

Analyzing the Impact of Car Features on Price and Profitability

Project Description

In this project we analyze the relationships between car features, market categories, and pricing, manufacturers and can identify which features apply most to consumers and create strategies that balance demand with profit. This data-driven approach can enhance profitability.

In the automotive industry there are rapid changes, with increasing focus on fuel efficiency, sustainability, and technology. As competition grows and consumer preferences changes, understanding what drives car demand is essential for manufacturers. With trends toward electric and hybrid vehicles and the continued popularity of gasoline models, a key challenge is optimizing pricing and product development to maximize profitability

Approach

For this project, I apply the following approach-

1. First of all i download the dataset which is available on the trainity platform.

The variables in the dataset are:

- **Make:** the make or brand of the car
- **Model:** the specific model of the car
- **Year:** the year the car was released
- **Engine Fuel Type:** the type of fuel used by the car (gasoline, diesel, etc.)
- **Engine HP:** the horsepower of the car's engine
- **Engine Cylinders:** the number of cylinders in the car's engine
- **Transmission Type:** the type of transmission (automatic or manual)
- **Driven_Wheels:** the type of wheels driven by the car (front, rear, all)
- **Number of Doors:** the number of doors the car has

- **Market Category:** the market category the car belongs to (Luxury, Performance, etc.)
 - **Vehicle Size:** the size of the car
 - **Vehicle Style:** the style of the car (Sedan, Coupe, etc.)
 - **Highway MPG:** the estimated miles per gallon the car gets on the highway
 - **City MPG:** the estimated miles per gallon the car gets in the city
 - **Popularity:** a ranking of the popularity of the car (based on the number of times it has been viewed on Edmunds.com)
 - **MSRP:** the manufacturer's suggested retail price of the car
2. After analyzing the dataset and data cleansing activity I started working on this project using excel. I perform different analysis from task 1 to task 5 in the dataset that are mentioned in the project details like Create a pivot table that shows the number of car models in each market category and their corresponding popularity scores, 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 and so on.
 3. After completing project tasks, I created a project report using google docs, then I recorded the presentation of this project through the loom platform.

Tech stack used

Microsoft Excel : Since the project is totally based on excels and statistics, therefore I use ms excel. I use excel's different tools , different tabs, editing tools, formulas like mean, sum, max, min, coefficient correlation regression analysis and sort and filter option , table design options, pivot table, visualization tools eg. column and bar chart, pie chart, histogram, scatter plot and many more that are available on the excel. They are easy to access and use.

Loom presentation platform : Loom is a video messaging tool that allows users to record and share presentations, screen activity, edit , store and more options available in this platform.

Insights

Through this project I gained knowledge about how to apply my data analytics skills in the field of automotive industry. By analyzing the different data patterns I understood how a car's various features affect its price and profitability like its model, manufacturer, release year, fuel type, engine hp, highway mpg etc.

