PROJECT 7

ANALYZING THE IMPACT OF CAR FEATURES ON PRICE AND PROFITABILITY

PROJECT DESCRIPTION:

This project aims to analyze key factors influencing car prices and profitability by examining the relationship between vehicle features, market categories, and pricing trends. Using a given dataset, we will identify the most in-demand and high-margin features by leveraging **data analysis techniques such as regression analysis, market segmentation, and clustering.**

APPROACH:

To optimize car pricing and product development, we will analyze key factors influencing consumer demand and profitability. This includes assessing car popularity by market category, engine power vs. price, and features impacting pricing using regression analysis. We'll also compare average prices across manufacturers and examine the relationship between fuel efficiency and engine cylinders through scatter plots and correlation analysis. By leveraging pivot tables, charts, and statistical techniques, we aim to provide data-driven insights to enhance pricing strategies and maximize profitability.

TECH STACK USED:

For this project, I used Microsoft Excel 2010 as the primary tool to analyze and visualize hiring process data. Excel 2010 provides powerful features that help in performing various calculations, organizing data efficiently, and generating meaningful insights through charts and graphs.

DATA ANALYTICS TASKS:

Task 1.A: Create a pivot table that shows the number of car models in each market category and their corresponding popularity scores.

MARKET CATEGORY	Count of Model	Average of Popularity
Crossover	1068	1539.475655
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	406	889.2142857
Crossover,Luxury,Diesel	33	2195.848485
Crossover,Luxury,High-Performance	9	1037.222222
Crossover,Luxury,Hybrid	24	630.9166667
Crossover,Luxury,Performance	112	1349.089286
Crossover,Luxury,Performance,Hybrid	2	3916
Crossover,Performance	69	2585.956522
Diesel	84	1730.904762
Diesel,Luxury	47	2416.106383
Exotic,Factory Tuner,High-Performance	21	1046.380952

◄ ► ►| Car_data **q1** q2 q3 q4 q5 d1 d2 d 3.1 d3.2 d4 d5 Sheet16

Task 1.B: Create a combo chart that visualizes the relationship between market category and popularity.
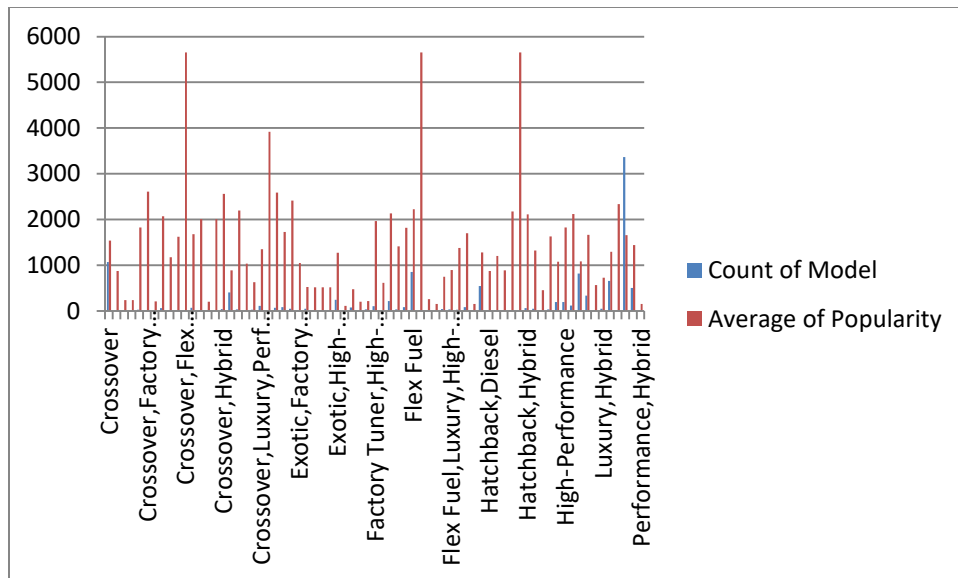
Conclusion:

The chart highlights varying car model popularity across market categories, revealing that some segments, like Crossover and Flex Fuel, have high popularity and model counts, while others, like Luxury Hybrid and High-Performance, are less common but highly favored. A mismatch between model availability and popularity suggests potential market saturation in some categories and niche demand in others. Manufacturers can leverage these insights to optimize production and pricing strategies.
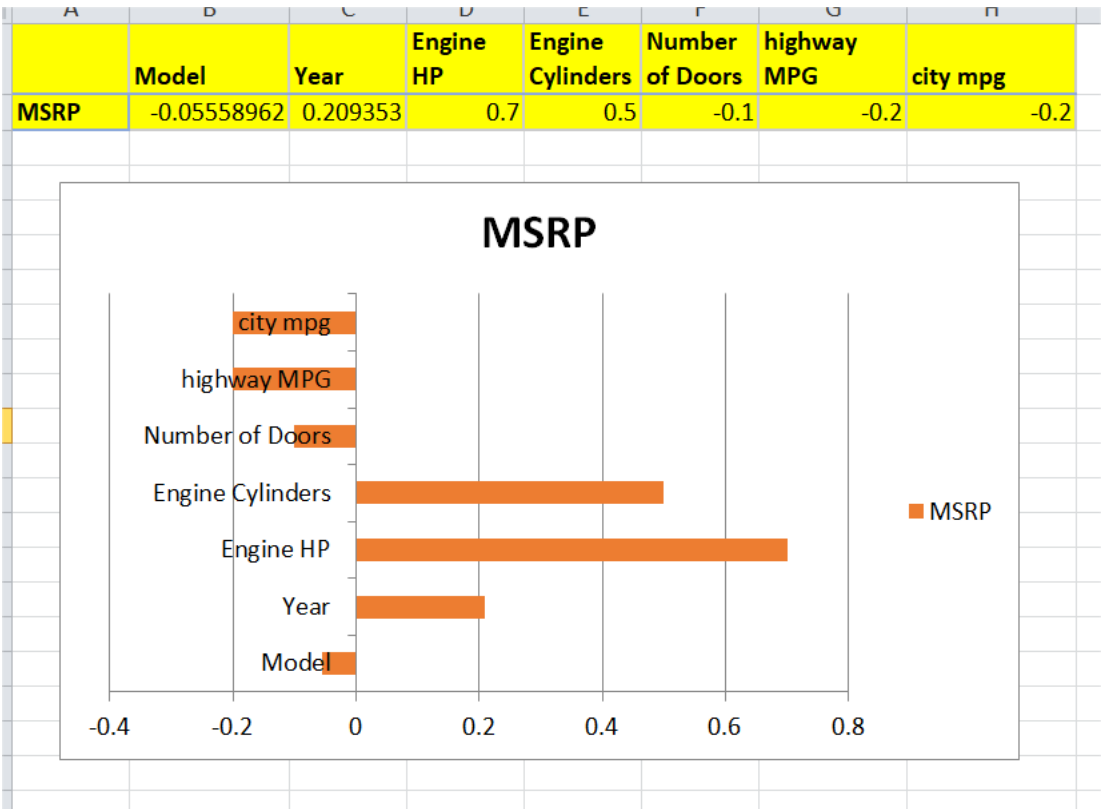
Task 2: Create a scatter chart that plots engine power on the x-axis and price on the y-axis. Add a trend line to the chart to visualize the relationship between these variables.
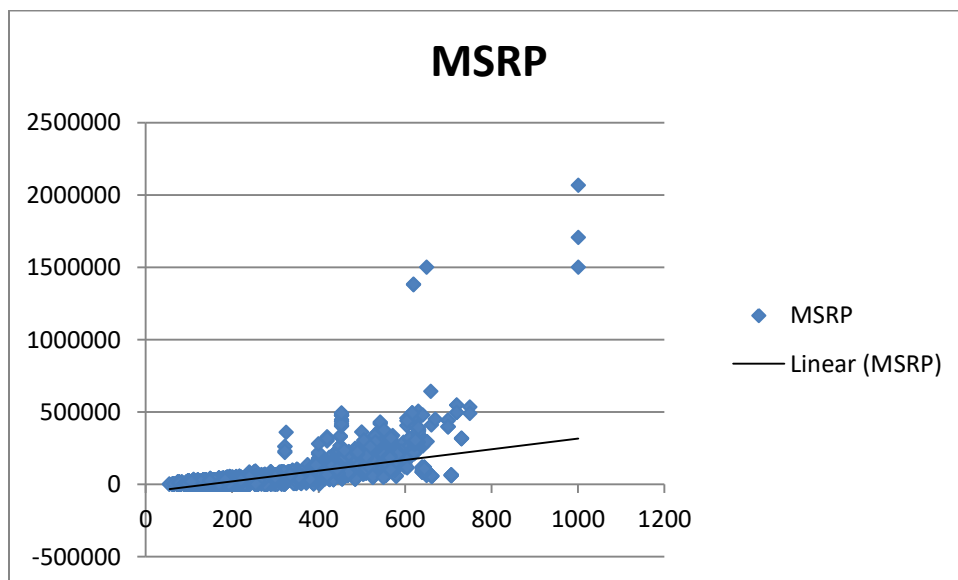
Conclusion:

The scatter plot shows the relationship between engine power (x-axis) and MSRP (y-axis), with a trend line indicating a positive correlation. This suggests that as engine power increases, car prices generally rise. However, there are outliers with extremely high MSRPs, likely representing luxury or exotic cars. The majority of cars cluster at lower price points, indicating that most vehicles have moderate engine power and pricing. The trendline's slight upward slope confirms the correlation, but the wide dispersion suggests other factors also influence MSRP beyond just engine power.

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.

