IMPACT OF CAR FEATURES ON PROFITABILITY AND PRICE

Trainity Project-7

Final Project-3

PROJECT OVERVIEW

DESCRIPTION

APPROACH

TECH-STACK USED

INSIGHTS

DASHBOARD

RESULT

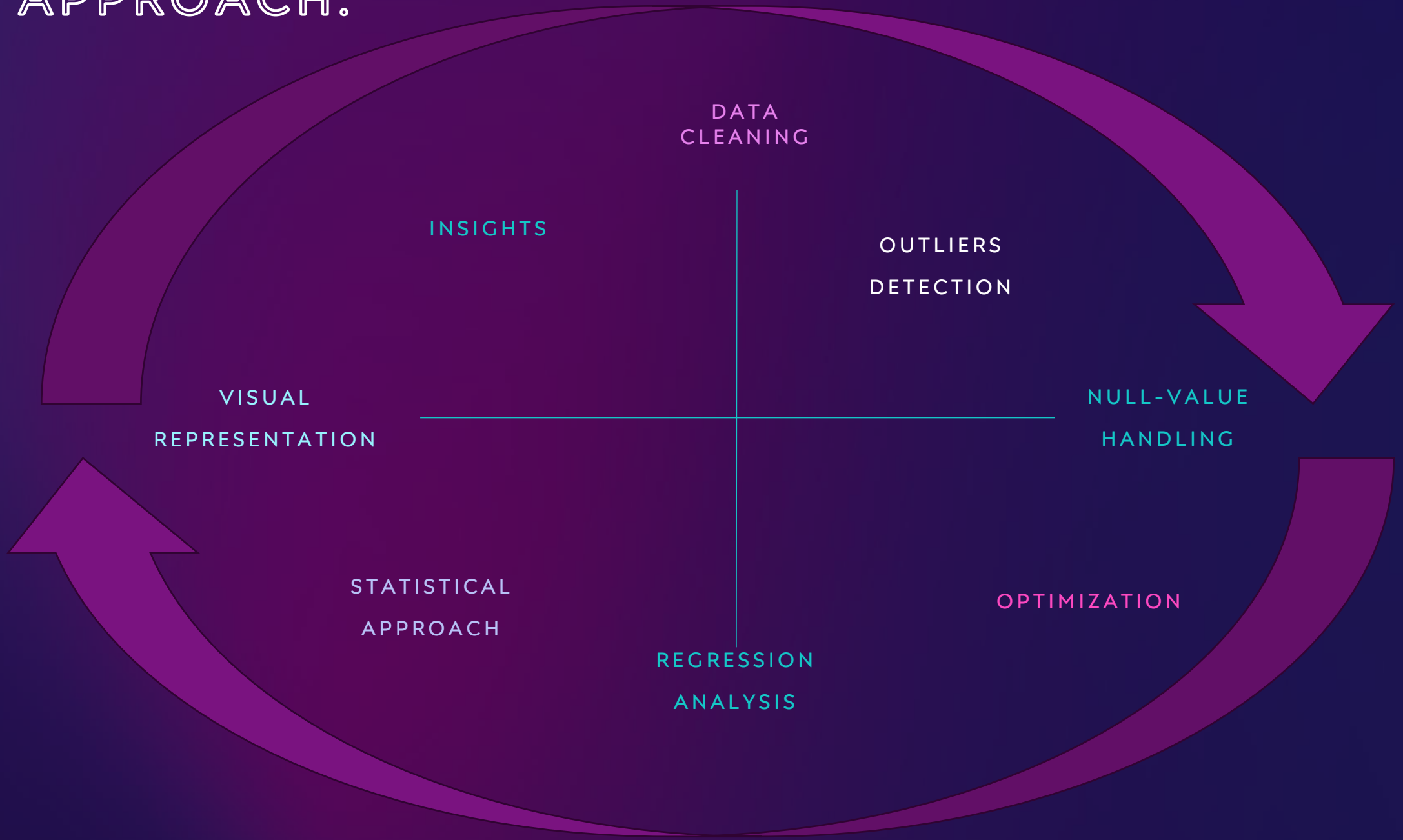
PROJECT DESCRIPTION:

The automotive industry is highly competitive and continuously evolving, driven by consumer preferences, technological advancements, and regulatory changes. Understanding the impact of various car features on price and profitability is crucial for manufacturers, marketers, and stakeholders.

Key features such as horsepower, fuel efficiency (MPG), car brand, and additional attributes like safety ratings, technological integrations, and design elements can significantly influence a car's market value and profitability.

This projects includes working as a data analyst for a company that analyses the impact of car features on profitability and price of a car. The following includes descriptive,statistical,visual analysis to uncover insights based on how car features have a direct or indirect relationships .

APPROACH:


DATA CLEANING
OUTLIERS DETECTION
NULL-VALUE HANDLING
OPTIMIZATION
REGRESSION ANALYSIS
STATISTICAL APPROACH
VISUAL REPRESENTATION
INSIGHTS

TECH-STACK USED:

1)Microsoft Excel 2016 : Microsoft Excel 2016, part of the Microsoft Office 2016 suite, is a powerful spreadsheet application widely used for data organization, analysis, and visualization. It supports large datasets and offers tools for sorting, filtering, and organizing information.

