

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

1. Project Description

This project involves creating two interactive dashboards in Excel—Client Dashboard and Analysis Dashboard—to analyze car specifications from a dataset containing vehicle information across multiple brands and styles. The goal is to derive business insights related to pricing, popularity, fuel efficiency, and feature importance, using visual analytics and Excel pivot tables, formulas, and charts.

2. Data Description

The dataset includes various specifications and attributes of cars such as:

- Make (Brand)
- Model
- Vehicle Style
- Engine HP
- Engine Cylinders
- Transmission Type
- Driven Wheels
- Popularity
- Market Category
- MSRP (Price)
- Fuel Efficiency (City/Highway MPG)
- Year

3. Data Cleaning Steps

- Removed Blanks: For numerical columns **Engine HP** blanks replaced with mean 253, **Engine Cylinders** blanks with 0.

- Removed Null : Replaced blank, #N/A, with **Unknown** using filters for categorical columns like **Market Category**.
- Data Formatting: Ensured numerical columns (like **MSRP**, **MPG**) were formatted consistently.
- Feature Engineering: Extracted relevant column **Market Category**, and split it into rows for charting and pivot analysis.

4. Dashboard Tasks

Analysis Dashboard Tasks

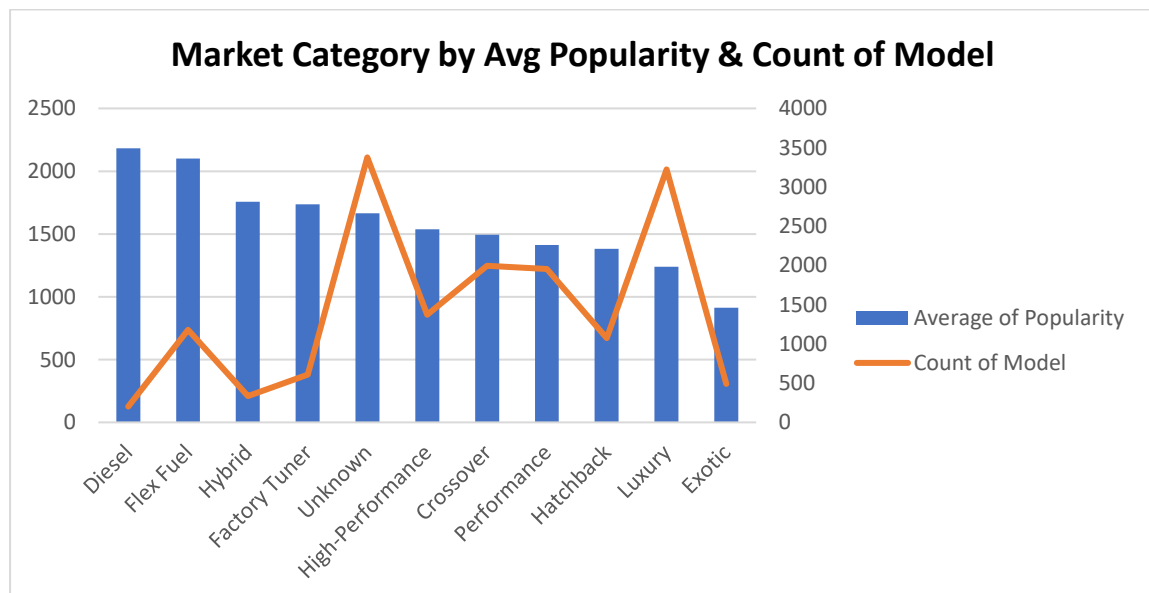
Task 1: Popularity by Market Category

How does the popularity of a car model vary across different market categories?

Approach:

- Created a pivot table for count of models and average popularity per market category.
- Combo chart (bar + line) was used.

Insight:



- **Diesel (2183)** and **Flex Fuel (2101)** cars are the most popular on average, despite having fewer models.
- **Hybrid (1756)** and **Factory Tuner (1736)** also show above-average popularity, indicating growing interest in fuel-efficient and performance-modified vehicles.

- **Luxury** and **Exotic** cars have **low average popularity** (1238 and 912 respectively), even though Luxury has a **high number of models** (3222), suggesting they cater to niche markets.
- **Hatchbacks** and **Crossover** categories have **moderate popularity** but a **large number of models**, pointing to their mass-market appeal.