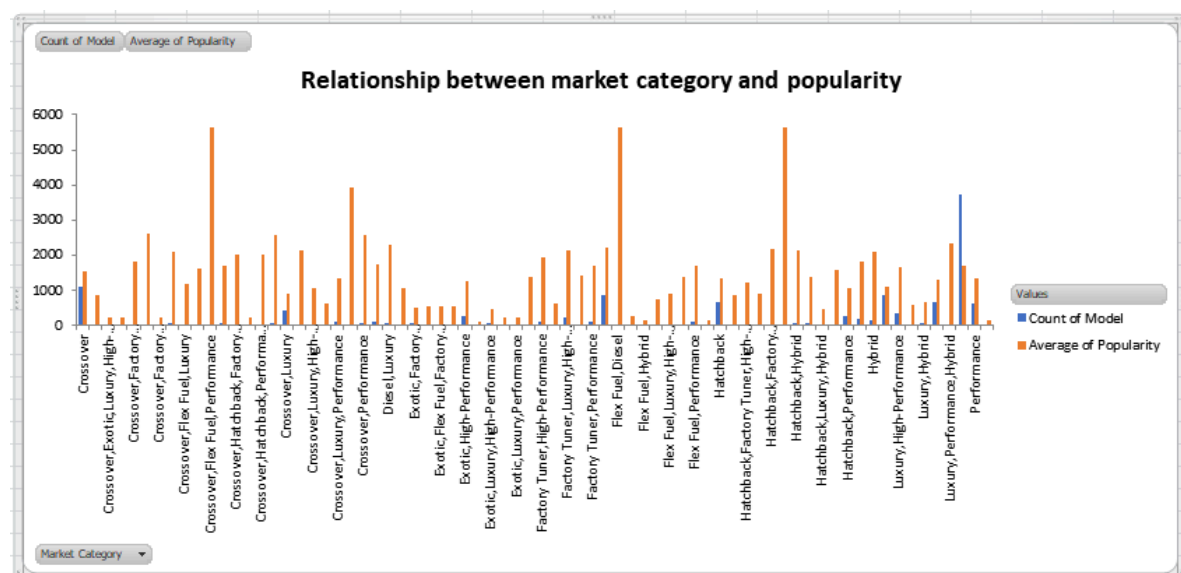
Also it expands my excel skills like how to use tables, pivot tables, sort and filtering options, conditional formatting, regression analysis, coefficient correlation, data visualization tools help me how to convert the data into column and bar chart, scatter plot, histogram, line chart, bubble chart and all other tools and techniques like to design tables, editing options and use of different tabs.

In this project the following observations and meaningful trends are covered:-

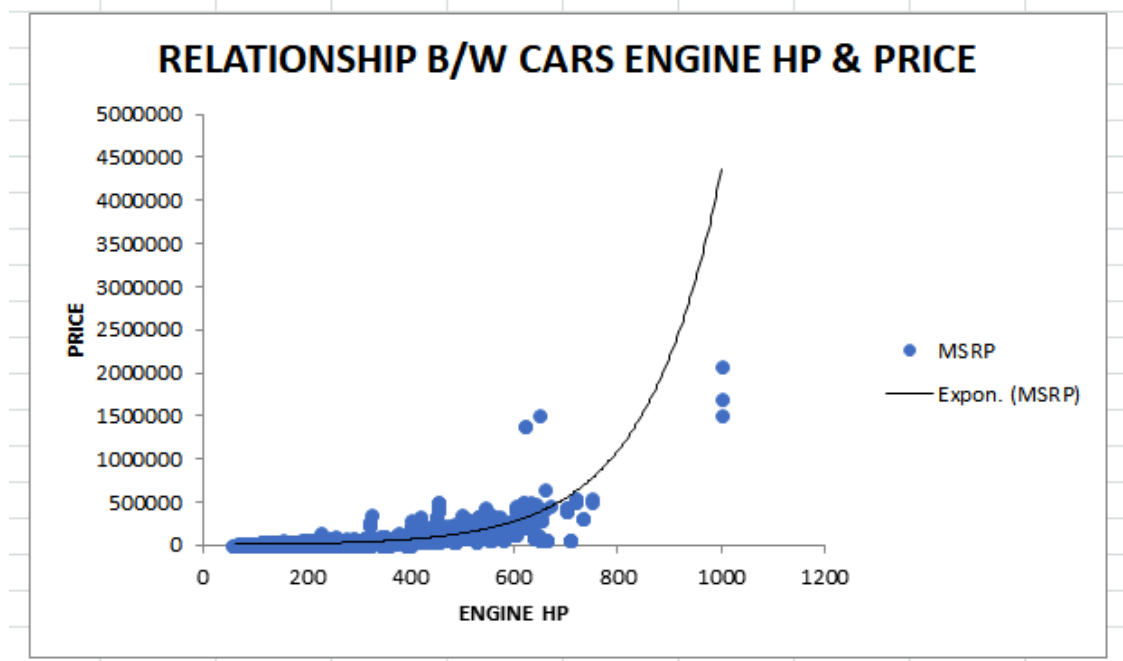
Tasks: Analysis

- **Task 1.A:** Create a pivot table that shows the number of car models in each market category and their corresponding popularity scores.
- **Task 1.B:** Create a combo chart that visualizes the relationship between market category and popularity.