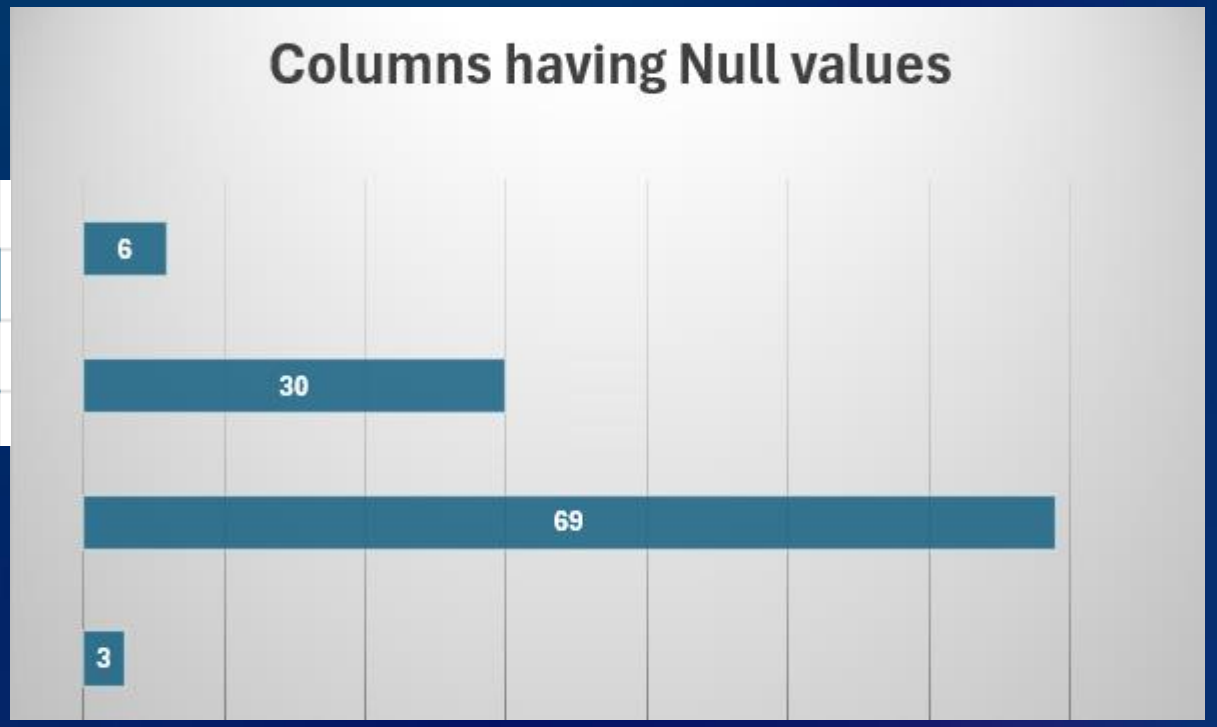
2)Microsoft Power-Point : Microsoft PowerPoint is a leading tool for creating and delivering professional presentations. I used it to make presentation of this project convenient and eye catchy with its advance functionality.

DATA CLEANING

- Before starting the analysis, we cleaned and processed the data to ensure its accuracy and reliability.
- This involved tasks like handling missing values, removing duplicates, standardizing data formats, and addressing any inconsistencies or errors in the dataset.
- On filtering the data, there were a total of 5 columns with blank values. Those values were handled using statistical methods . (Mean, Median, Mode)

