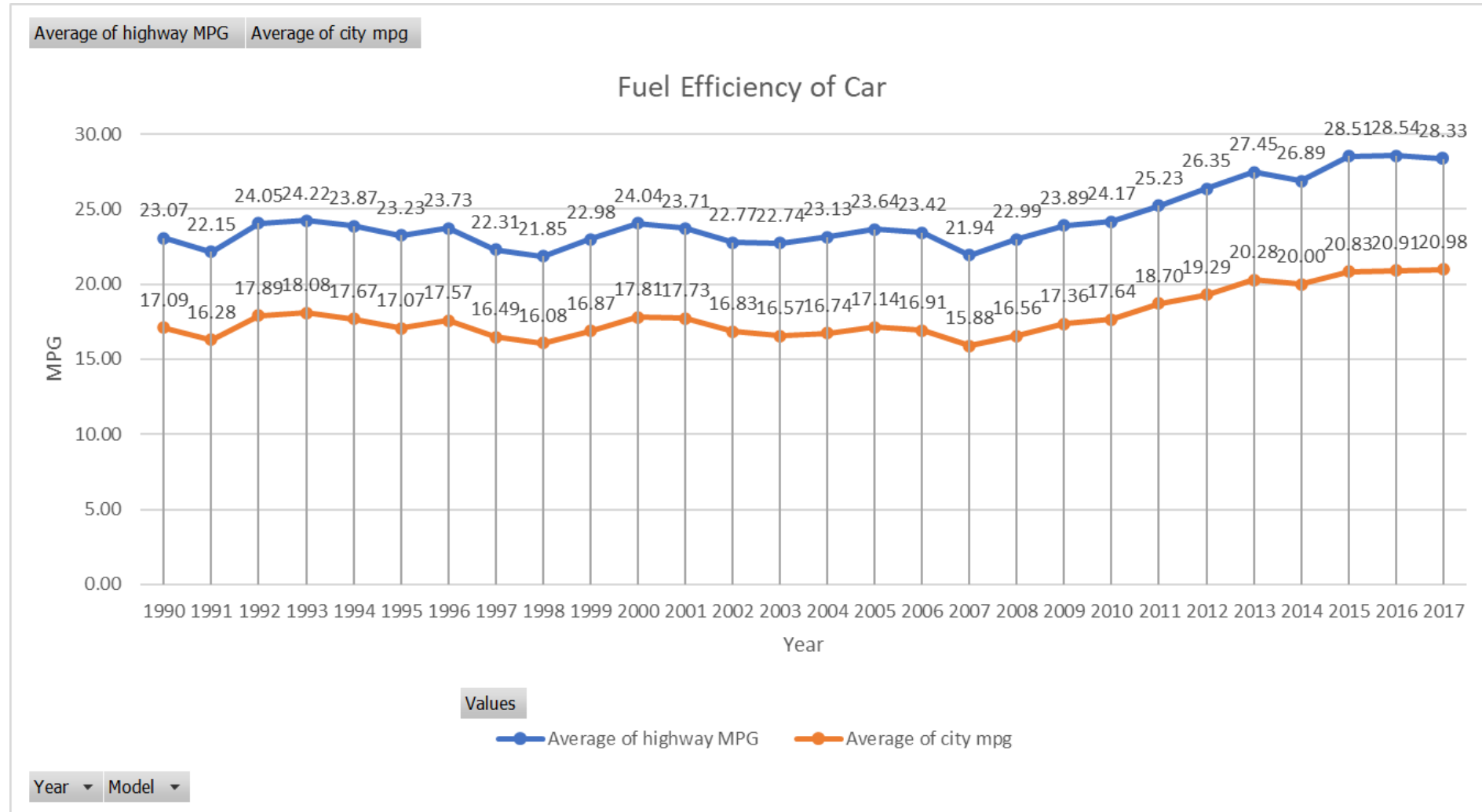
Relationship between MSRP and transmission type



