Project Report: Analyzing the Impact of Car Features on Price and Profitability

Project Overview:

As part of my data analytics course at Trainity, I was tasked with analyzing a dataset containing information on over 11,000 car models to help a car manufacturer optimize pricing and product development decisions. The goal was to maximize profitability while meeting consumer demand in the rapidly evolving automotive industry.

Business Problem:

The key question posed was: How can a car manufacturer optimize pricing and product development decisions to maximize profitability while meeting consumer demand?

Approach:

To address this problem, I used Excel to perform various analyses on the dataset, including:

1. Creating pivot tables and charts to visualize relationships between variables

2. Conducting regression analysis to identify key factors influencing car prices

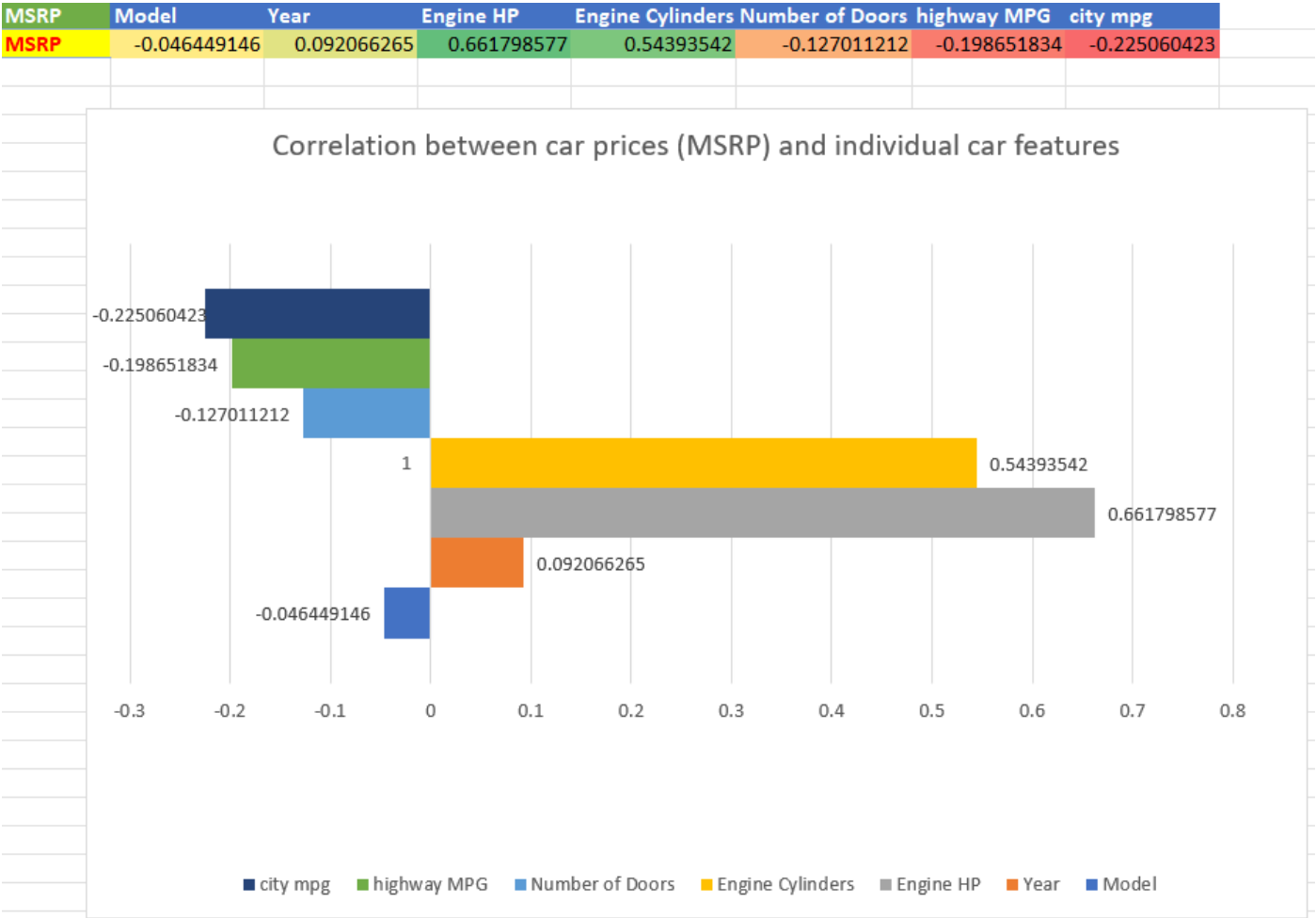3. Building an interactive dashboard to explore trends across different car features