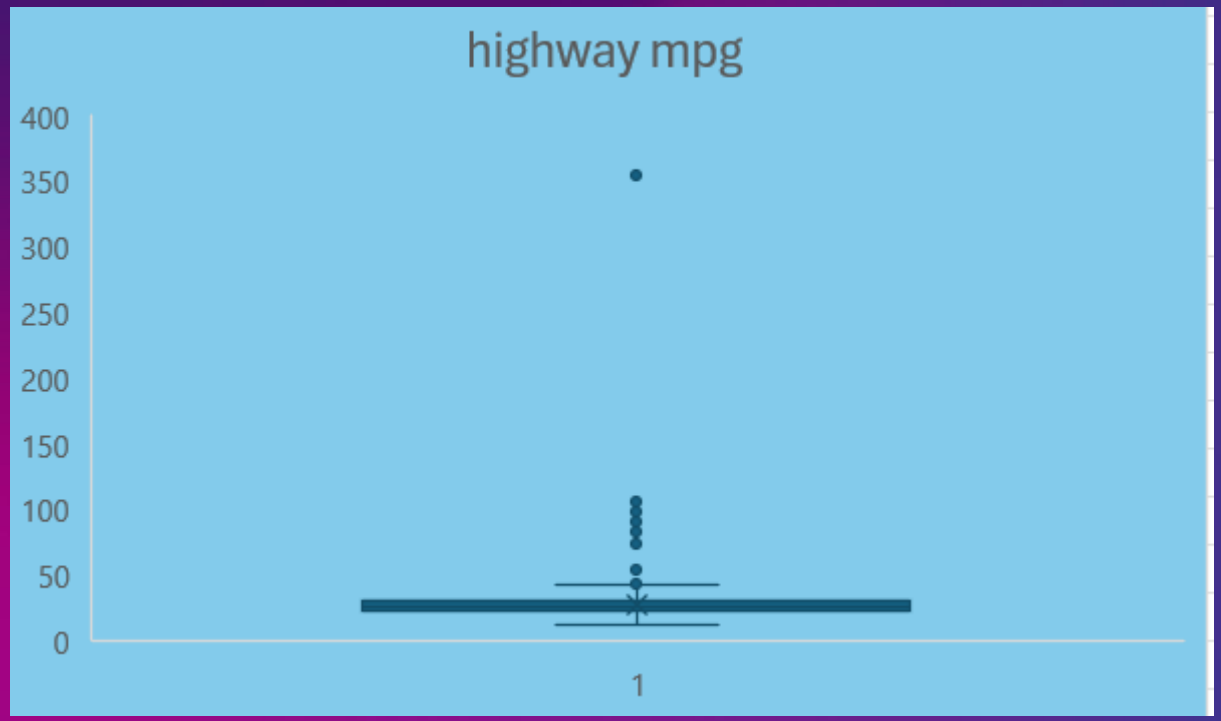
Columns having Null Values

Engine Fuel Type	Engine H	Engine Cylinders	Number of Doors
3	69	30	6

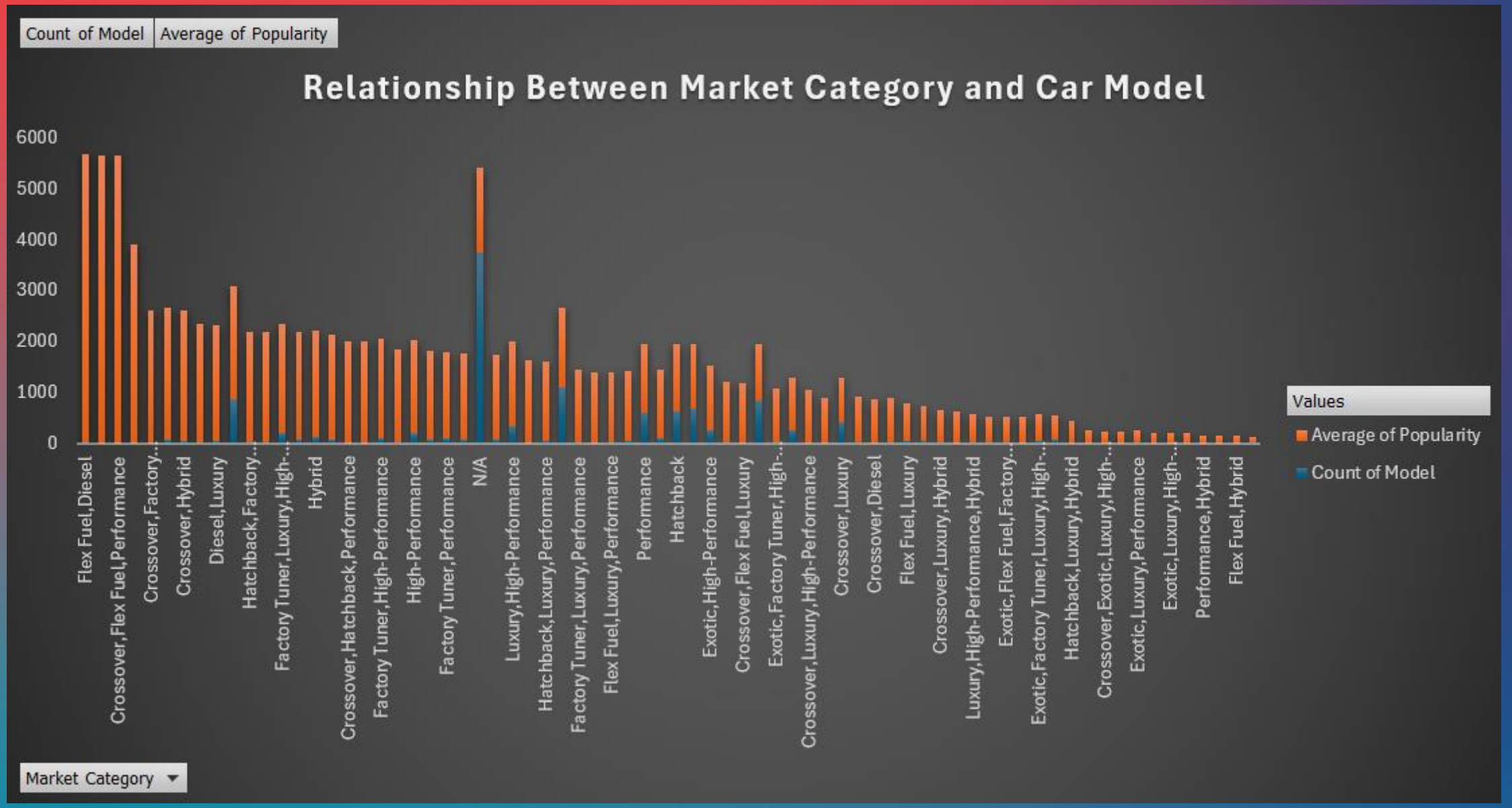


OUTLIERS DETECTION

- ✓ A total of 5 columns had outlier values as I calculated . Out of these 5 values, 4 of them were genuine data points and needed no rectification, but the column named ‘Highway MPG’ had an outlier value that could have hindered the process of analysis. Therefore, I replaced that value with the most recurring value (mode) of cars with 4 cylinders