	Model	Year	Engine HP	Engine Cylinders	Number of Doors	highway MPG	city mpg
MSRP	-0.05558962	0.209353	0.7	0.5	-0.1	-0.2	-0.2

Conclusion:

This bar chart visualizes the impact of different car features on MSRP (price) based on regression coefficients. Engine HP and Engine Cylinders have the strongest positive influence, meaning cars with higher horsepower and more cylinders tend to be more expensive. Year also has a slight positive correlation, indicating newer models are generally priced higher. City MPG and Highway MPG have negative correlations, suggesting that fuel-efficient cars tend to be cheaper. Number of doors and model type have minimal impact, indicating they are not significant price determinants

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

Make	Average of MSRP
Acura	35087.4878
Alfa Romeo	61600
Aston Martin	198123.4615
Audi	54574.1215
Bentley	247169.3243
BMW	62162.55864
Bugatti	1757223.667
Buick	29034.18947
Cadillac	56368.26515
Chevrolet	29000.2214
Chrysler	26722.96257
Dodge	24857.04537
Ferrari	237383.8235
FIAT	22206.01695
Ford	28522.86207
Genesis	46616.66667
GMC	32444.08506
Honda	26608.88399
HUMMER	36464.41176
Hyundai	24926.26255
Infiniti	42640.27134
Kia	25318.75
Lamborghini	331567.3077
Land Rover	68067.08633
Lexus	47549.06931
Lincoln	43560.01316

Task 4.B: Create a bar chart or a horizontal stacked bar chart that visualizes the relationship between manufacturer and average price.
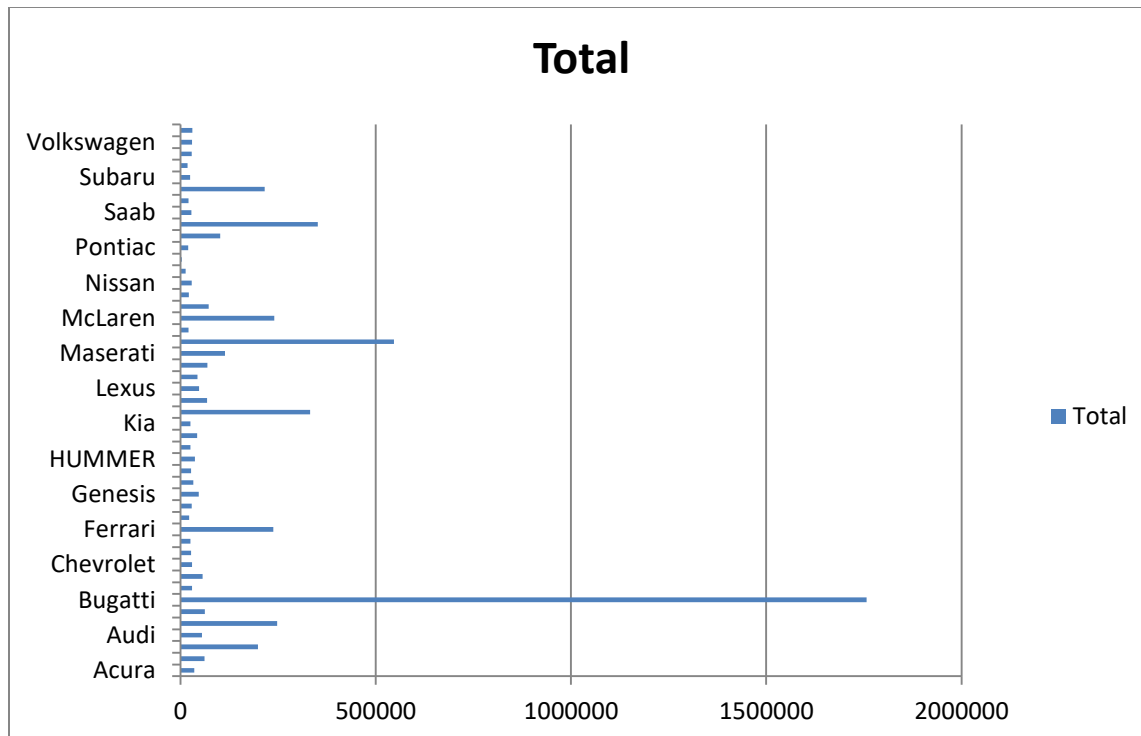
Total

This chart shows the total value (possibly revenue, units sold, or average price) for different car manufacturers. Cadillac has the highest total value, significantly outpacing all other brands, followed by Maybach at a distant second. Pontiac, Lexus, and Ferrari also have moderate totals, while brands like Toyota, Mitsubishi, and Acura have much lower totals. This suggests that Cadillac dominates in terms of total value, likely due to higher-priced models or higher sales volume.