	A	B	C	D	E	F	G	H	I	J	K	L
1	Make	Model	Year	Engine Fuel Type	Engine H	Engine Cylinder	Transmission Type	Driven_Wheel	Number of Door	Market Category	Vehicle Si	Vehicle Style
2	BMW	1 Series M	2011	premium unleaded (required)	335	6	MANUAL	rear wheel drive	2	Factory Tuner,Luxury,High-Performance	Compact	Coupe
3	BMW	1 Series	2011	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible
4	BMW	1 Series	2011	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe
5	BMW	1 Series	2011	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe
6	BMW	1 Series	2011	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible
7	BMW	1 Series	2012	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe
8	BMW	1 Series	2012	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible
9	BMW	1 Series	2012	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe
10	BMW	1 Series	2012	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible
11	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible
12	BMW	1 Series	2013	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe
13	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe
14	BMW	1 Series	2013	premium unleaded (required)	300	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Convertible
15	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury	Compact	Convertible
16	BMW	1 Series	2013	premium unleaded (required)	230	6	MANUAL	rear wheel drive	2	Luxury,Performance	Compact	Coupe
17	BMW	1 Series	2013	premium unleaded (required)	320	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Convertible
18	BMW	1 Series	2013	premium unleaded (required)	320	6	MANUAL	rear wheel drive	2	Luxury,High-Performance	Compact	Coupe
19	Audi	100	1992	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan
20	Audi	100	1992	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan
21	Audi	100	1992	regular unleaded	172	6	AUTOMATIC	all wheel drive	4	Luxury	Midsize	Wagon
22	Audi	100	1992	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan
23	Audi	100	1992	regular unleaded	172	6	MANUAL	all wheel drive	4	Luxury	Midsize	Sedan
24	Audi	100	1993	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan
25	Audi	100	1993	regular unleaded	172	6	AUTOMATIC	all wheel drive	4	Luxury	Midsize	Wagon
26	Audi	100	1993	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan
27	Audi	100	1993	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan
28	Audi	100	1993	regular unleaded	172	6	MANUAL	all wheel drive	4	Luxury	Midsize	Sedan
29	Audi	100	1994	regular unleaded	172	6	AUTOMATIC	front wheel drive	4	Luxury	Midsize	Wagon
30	Audi	100	1994	regular unleaded	172	6	MANUAL	all wheel drive	4	Luxury	Midsize	Sedan
31	Audi	100	1994	regular unleaded	172	6	MANUAL	front wheel drive	4	Luxury	Midsize	Sedan
32	Audi	100	1994	regular unleaded	172	6	AUTOMATIC	front wheel drive	4	Luxury	Midsize	Sedan
33	Audi	100	1994	regular unleaded	172	6	AUTOMATIC	all wheel drive	4	Luxury	Midsize	Wagon
34	FIAT	124 Spider	2017	premium unleaded (recommended)	160	4	MANUAL	rear wheel drive	2	Performance	Compact	Convertible
35	FIAT	124 Spider	2017	premium unleaded (recommended)	160	4	MANUAL	rear wheel drive	2	Performance	Compact	Convertible
36	FIAT	124 Spider	2017	premium unleaded (recommended)	160	4	MANUAL	rear wheel drive	2	Performance	Compact	Convertible
37	Mercedes-Benz	190-Class	1991	regular unleaded	130	4	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan
38	Mercedes-Benz	190-Class	1991	regular unleaded	158	6	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan
39	Mercedes-Benz	190-Class	1992	regular unleaded	158	6	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan
40	Mercedes-Benz	190-Class	1992	regular unleaded	130	4	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan
41	Mercedes-Benz	190-Class	1993	regular unleaded	130	4	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan
42	Mercedes-Benz	190-Class	1993	regular unleaded	158	6	MANUAL	rear wheel drive	4	Luxury	Compact	Sedan
43	BMW	2 Series	2016	premium unleaded (required)	240	4	AUTOMATIC	rear wheel drive	2	Luxury,Performance	Compact	Coupe
44	BMW	2 Series	2016	premium unleaded (required)	240	4	AUTOMATIC	rear wheel drive	2	Luxury	Compact	Convertible