1) POPULARITY ANALYSIS



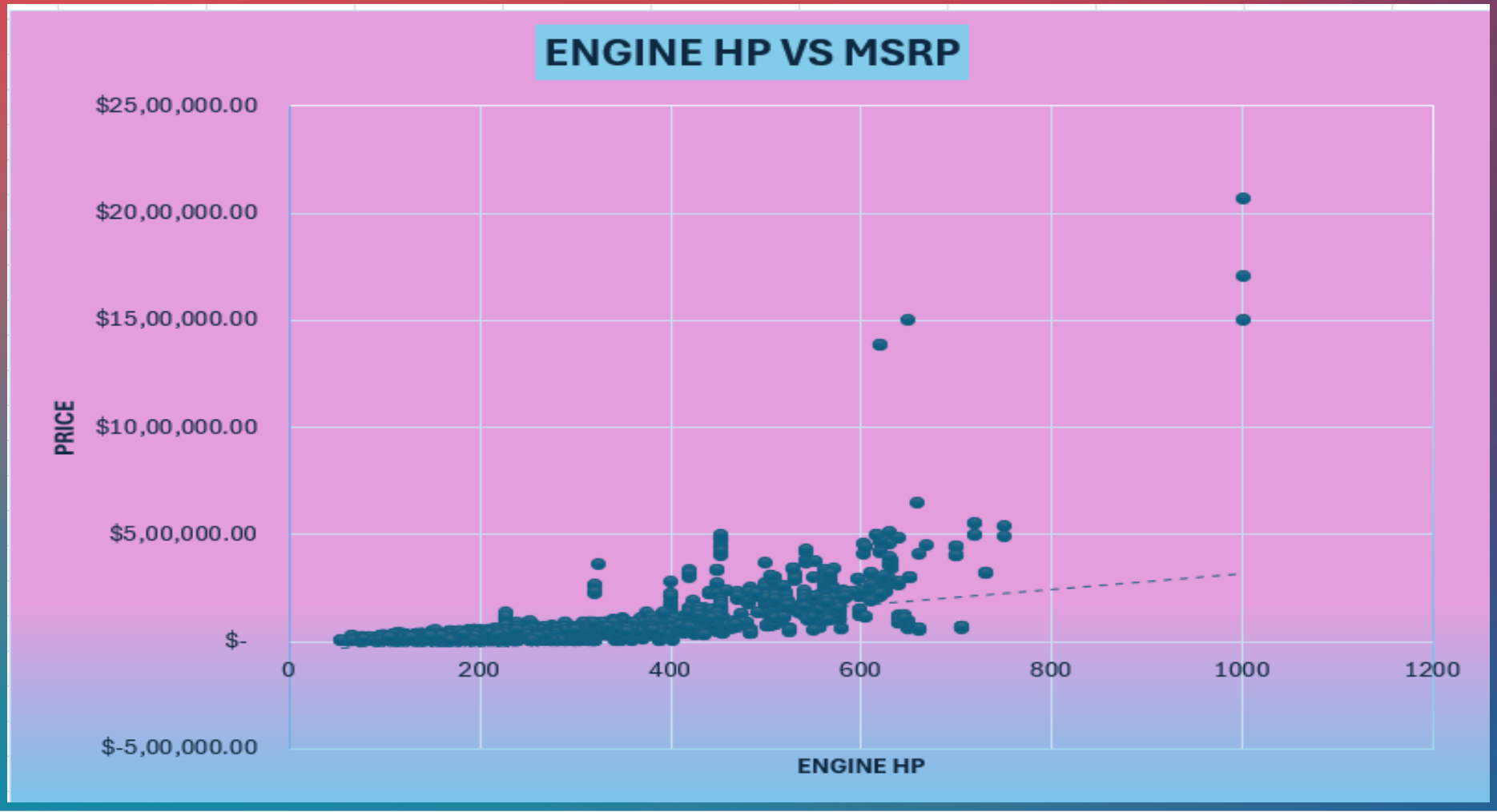
1) POPULARITY ANALYSIS

INSIGHTS:

- ‘Hatchback, Flex, fuel’, ‘Flex Fuel, Diesel’, and Crossover, Flex Fuel, Performance model are very popular but available in few models.
- Exotic, Luxury Models are the very low in popularity, it also may be due to high price and only affordable for rich people.
- Crossover, Luxury, Performance, Hybrid category have only 2 model available but it is very popular .
- ‘Crossover, Exotic, Luxury, High-Performance’, ‘Exotic, Luxury, High-Performance, Hybrid, Performance, Hybrid’, ‘Flex Fuel, Factory Tuner, Luxury, High-Performance’,’ Crossover, Exotic, Luxury, Performance’ category belong to luxury models and have single model available in Market

2) ENGINE POWER VS PRICE ANALYSIS

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.



2) INSIGHTS:

- ✓ In the scatter plot graph trendline moving upward and it is showing the positive relationship between price and engine power, it means as the engine power increasing price is also increasing

3) MOST IMPACTFUL CAR FEATURE

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.

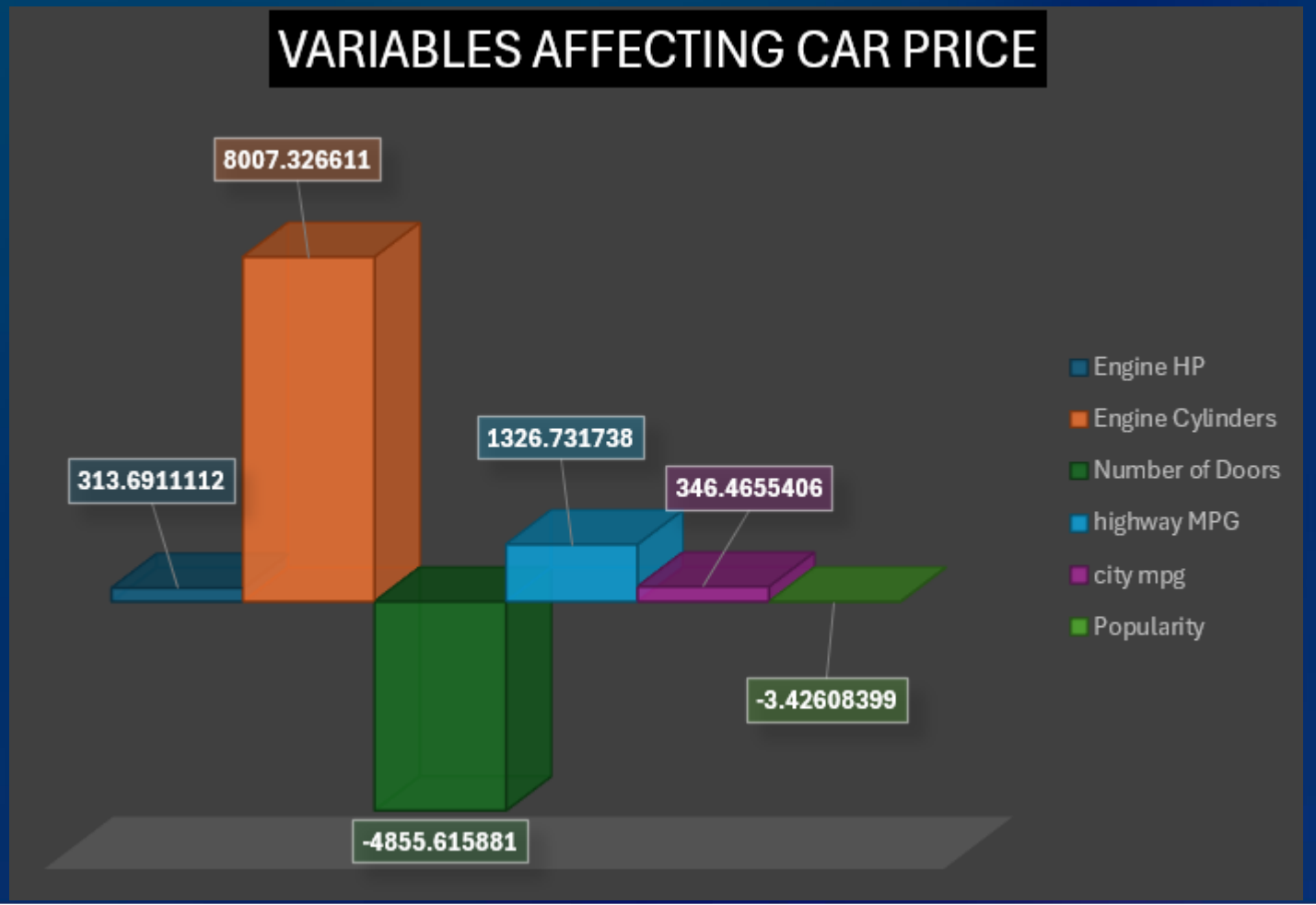
Regression Statistics	
Multiple R	0.683633
R Square	0.467354
Adjusted R	0.467066
Standard E	45050.16
Observatic	11122