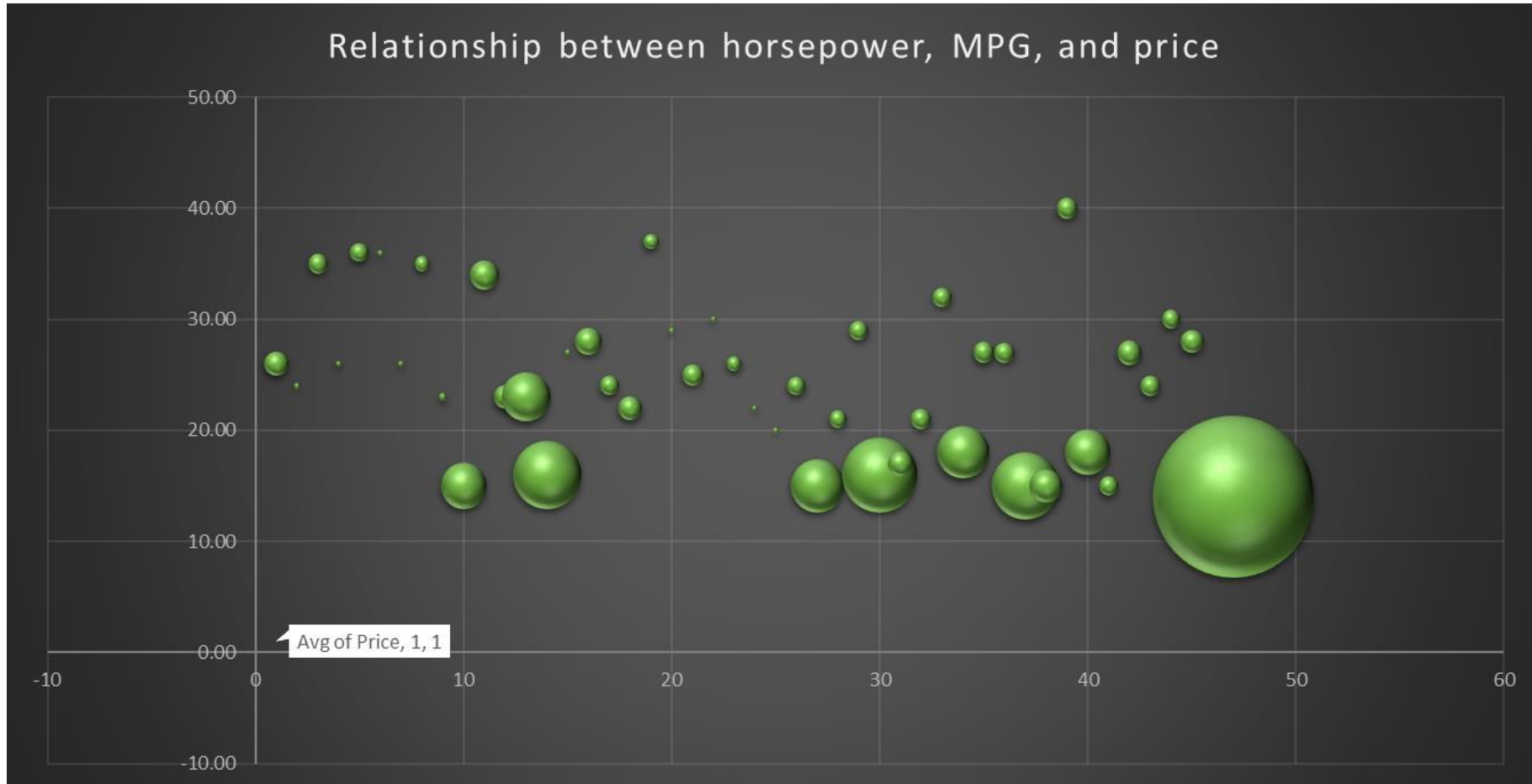
Fuel efficiency of cars



Fuel Efficiency of car



Relationship Between HP, MPG and Price



THANK YOU
BY SUMIT K PRAJAPAT

DriveLink:

<https://drive.google.com/drive/folders/1gyPXczxfP-lmQCAVwWARcn2HwjLMzfV8?usp=sharing>