Key Analyses and Findings:
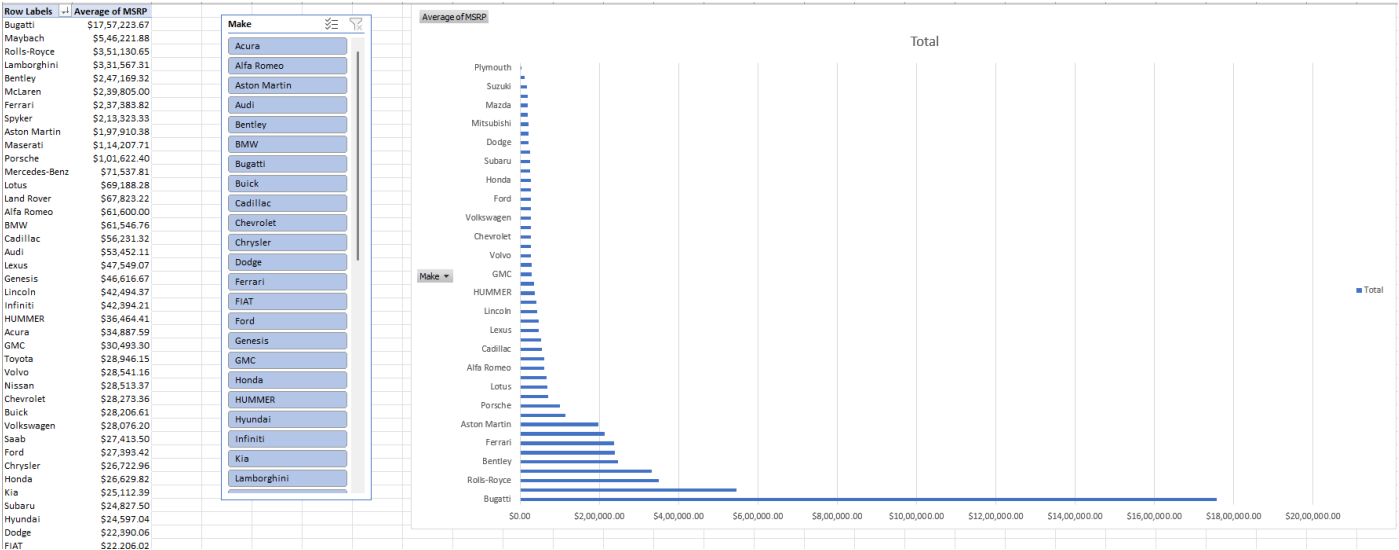
1. Popularity across market categories:

Row Labels	Average of Popularity	Count of Model
Crossover	1529.030825	1103
Crossover,Diesel	873	7
Crossover,Exotic,Luxury,High-Performance	238	1
Crossover,Exotic,Luxury,Performance	238	1
Crossover,Factory Tuner,Luxury,High-Performance	1823.461538	26
Crossover,Factory Tuner,Luxury,Performance	2607.4	5
Crossover,Factory Tuner,Performance	210	4
Crossover,Flex Fuel	2073.75	64
Crossover,Flex Fuel,Luxury	1173.2	10
Crossover,Flex Fuel,Luxury,Performance	1624	6
Crossover,Flex Fuel,Performance	5657	6
Crossover,Hatchback	1675.694444	72
Crossover,Hatchback,Factory Tuner,Performance	2009	6
Crossover,Hatchback,Luxury	204	7
Crossover,Hatchback,Performance	2009	6
Crossover,Hybrid	2563.380952	42
Crossover,Luxury	884.5487805	410
Crossover,Luxury,Diesel	2195.848485	33
Crossover,Luxury,High-Performance	1037.222222	9
Crossover,Luxury,Hybrid	630.9166667	24
Crossover,Luxury,Performance	1344.849558	113
Crossover,Luxury,Performance,Hybrid	3916	2
Crossover,Performance	2585.956522	69
Diesel	1730.904762	84
Diesel,Luxury	2275	51
Exotic,Factory Tuner,High-Performance	1046.380952	21
Exotic,Factory Tuner,Luxury,High-Performance	517.5384615	52
Exotic,Factory Tuner,Luxury,Performance	520	3
Exotic,Flex Fuel,Factory Tuner,Luxury,High-Performance	520	13
Exotic,Flex Fuel,Luxury,High-Performance	520	11
Exotic,High-Performance	1261.571429	252
Exotic,Luxury	112.6666667	12
Exotic,Luxury,High-Performance	467.0759494	79
Exotic,Luxury,High-Performance,Hybrid	204	1
Exotic,Luxury,Performance	217.0277778	36
Factory Tuner,High-Performance	1941.415094	106
Factory Tuner,Luxury	617	2
Factory Tuner,Luxury,High-Performance	2133.367442	215
Factory Tuner,Luxury,Performance	1413.419355	31
Factory Tuner,Performance	1733.101124	89
Flex Fuel	2217.302752	872
Flex Fuel,Diesel	5657	16
Flex Fuel,Factory Tuner,Luxury,High-Performance	258	1

Analysis: This visualization reveals which market categories are most popular among consumers, helping guide product development priorities.

2. Relationship between engine power and price:

Engine HP	MSRP
335	46135
300	40650
300	36350
230	29450
230	34500
230	31200
300	44100
300	39300
230	36900
230	37200
300	39600
230	31500
300	44400
230	37200
230	31500
320	48250
320	43550
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
172	2000
160	27495
160	24995
160	28195
130	2000
158	2000
158	2000
130	2000
130	2000
158	2000
240	32850

Analysis: The trendline indicates a positive correlation between engine power and price, suggesting that higher horsepower generally commands a premium.

3. Car features most influential on price:

MSRP	Model	Year	Engine HP	Engine Cylinders	Number of Doors	highway MPG	city mpg
MSRP	-0.046449146	0.092066265	0.661798577	0.54393542	-0.127011212	-0.198651834	-0.225060423

Correlation between car prices (MSRP) and individual car features

city mpg: -0.225060423
highway MPG: -0.198651834
Number of Doors: -0.127011212
Engine Cylinders: 0.54393542
Engine HP: 0.661798577
Year: 0.092066265
Model: -0.046449146
(MSRP: 1)