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	-102632	4247.791679	-24.1613	9.6E-126	-110958.755	-94305.9	-110959	-94305.9
Engine HP	313.6911	6.417472726	48.88079	0	301.111726	326.2705	301.1117	326.2705
Engine Cyli	8007.327	474.9070156	16.86083	5.28E-63	7076.424594	8938.229	7076.425	8938.229
Number of	-4855.62	495.9000533	-9.79152	1.51E-22	-5827.667976	-3883.56	-5827.67	-3883.56
highway MI	1326.732	172.5238255	7.690136	1.59E-14	988.5544276	1664.909	988.5544	1664.909
city mpg	346.4655	158.9342156	2.17993	0.029284	34.92627724	658.0048	34.92628	658.0048
Popularity	-3.42608	0.296678217	-11.5481	1.13E-30	-4.007625936	-2.84454	-4.00763	-2.84454

ANOVA

	df	SS	MS	F	Significance F
Regressior	6	1.97929E+13	3.3E+12	1625.419	0
Residual	11115	2.25581E+13	2.03E+09		
Total	11121	4.2351E+13			

❖ Visual Representation



3) INSIGHTS:

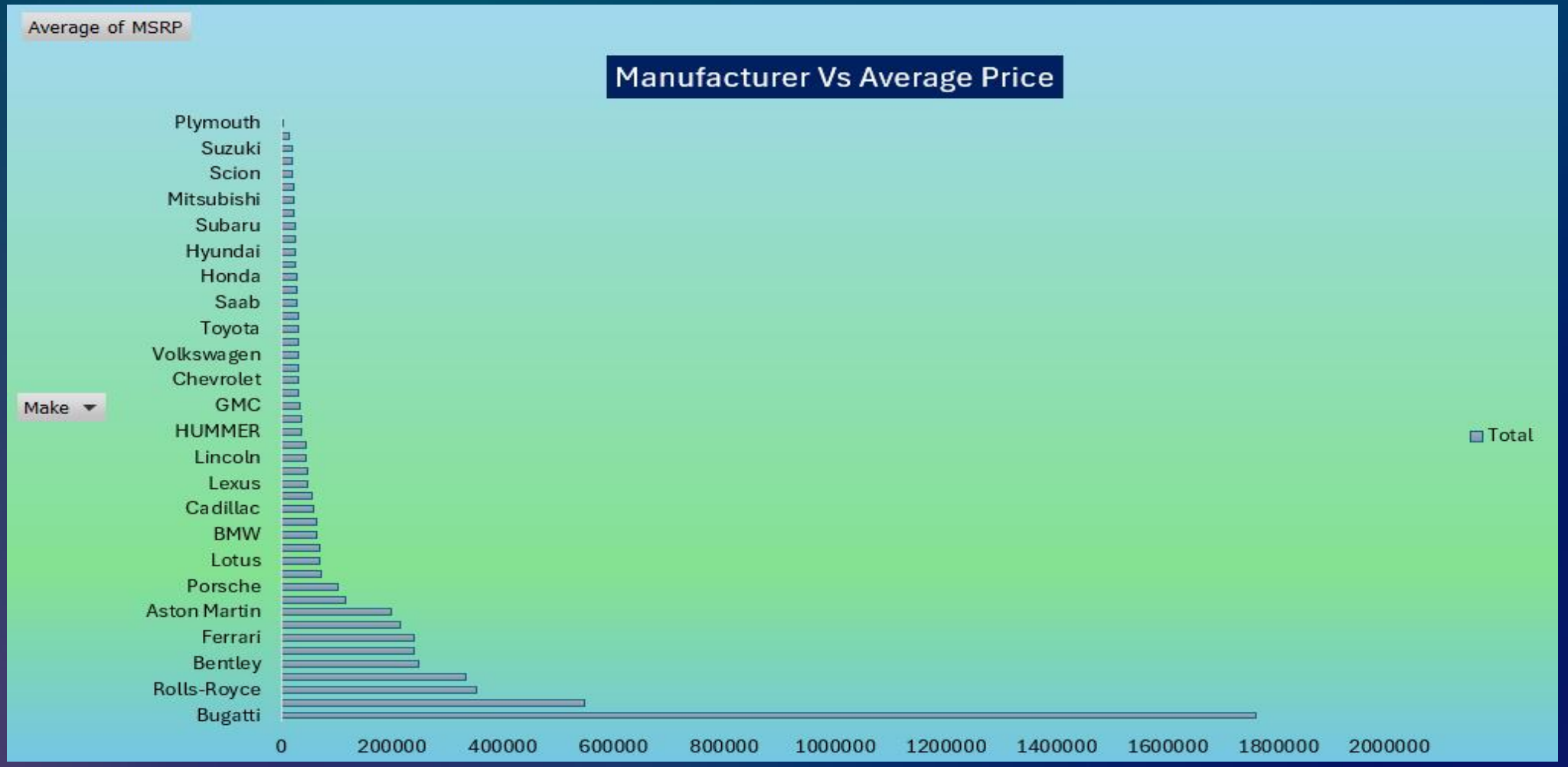
❖ On the basis of regression analysis, we can see that Engine HP, Engine Cylinders, Highway MPG, City MPS having the positive and significant relationship with car price.

❖ In the graph Engine cylinder having the most positive relation whereas Number of Doors having the most negative relation with Car Price, it means number of doors increasing then car price decreasing.

4)BRAND VS AVERAGE PRICE ANALYSIS

Task 4) A: Create a pivot table that shows the average price of cars for each manufacturer.