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.
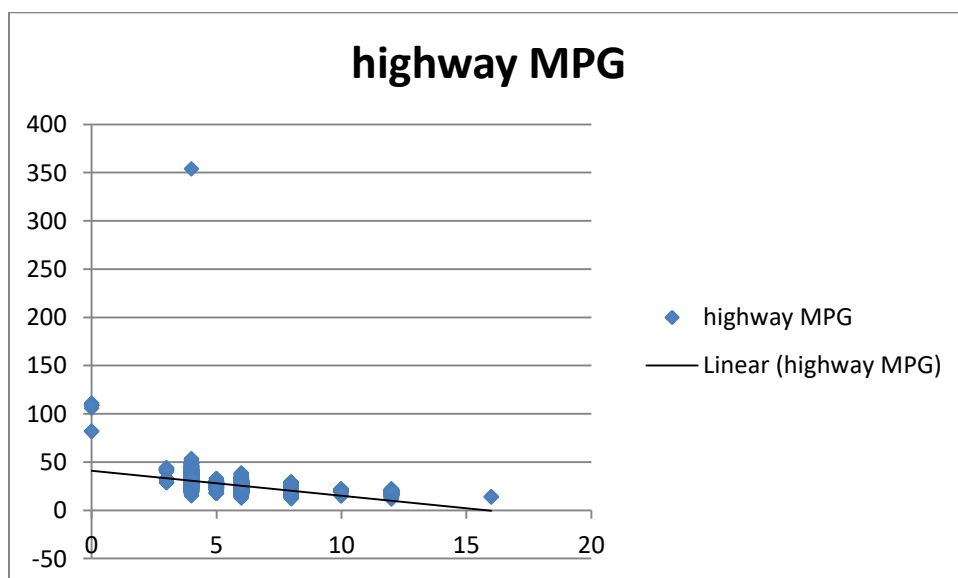
highway MPG

Task 5.B: Calculate the correlation coefficient between the number of cylinders and highway MPG to quantify the strength and direction of the relationship.
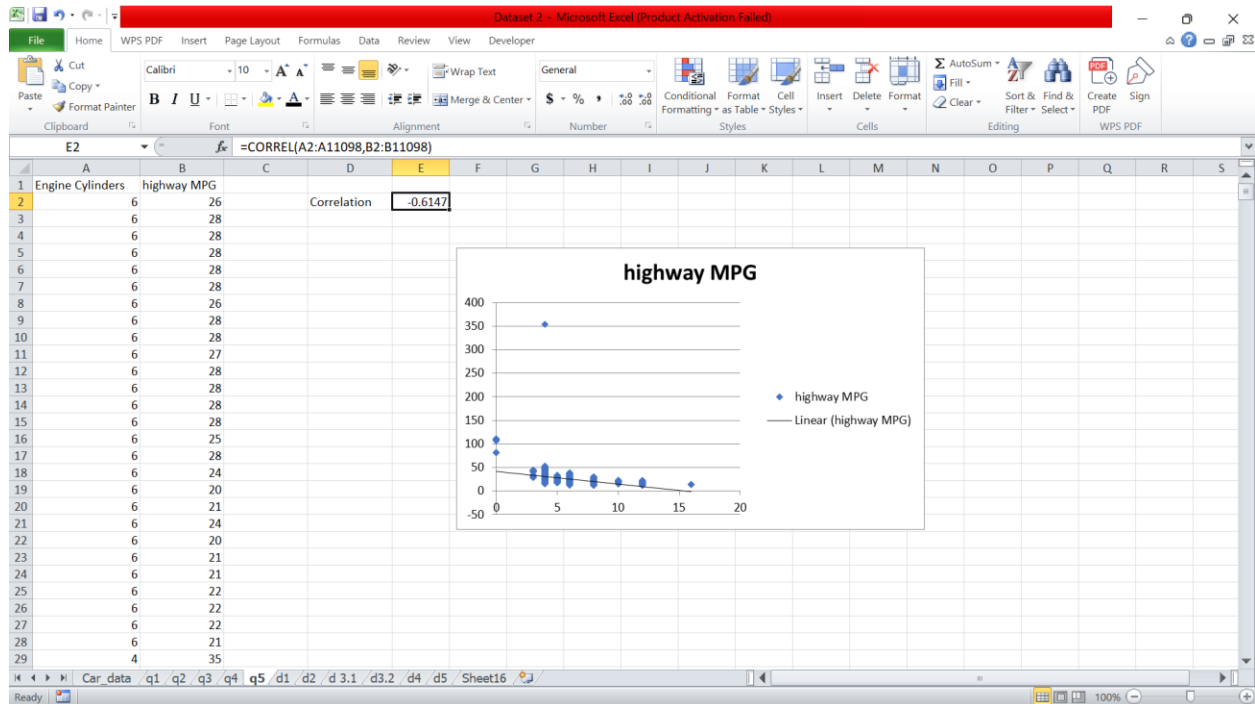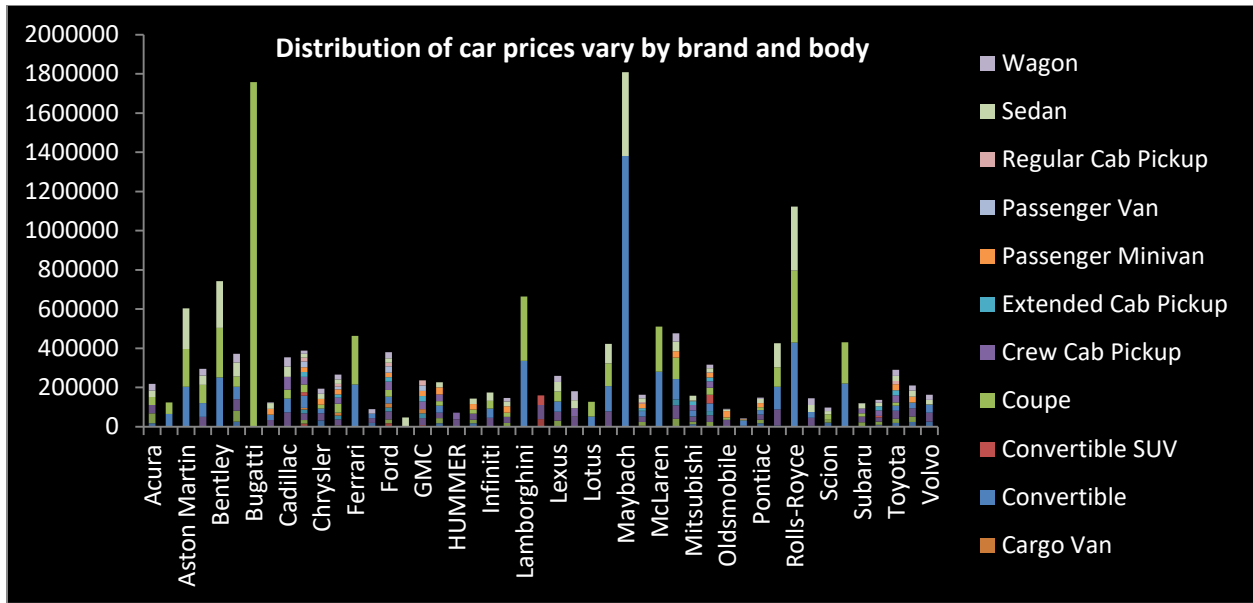