Legend: city mpg, highway MPG, Number of Doors, Engine Cylinders, Engine HP, Year, Model
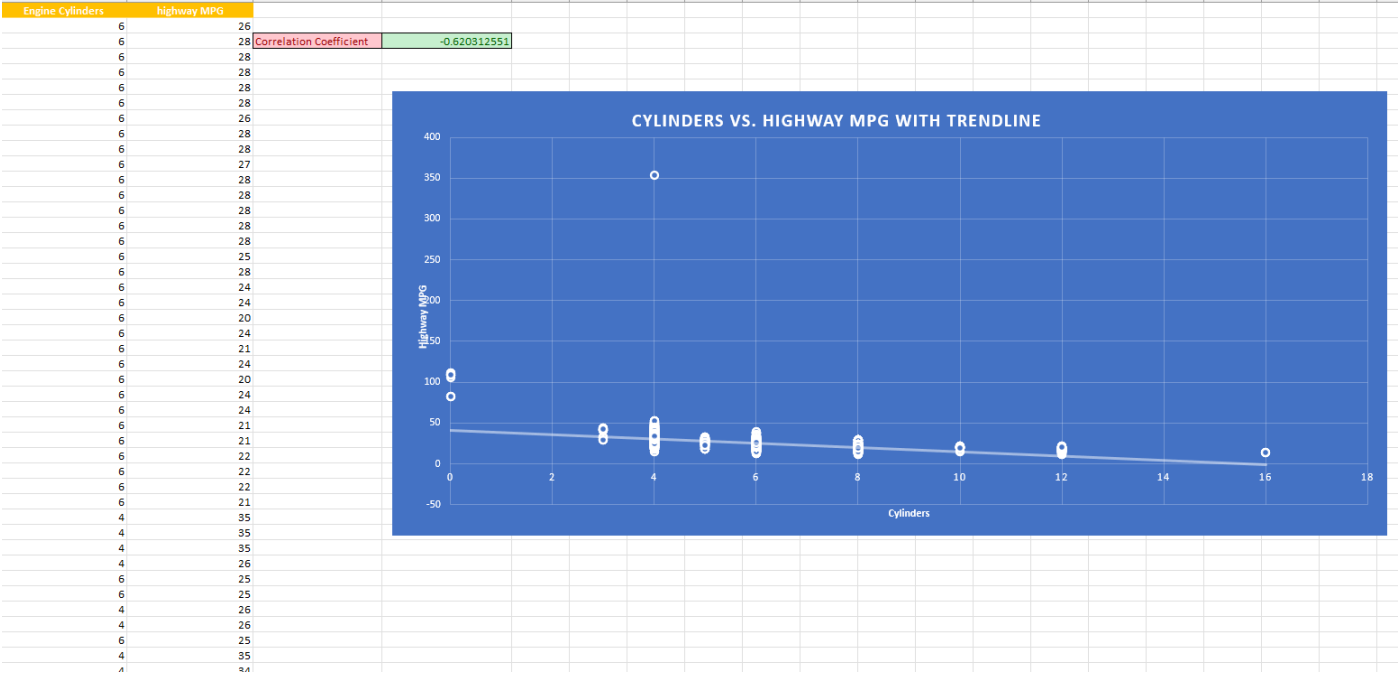
Analysis: This chart highlights which features have the strongest impact on a car's price, informing pricing strategies and product development focus.

4. Average price by manufacturer:

Row Labels	Average of MSRP
Bugatti	$17,57,223.67
Maybach	$5,46,221.88
Rolls-Royce	$3,51,130.65
Lamborghini	$3,31,567.31
Bentley	$2,47,169.32
McLaren	$2,39,805.00
Ferrari	$2,37,383.82
Spyker	$2,13,323.33
Aston Martin	$1,97,910.38
Maserati	$1,14,207.71
Porsche	$1,01,622.40
Mercedes-Benz	$71,537.81
Lotus	$69,188.28
Land Rover	$67,823.22
Alfa Romeo	$61,600.00
BMW	$61,546.76
Cadillac	$56,231.32
Audi	$53,452.11
Lexus	$47,549.07
Genesis	$46,616.67
Lincoln	$42,494.37
Infiniti	$42,394.21
HUMMER	$36,464.41
Acura	$34,887.59
GMC	$30,493.30
Toyota	$28,946.15
Volvo	$28,541.16
Nissan	$28,513.37
Chevrolet	$28,273.36
Buick	$28,206.61
Volkswagen	$28,076.20
Saab	$27,413.50
Ford	$27,393.42
Chrysler	$26,722.96
Honda	$26,629.82
Kia	$25,112.39
Subaru	$24,827.50
Hyundai	$24,597.04
Dodge	$22,390.06
FIAT	$22,206.02

Make filter list: Acura, Alfa Romeo, Aston Martin, Audi, Bentley, BMW, Bugatti, Buick, Cadillac, Chevrolet, Chrysler, Dodge, Ferrari, FIAT, Ford, Genesis, GMC, Honda, HUMMER, Hyundai, Infiniti, Kia, Lamborghini

Average of MSRP — Total

Analysis: This visualization allows for easy comparison of pricing across different manufacturers, revealing competitive positioning.