B: Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.



manufactur	Average of MSRP
Bugatti	1757223.667
Maybach	546221.875
Rolls-Royce	351130.6452
Lamborghini	331567.3077
Bentley	247169.3243
McLaren	239805
Ferrari	238218.8406
Spyker	214990
Aston Martin	198123.4615
Maserati	113684.4909
Porsche	101622.3971
Mercedes-Benz	72069.52786
Lotus	68377.14286
Land Rover	68067.08633
BMW	62162.55864
Alfa Romeo	61600
Cadillac	56368.26515
Audi	54583.41563
Lexus	47549.06931
Genesis	46616.66667
Lincoln	43966.55128
Infiniti	42640.27134
HUMMER	36464.41176
Acura	35087.4878
GMC	32444.08506
Volvo	29724.68421
Chevrolet	29056.0111
Buick	29034.18947
Volkswagen	28978.52289
Nissan	28856.42329
Toyota	28788.11297
Ford	28522.49573
Saab	27879.80734
Chrysler	26722.96257
Honda	26608.88399
Kia	25318.75
Hyundai	24926.26255
Dodge	24857.04537
Subaru	24240.67364
FIAT	22206.01695
Mitsubishi	21332.57005
Mazda	20106.55612
Scion	19932.5
Pontiac	19800.0442
Suzuki	18021.0531
Oldsmobile	12843.79545
Plymouth	3296.873239

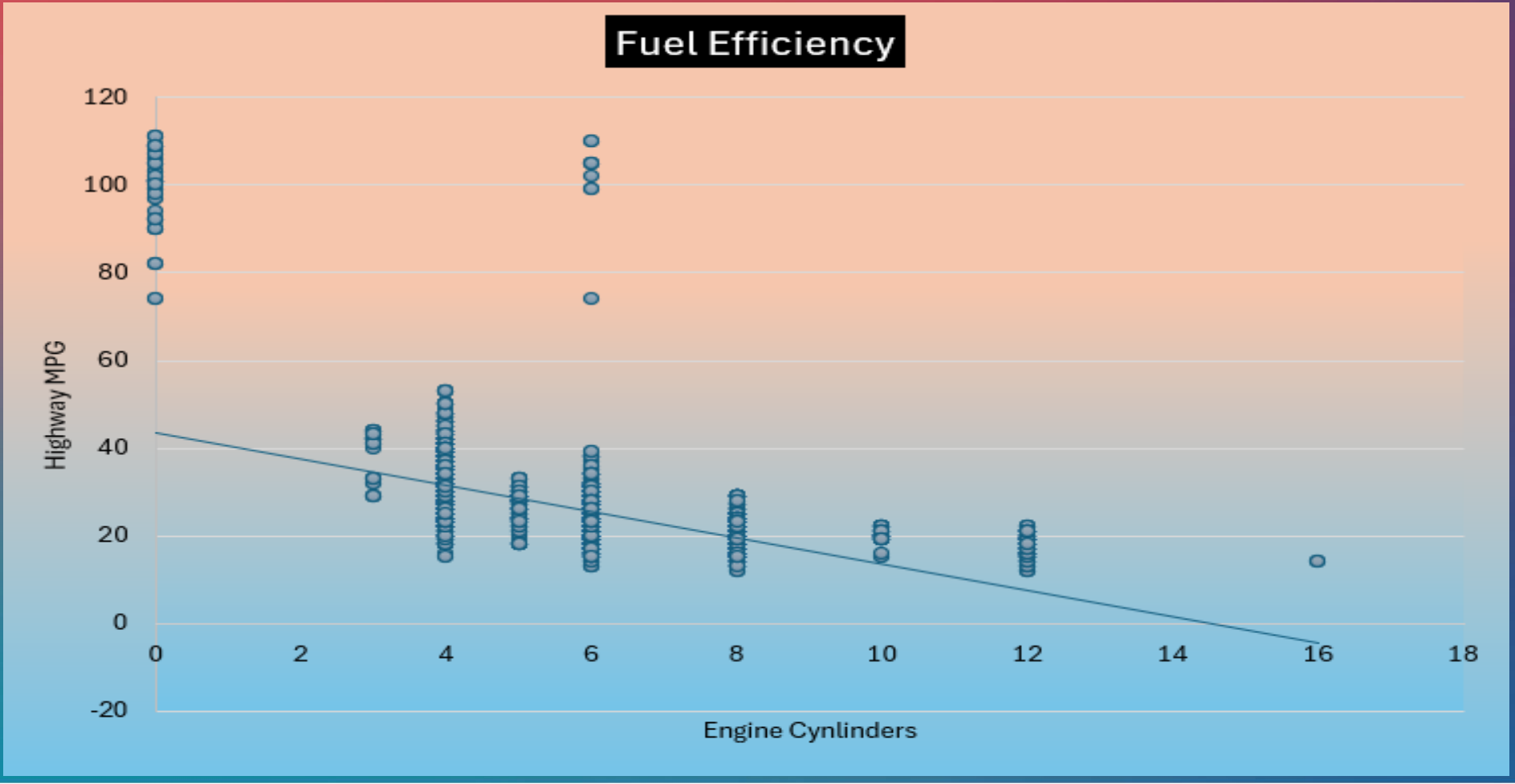
4) INSIGHTS

- ✓ This analysis shows the average price difference of each car, some company like Bugatti having the very high price followed by Maybach, Rolls-Royce and Lamborghini, some company manufacture the less price car like Plymouth, Oldsmobile, Suzuki.

5) FUEL EFFICIENCY VS NUMBER OF CYLINDER

Task 5) A: Create a scatter plot with the number of cylinders on the x-axis and highway MPG on the y-axis. Then create a trendline on the scatter plot to visually estimate the slope of the relationship and assess its significance.
B: Calculate the correlation coefficient between the number of cylinders and highway MPG to quantify the strength and direction of the relationship.

Correlation Coeifficient
-0.63562



5) INSIGHTS:

- ✓ The correlation between Engine cylinder and Highway mpg is ‘-0.635’ which is negative, because of that its clearly showing that as the number of cylinders increase in car the Highway milage will decrease and in the graph the trendline going downwards which is showing negative slope result is declining of Highway milage as per engine cylinder increase. which is not as profitable to the company. Therefore, the company must keep this point in mind before starting the bulk manufacture of any car.

DASHBOARD

Dashboard description: The upcoming dashboard is interactive with the user and the values can be manipulated using the slicers provided next to each graph.