market category	Count of Model	Average of Popularity
Crossover	1110	1545.26
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-Performance	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,Performance	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	34	2149.41
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-Performance	13	520.00
Exotic,Flex Fuel,Luxury,High-Performance	11	520.00

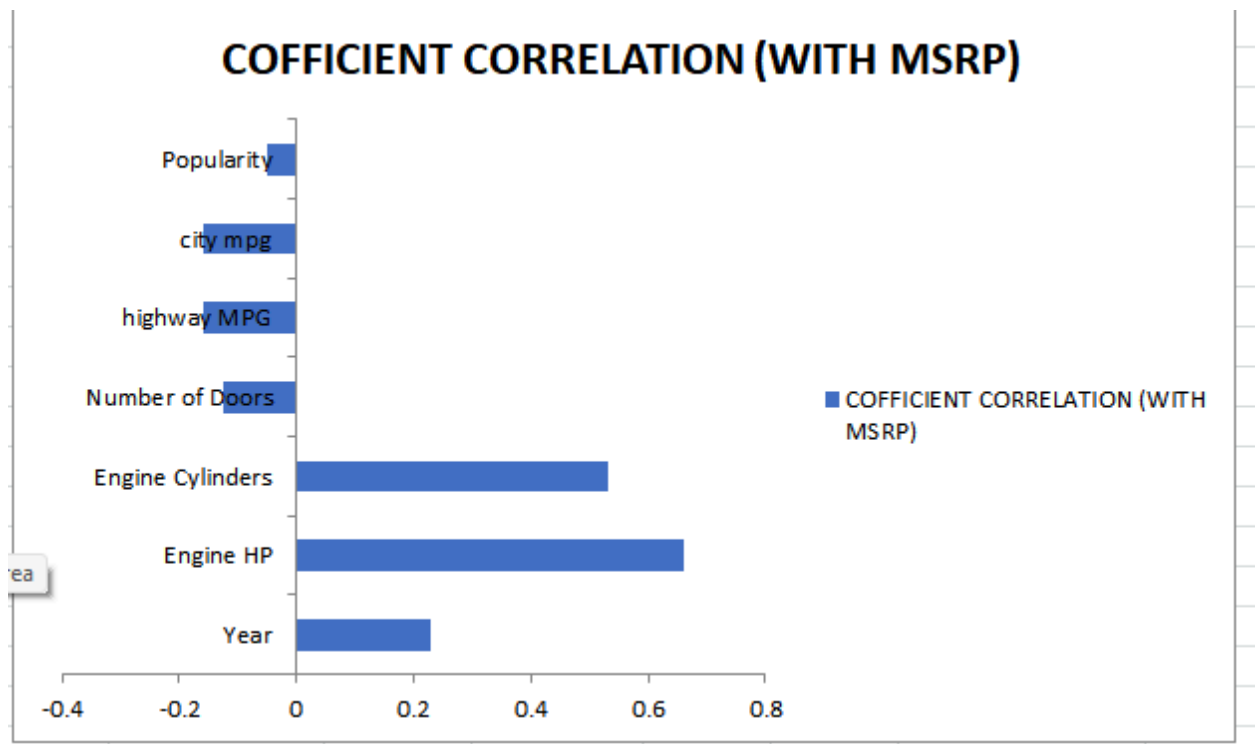


- **Task 2:** Create a scatter chart that plots engine power on the x-axis and price on the y-axis. Add a trendline to the chart to visualize the relationship between these variables.