Conclusion-

The trend line slopes downwards from left to right. This indicates a negative correlation. As the number of cylinders in an engine increases, the highway MPG tends to decrease. This is expected, as engines with more cylinders generally consume more fuel.

DASHBOARD TASKS:

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

Distribution of car prices vary by brand and body

Conclusion:

- **Price Variation:** There's a significant variation in price depending on both the brand and body style. Luxury brands like Bugatti, Bentley, and McLaren have the highest MSRPs.
- **Body Style Impact:** Certain body styles within a brand also command higher prices. For example, a sports car or convertible from a luxury brand will likely be more expensive than a sedan.

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

MSRP Comparison: Brands & Body Styles
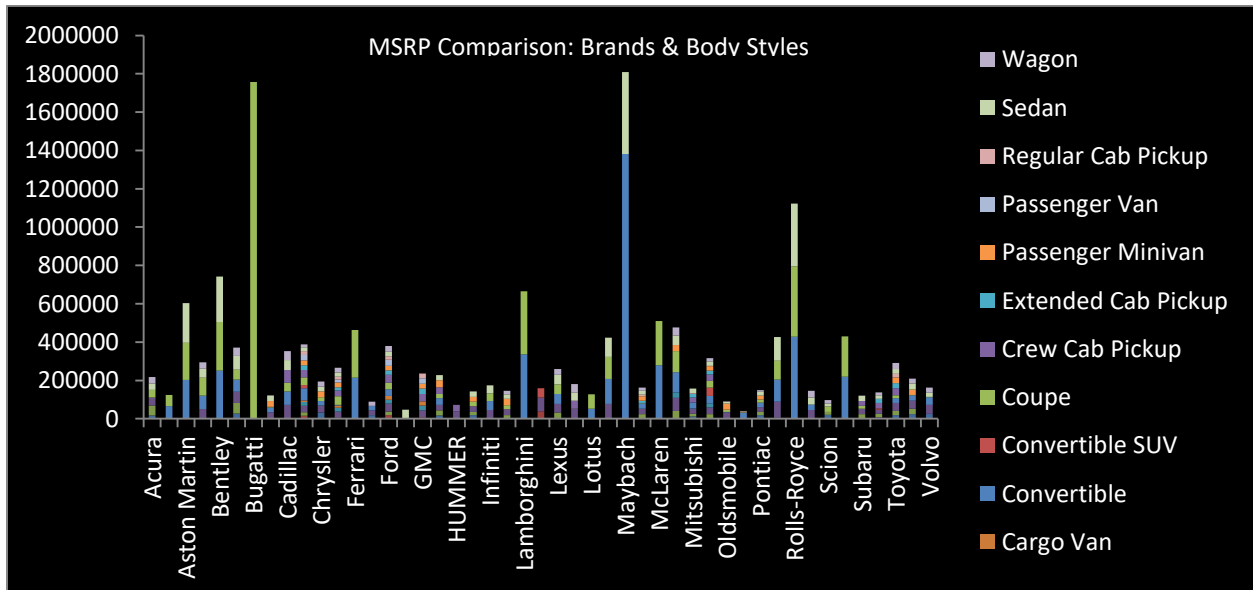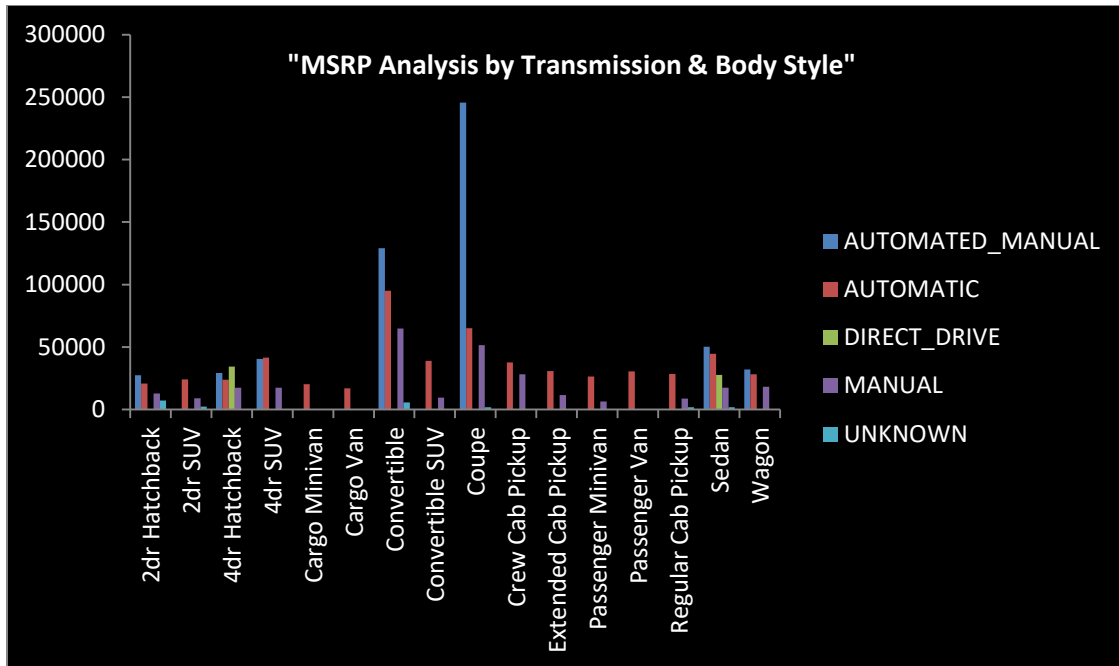
Conclusion:

Highest Average MSRPs:

- **Bugatti, Bentley, McLaren, and Rolls-Royce:** These luxury brands consistently show the highest MSRPs across various body styles. Bugatti, in particular, has the highest MSRP.
- **Body Style Influence:** Within these brands, certain body styles like convertibles, coupes, and SUVs tend to be the most expensive.

Lowest Average MSRPs:

- **Acura, Toyota, and Volvo:** These brands generally have lower MSRPs compared to the luxury brands.
- **Body Style Influence:** Within these brands, sedans, wagons, and smaller pickups tend to have the lowest prices.

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

Figure: "MSRP Analysis by Transmission & Body Style"
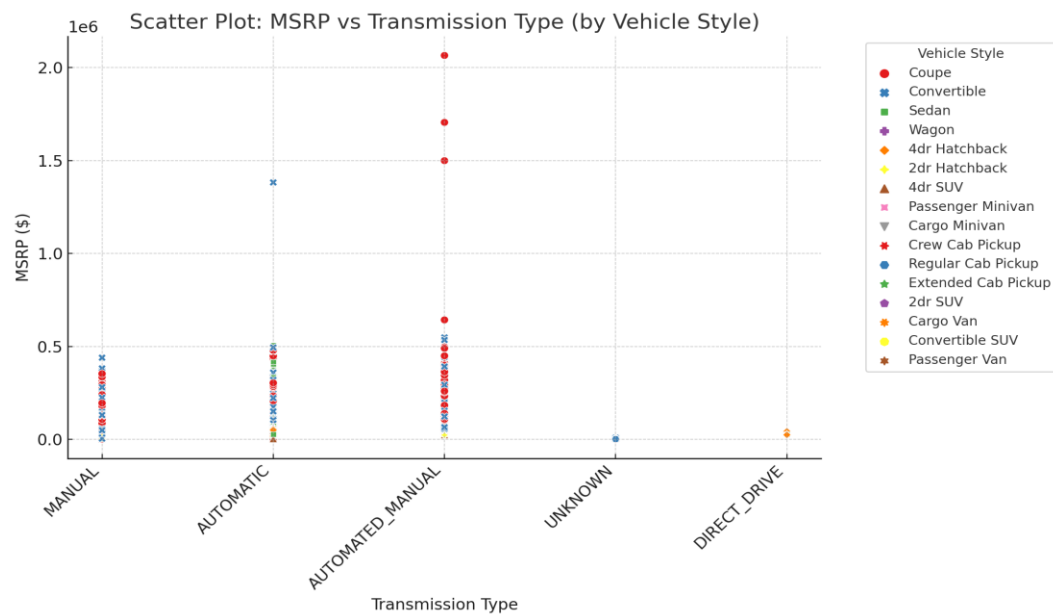
Conclusion:

Automated Manual Dominance: The most striking observation is that "AUTOMATED_MANUAL" transmissions generally command the highest MSRPs across many body styles. This suggests that this transmission type is associated with more expensive vehicles, likely due to its performance-oriented nature.