- The dashboard showcases and solves the following problems:

Q1. How does the distribution of car prices vary by brand and body style?

Q2. Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?

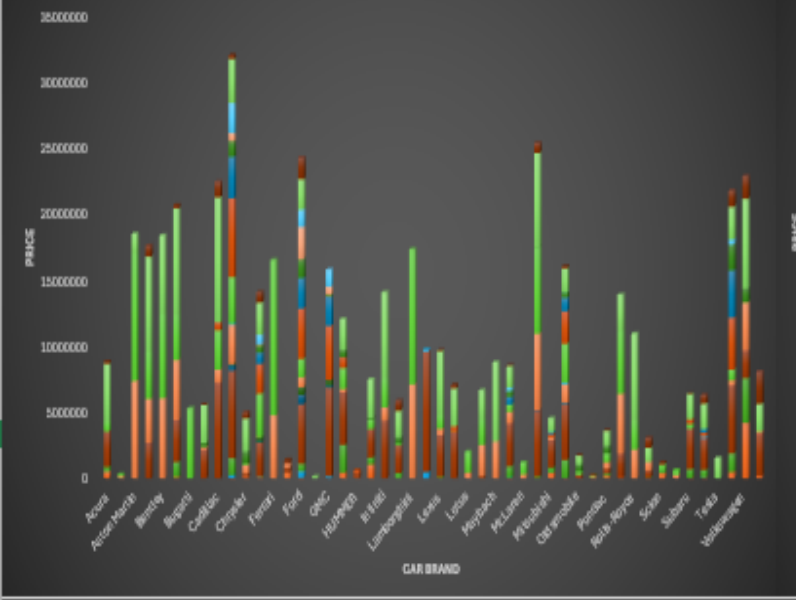
Q3. How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?

Q4. How does the fuel efficiency of cars vary across different body styles and model years?

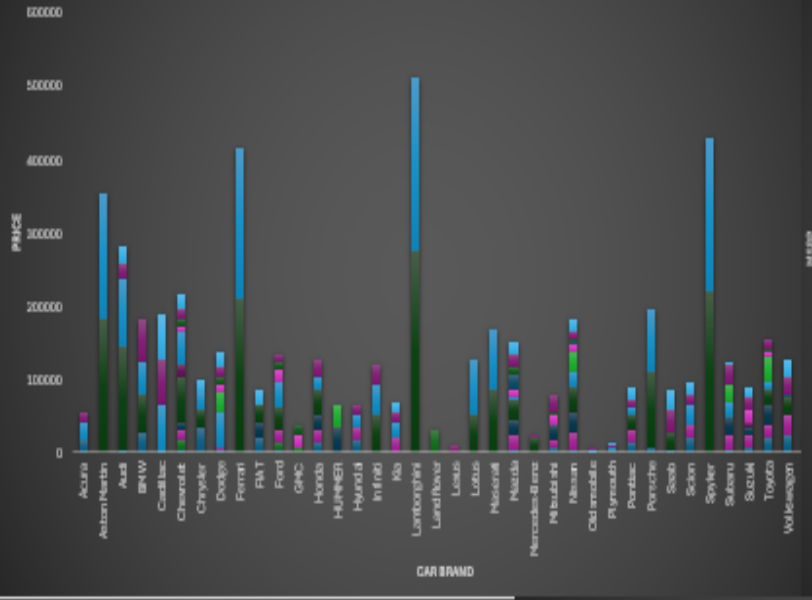
Q5. How does the car's horsepower, MPG, and price vary across different Brands?