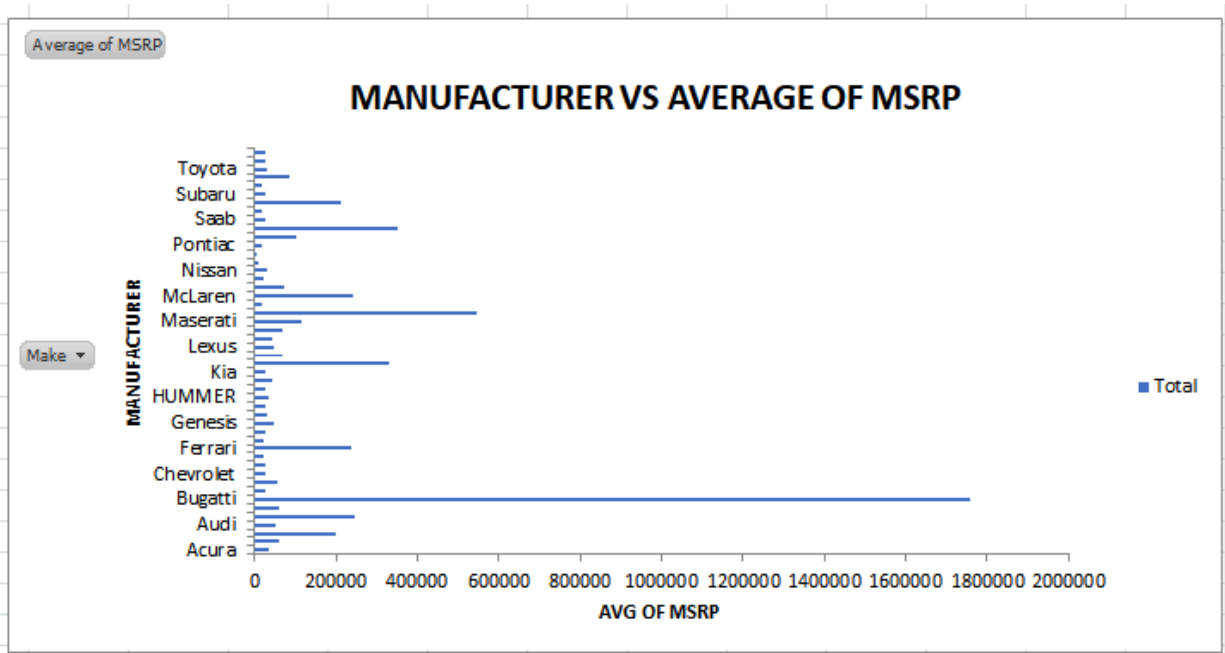
- **Task 3:** Use regression analysis to identify the variables that have the strongest relationship with a car's price. Then create a bar chart that shows the coefficient values for each variable to visualize their relative importance.

	COFFICIENT CORRELATION (WITH MSRP)
Year	0.227536164
Engine HP	0.661395911
Engine Cylinders	0.53116957
Number of Doors	-0.126031161
highway MPG	-0.16006307
city mpg	-0.157708208
Popularity	-0.048548991



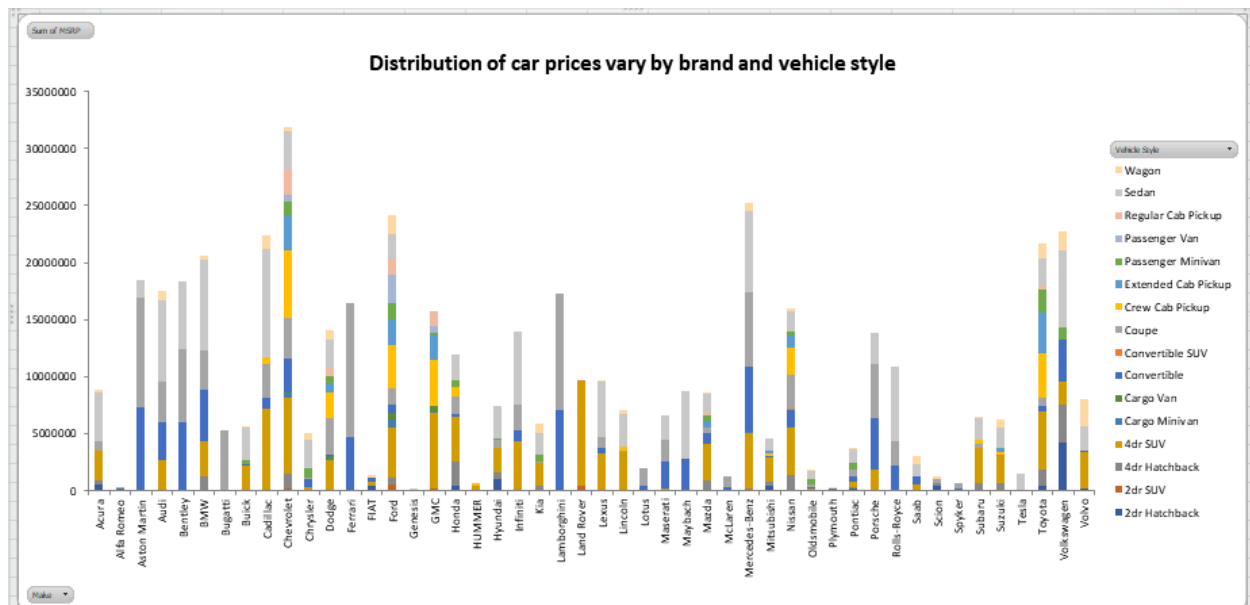
- **Task 4.A:** Create a pivot table that shows the average price of cars for each manufacturer.
- **Task 4.B:** Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.