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

Figure: Fuel Efficiency Trends by Body Style
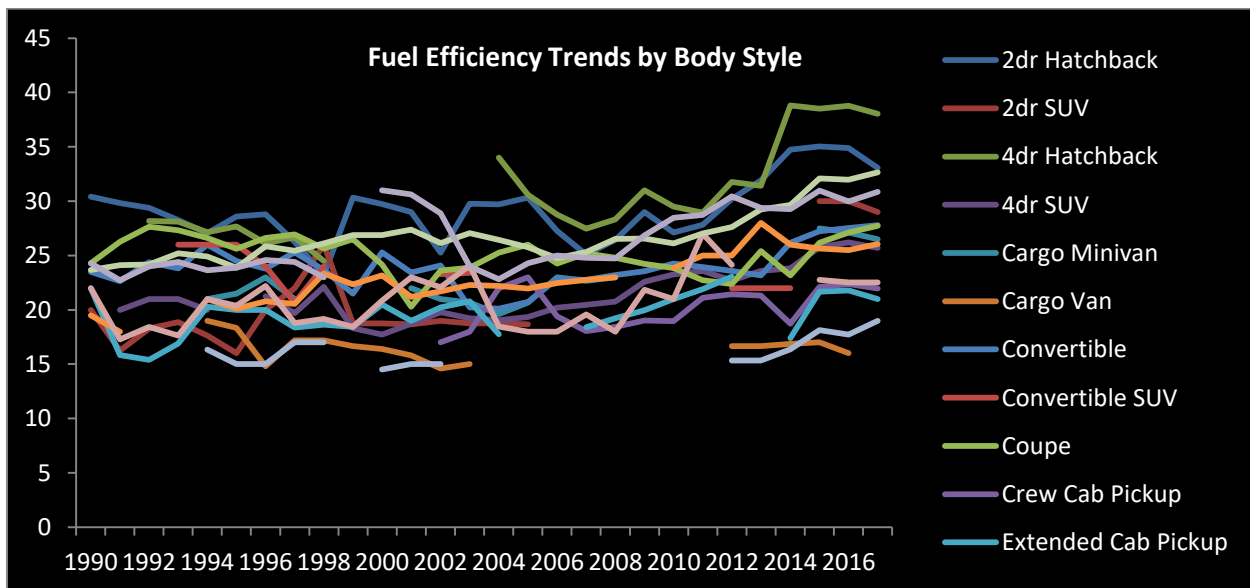
Conclusion:

- **Higher Efficiency: 2dr Hatchbacks and 4dr Hatchbacks** consistently show higher fuel efficiency compared to other body styles. This is expected, as hatchbacks are typically smaller and lighter vehicles.
- **Lower Efficiency: Cargo Vans, Cargo Minivans, and Crew Cab Pickups** generally have lower fuel efficiency. These are larger, heavier vehicles designed for carrying cargo or passengers.