5. Fuel efficiency vs. engine cylinders:

| Engine Cylinders	highway MPG		
6	26		
6	28	Correlation Coefficient	-0.620312551
6	28		
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4	34		

CYLINDERS VS. HIGHWAY MPG WITH TRENDLINE

Analysis: The trendline and correlation coefficient quantify the relationship between engine size and fuel efficiency, informing decisions on engine configurations.

Interactive Dashboard:

I created an interactive dashboard in Excel to allow for dynamic exploration of the data. Key components include:

Fuel Efficiency by Body Style and Model Year

Car Horsepower, MPG, and Price by Brand
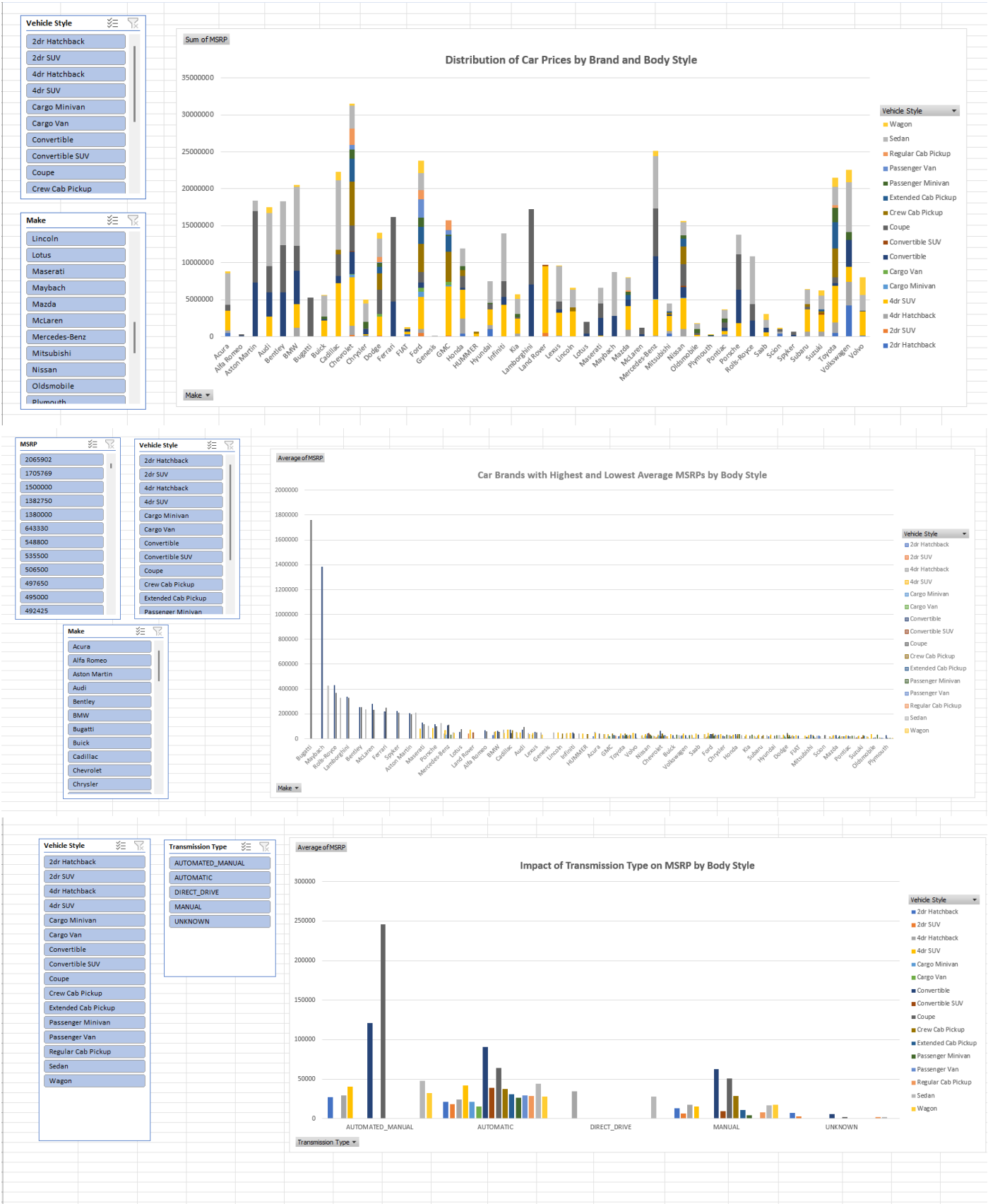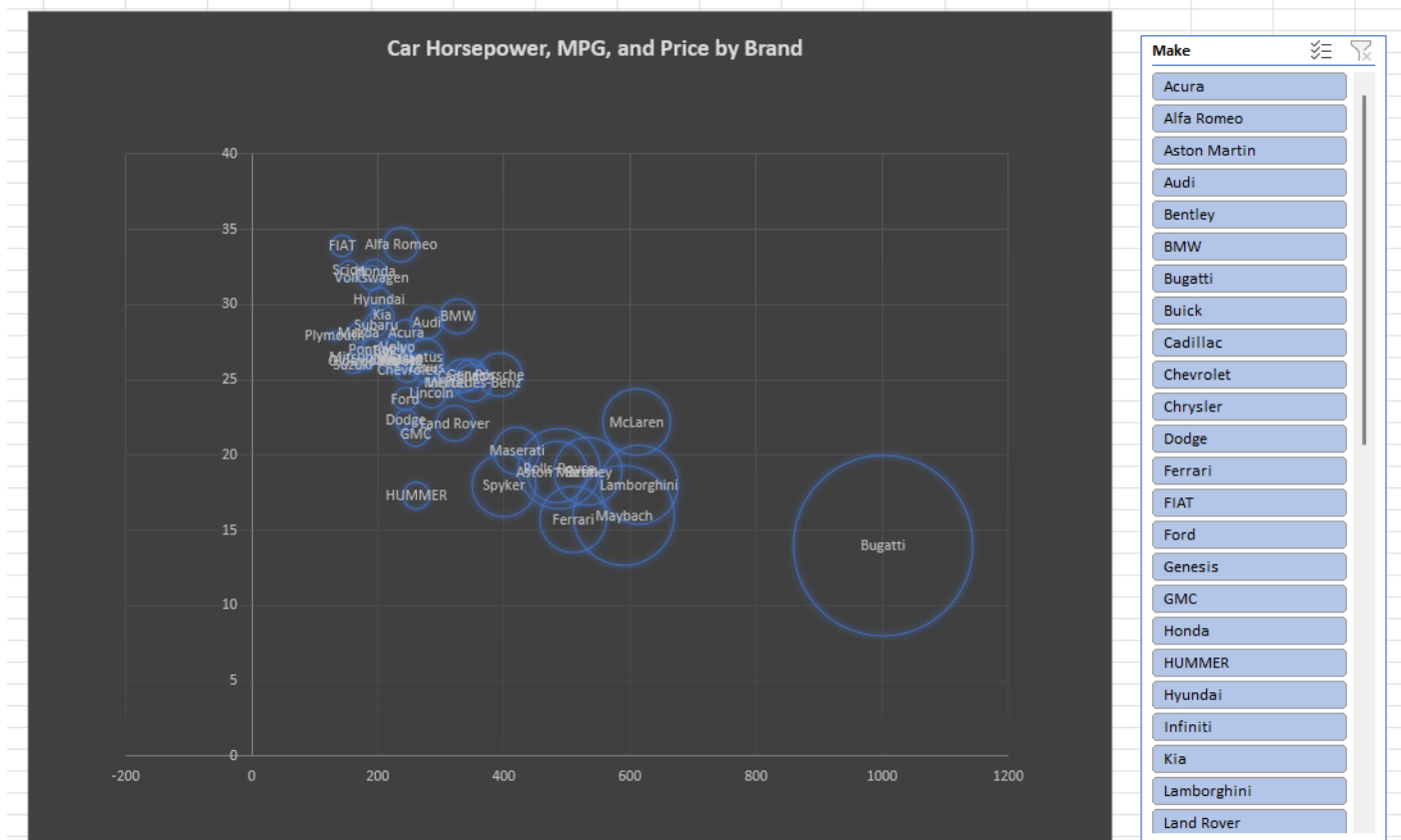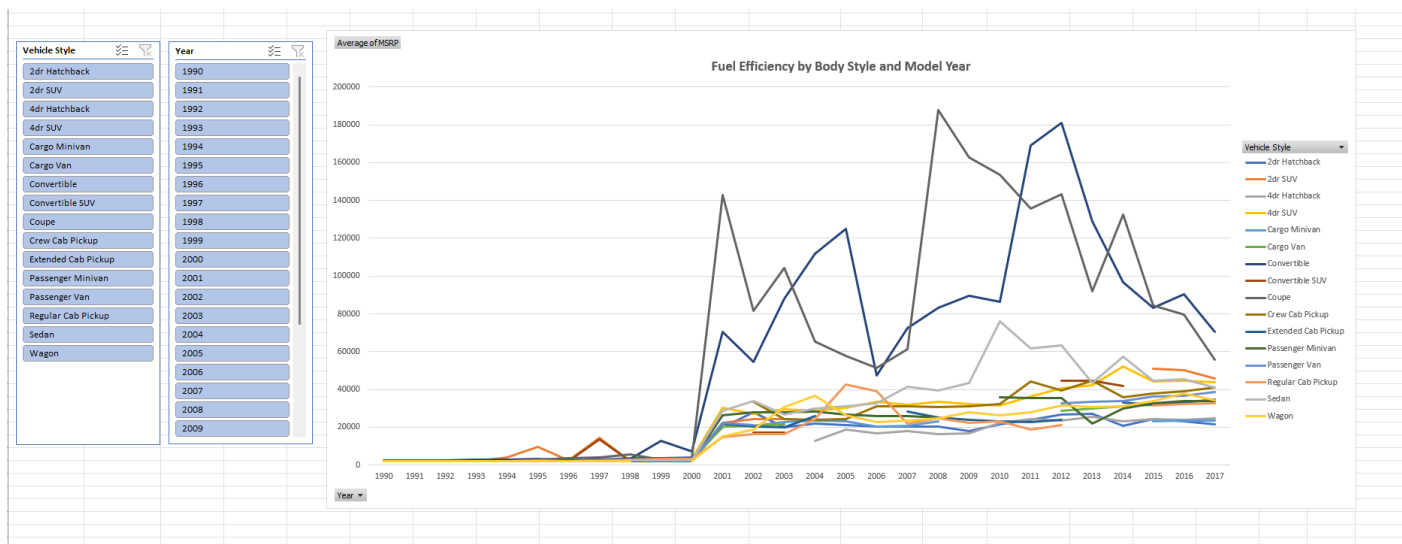
1. Price distribution by brand and body style

2. Average MSRP comparison across brands and body styles

3. Impact of transmission type on MSRP by body style

4. Fuel efficiency trends across body styles and model years

5. Relationship between horsepower, MPG, and price for different brands

This analysis provides valuable insights into the factors influencing car pricing and consumer preferences. By leveraging these findings, the manufacturer can make data-driven decisions to optimize their product lineup and pricing strategy, ultimately improving profitability and market competitiveness.

Learning Outcomes:

Through this project, I gained hands-on experience with:

- Advanced Excel techniques including pivot tables, charts, and dashboard creation

- Data cleaning and preprocessing

- Statistical analysis and interpretation

- Translating data insights into actionable business recommendations

This project has significantly enhanced my data analytics skills and ability to derive meaningful insights from complex datasets.

EXCEL SHEET LINK: Dataset solution.xlsx

GOOGLE DRIVE LINK:
https://drive.google.com/drive/folders/1I6FGrQVl4QiiwQULEp0fQFwtTAH5hPIR?usp=sharing