Make	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

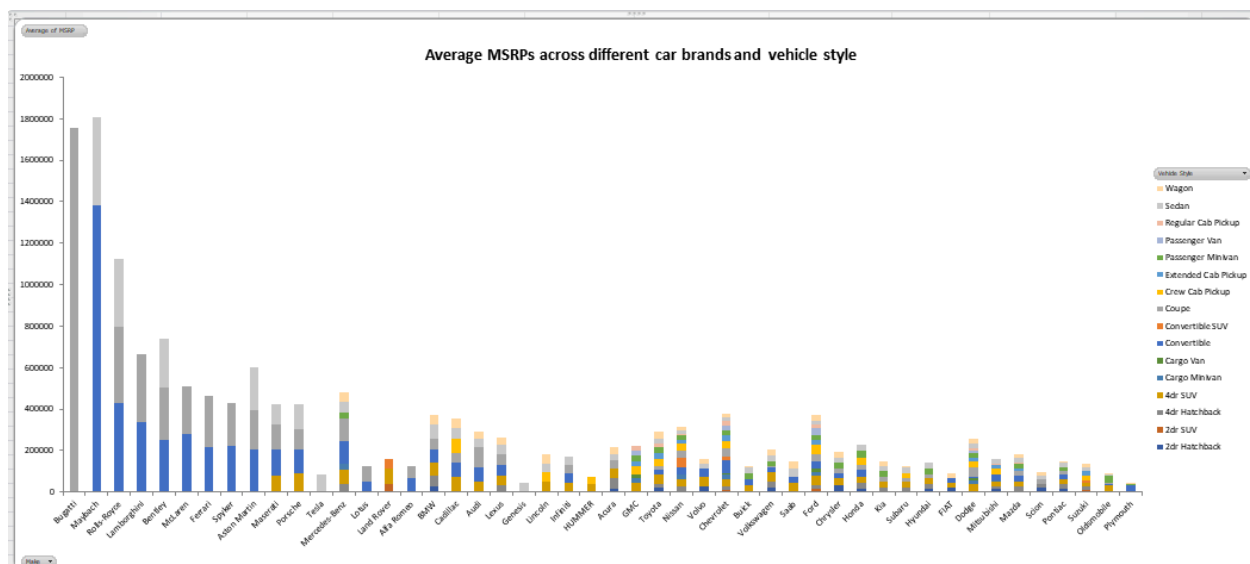


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- No of cylinder vs highway mpg**
- Scatter plot showing the relationship between the number of cylinders (X-axis) and highway miles per gallon (Y-axis). The X-axis ranges from 0 to 20, and the Y-axis ranges from -50 to 400. The data points are blue diamonds, and a black line represents the linear regression fit.
- Legend:
- ◆ highway MPG
 - Linear (highway MPG)
- Approximate data points from the plot:
- | NO OF CYLINDER | HIGHWAY MPG |
|----------------|-------------|
| 0 | 100 |
| 0 | 80 |
| 0 | 70 |
| 0 | 60 |
| 3 | 40 |
| 4 | 350 |
| 4 | 50 |
| 4 | 40 |
| 4 | 30 |
| 5 | 30 |
| 5 | 20 |
| 6 | 30 |
| 6 | 20 |
| 6 | 10 |
| 8 | 20 |
| 8 | 10 |
| 10 | 20 |
| 12 | 20 |
| 12 | 10 |
| 16 | 10 |
- Coofficient correlation between no of cylinder and highway mpg
-0.62161

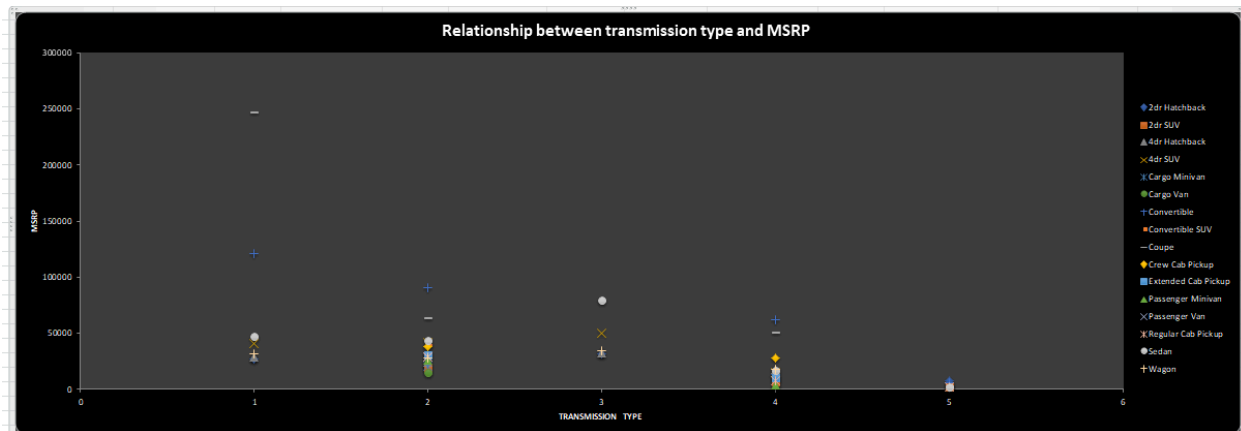
Task 1: How does the distribution of car prices vary by brand and body style?



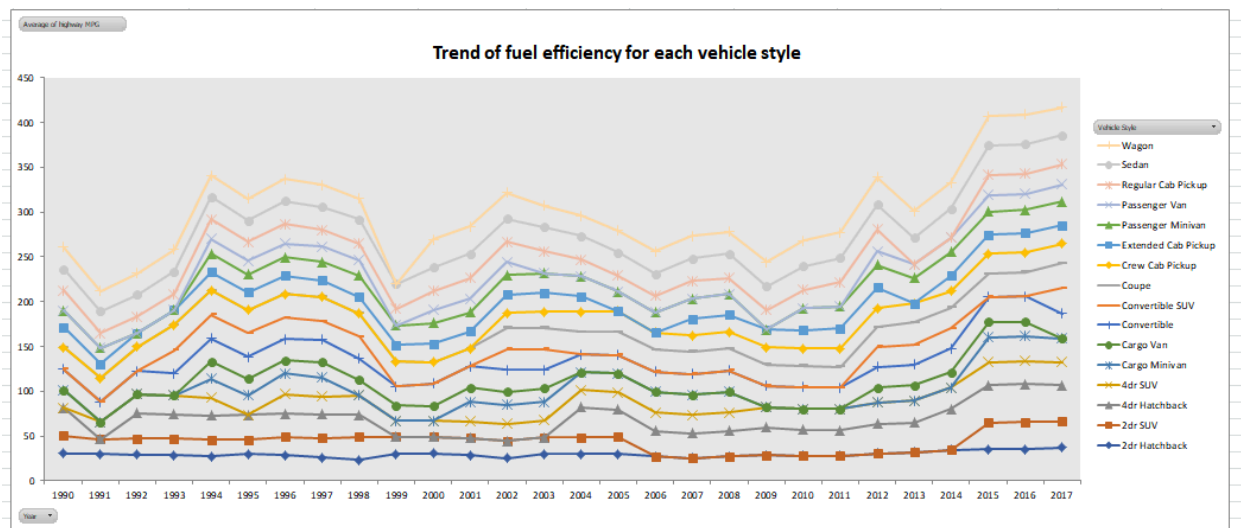
Task 2: Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?