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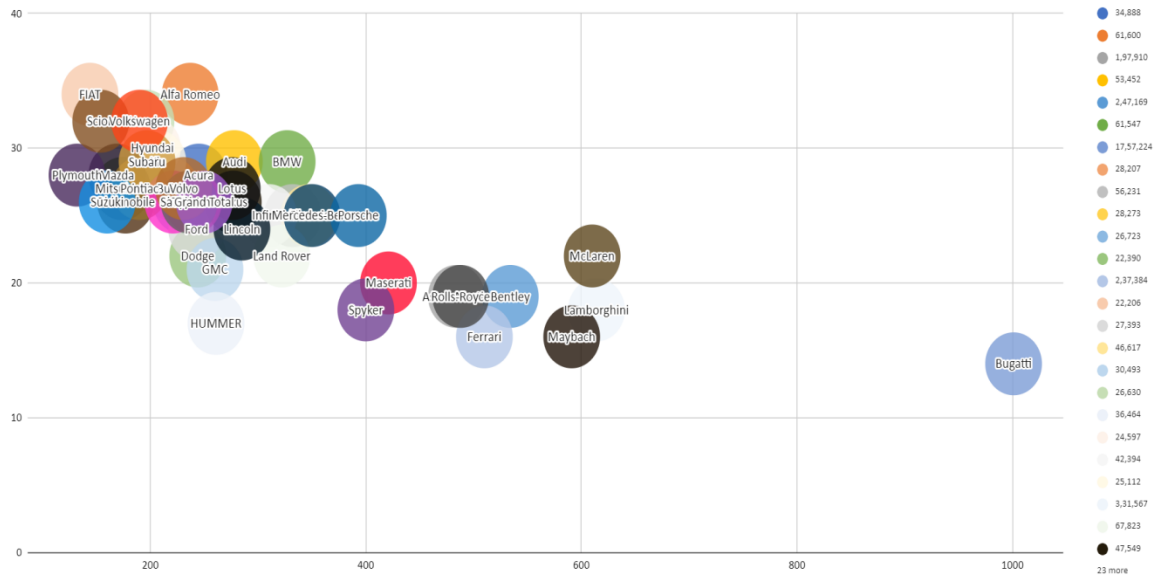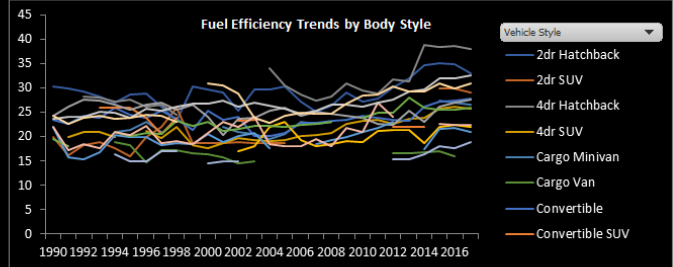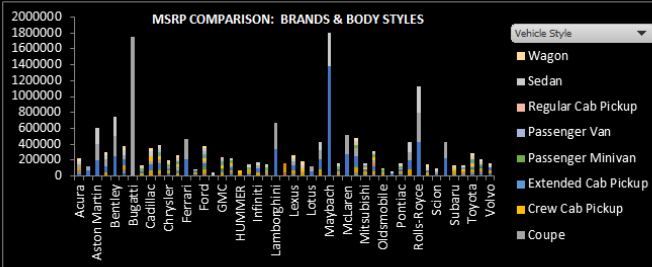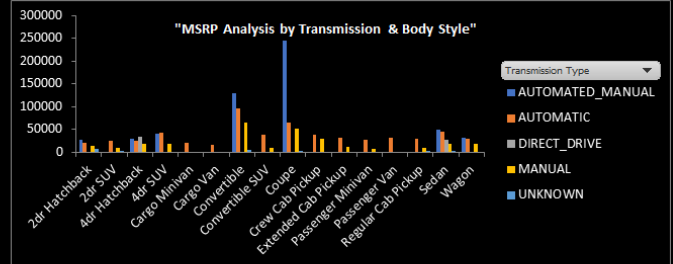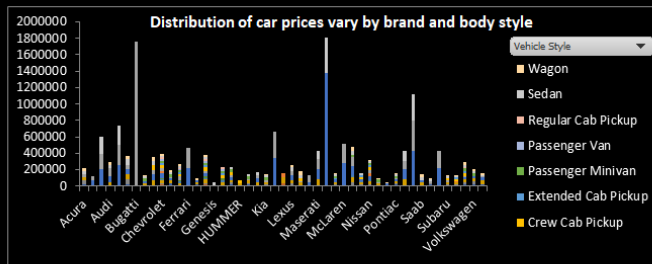

Conclusion:

- **Supercars & Luxury Brands (Bugatti, Ferrari, McLaren, Lamborghini)** prioritize power over efficiency and have high prices.
- **Premium brands (BMW, Audi, Mercedes)** offer a mix of power and efficiency at mid-to-high price points.
- **Affordable brands (Toyota, Hyundai, Subaru)** focus on fuel efficiency at lower price points.

DASHBOARD

CAR FEATURES ANALYSIS

INSIGHTS:

- Distribution of car prices by brand and body style – Luxury brands like Bugatti, McLaren, and Maybach have significantly higher prices, with noticeable variations across body styles.
- MSRP Analysis by Transmission & Body Style – Automated manual and automatic transmissions dominate, with luxury cars and coupes having the highest MSRPs.
- MSRP Comparison: Brands & Body Styles – High-end brands such as Rolls-Royce, Ferrari, and Lamborghini show extreme price variations across different body styles.
- Fuel Efficiency Trends by Body Style – Fuel efficiency has generally improved over time, with smaller body styles like hatchbacks achieving the highest MPG.

RESULT:

Luxury brands like Bugatti, McLaren, and Rolls-Royce dominate the high-end price range, with significant variations across body styles and transmission types. Automated manual and automatic transmissions are the most common in expensive models, while fuel efficiency trends show consistent improvements over time, particularly in smaller vehicles like hatchbacks.

HYPERLINK:

https://docs.google.com/spreadsheets/d/1ajnur-FMLa8sQv0lEytr5lhsPVP04qF5/edit?usp=sharing&ouid=109538772972576336481&rtpof=true&sd=true