Dashboard : Impact of Car Features On Its Profitability and Price

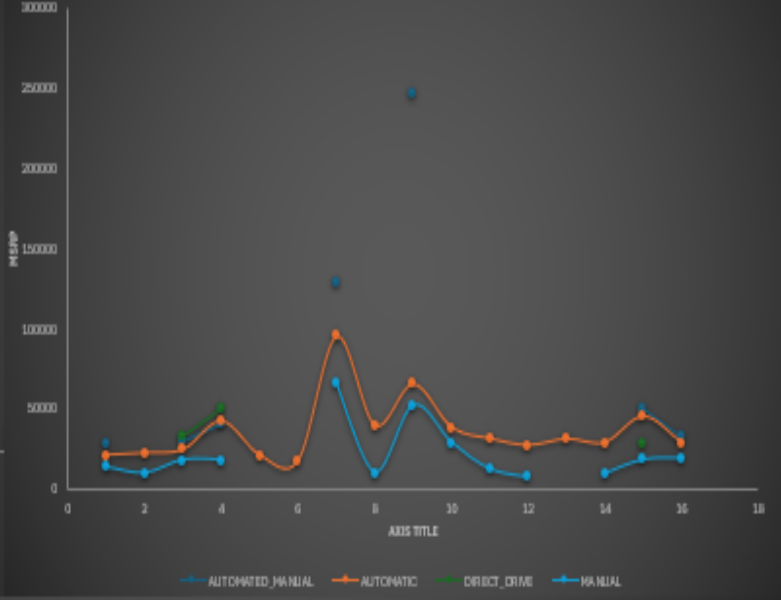
Distribution of Car Pricing



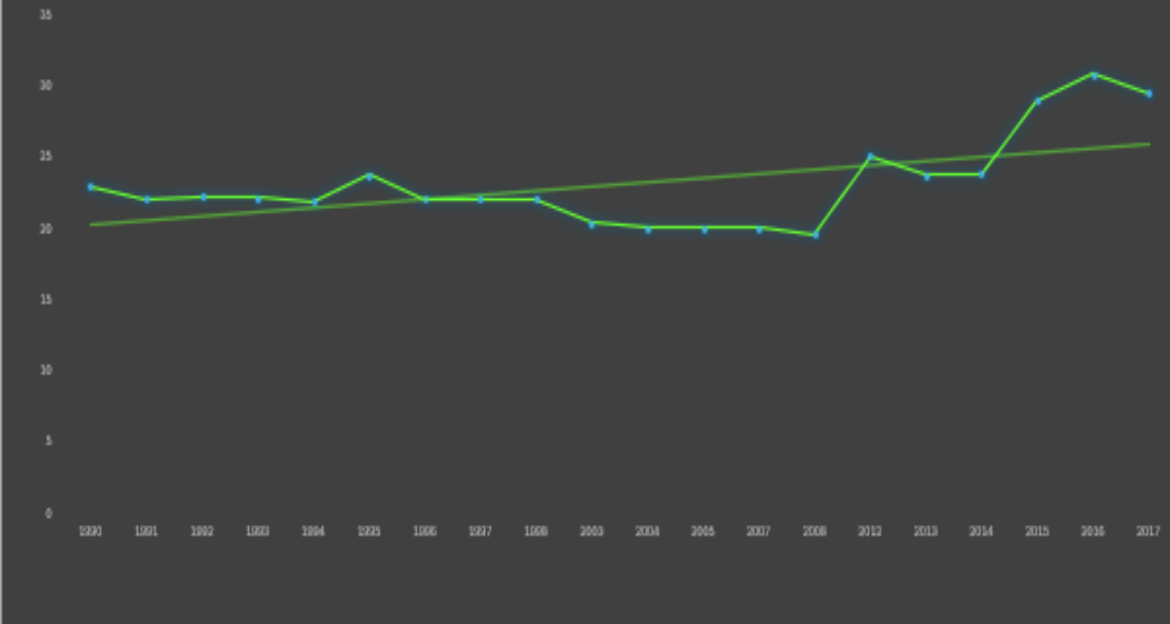
Average Price of Car by its Brand & Body Style



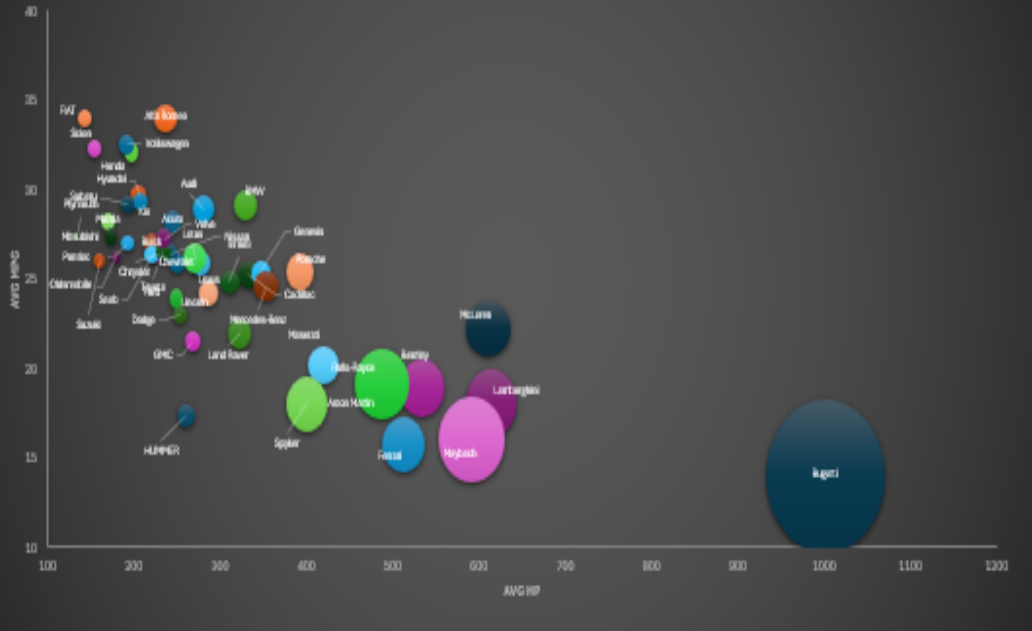
Relation between MSRP and Transmission Type



Fuel efficiency over the years



Relationship between HP, MPG and Price



Make

- Acura
- Alfa Romeo
- Aston Martin
- Audi
- Bentley
- BMW
- Bugatti
- Buick

Model

- 1 Series
- 1 Series M
- 100
- 124 Spider
- 190-Class
- 2
- 2 Series
- 200

Transmission Ty...

- AUTOMATED_MA...
- AUTOMATIC
- DIRECT_DRIVE
- MANUAL
- UNKNOWN
- (blank)

Year

- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997

DASHBOARD INSIGHTS

- ✓ Task 1) I have calculated the total MSRP as per body type and brand name. The brand Chevrolet have the maximum number of cars available in different body style then Mercedes-Benz cars having the maximum variant in body style. Bugatti having the single variant of body style.

- ✓ Task 2) Bugatti brand have the highest average price in Coupe style among all the brands followed by Maybach in Convertible body style. Plymouth brand having the lowest average price compared to all other brands.

- ✓ Task 3) The automated manual transmission having the highest average MSRP and have coupe, and convertible body style. Manual transmission has the lowest average MSRP and it is of body type Passenger minivan. From the graph we can see that the automatic transmission types having the higher average MSRP compered to the manual transmission. Automated manual transmission only available in the luxury brands like Bugatti, Maybach, Lamborghini, Ferrari, Bentley and also average MSRP is very high.

- ✓ Task 4) Passenger Van style are the highest fuel consumption style among all the body style and have no improvement during time. Fuel efficiency have significantly improved in 4dr hatchback during time and have very good milage.

- ✓ Task 5) Horsepower and price indicate that higher horsepower cars tend to be more expensive. Correlation between MPG and price suggests that more fuel-efficient cars might be less expensive within some brands. We can see that the brand BMW have the highest engine power but milage is very low.

RESULT

The analysis provided valuable insights into how car features impact price and profitability. By leveraging these insights, automotive companies can make informed decisions to optimize their product offerings, pricing strategies, and marketing efforts to enhance profitability.

I Delved deep into statistics of car manufacturing and its profit and loss parameters and understood the key points that help in car to flourish in the market.

Overall, this project makes me learnt the various data analysis in excel, like regression analysis, creating the bubble charts, scatter charts, calculating the average, sum by using the pivot table etc. This project enabled my EDA skill to next level, also enhanced my knowledge to extract the meaningful insights from the data to take the progressive decision and contribute in a meaningful outcomes.

Link to Excel Sheet

THANK YOU !

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