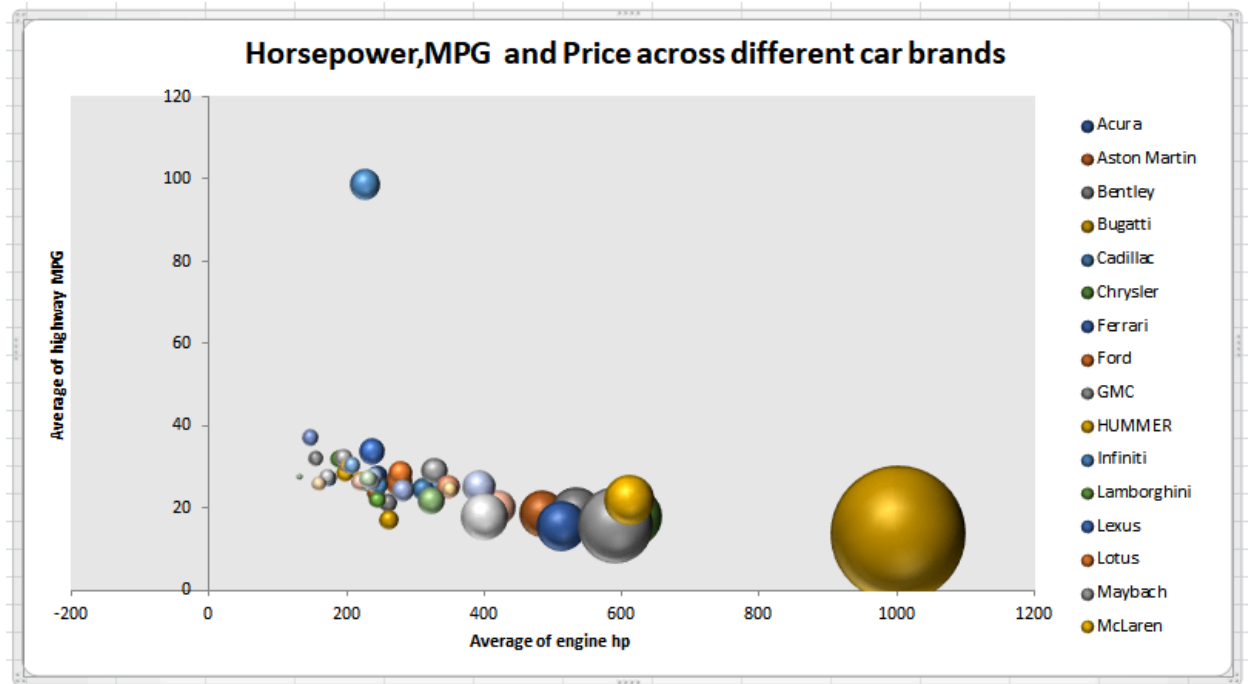
Task 3: How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?



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



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



Result:

In this project I learned that to optimize pricing and product development in the automotive industry, manufacturers should focus on understanding consumer preferences and the profitability of different vehicle features.

In other words, we can say leveraging data-driven insights into consumer demand, feature preferences, and profitability will allow car manufacturers to make strategic pricing and product development decisions. This will support long-term competitiveness and help the manufacturer for market opportunities in a rapidly changing industry.

Excel sheet link

Access the excel sheet through this link

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