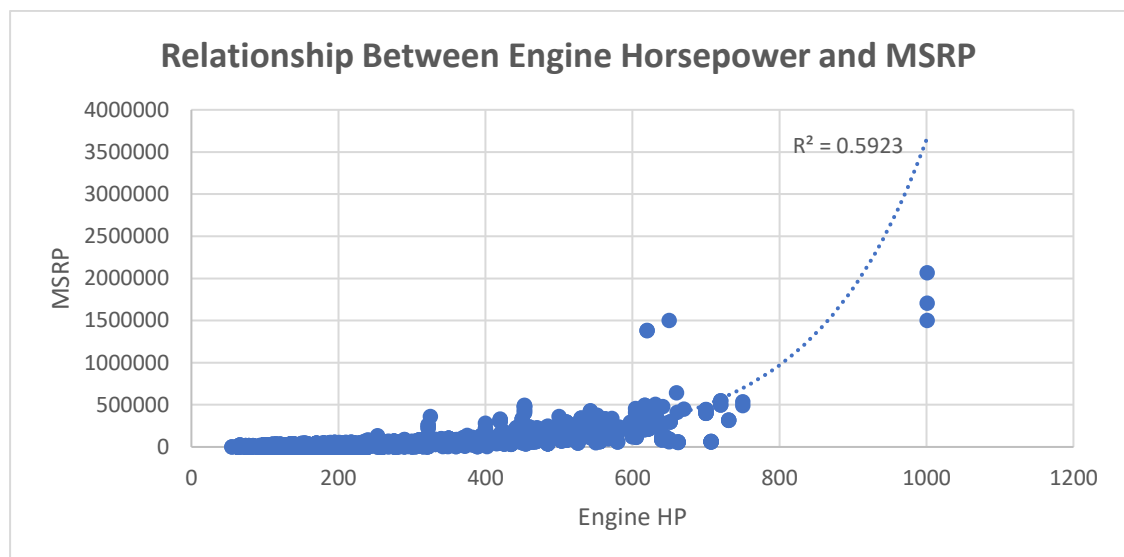
Task 2: Engine Power vs. Price

What is the relationship between a car's engine power and its price?

Approach:

- Directly used a scatter plot with **MSRP** vs. **Engine HP** from Car_data_clean.
- Added trendline with R^2 value.

Insight:



Strong positive relationship ($R^2 \approx 0.59$) between engine power and MSRP. This suggests:

- As **engine power increases**, the **price tends to rise at an accelerating rate**.
- The **moderate R^2** implies that while engine power significantly impacts price, other factors (e.g., brand, features, category) also play a role.
- High-powered engines are typically found in **premium or performance-oriented vehicles**, contributing to higher pricing tiers

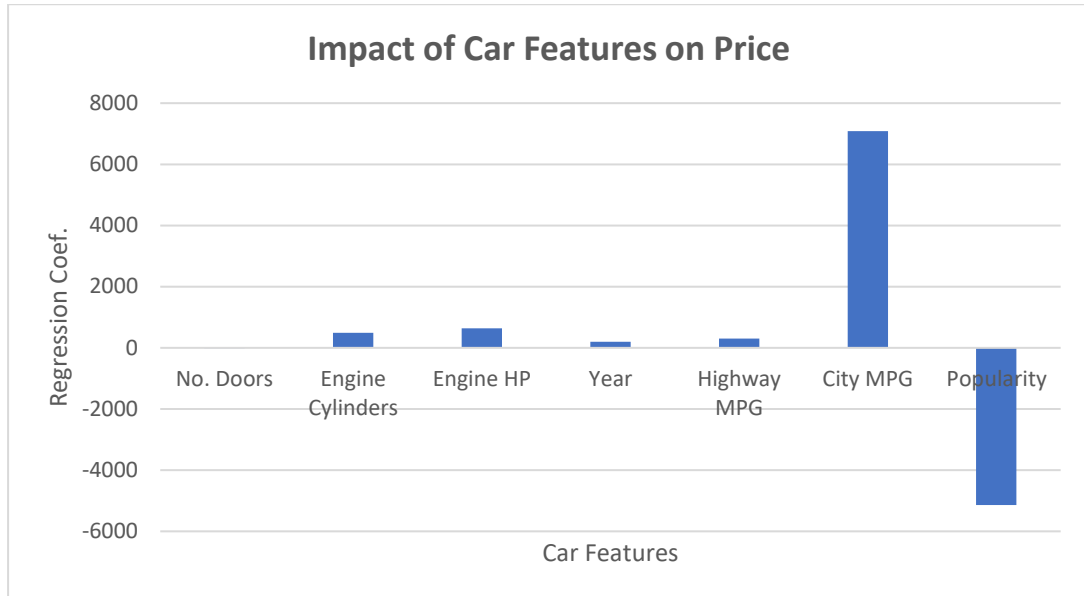
Task 3: Feature Importance on Price

Which car features are most important in determining a car's price?

Approach:

- Conducted linear regression using Excel's LINEST() function on numerical columns.
- Plotted regression coefficients as a bar chart.

Insight:



- **City MPG** and **Engine HP** are the most influential factors on price.
- **Popularity** negatively impacts price(as can be seen **Moderate price** cars like diesel, Flex Fuel cars have highest popularity.)

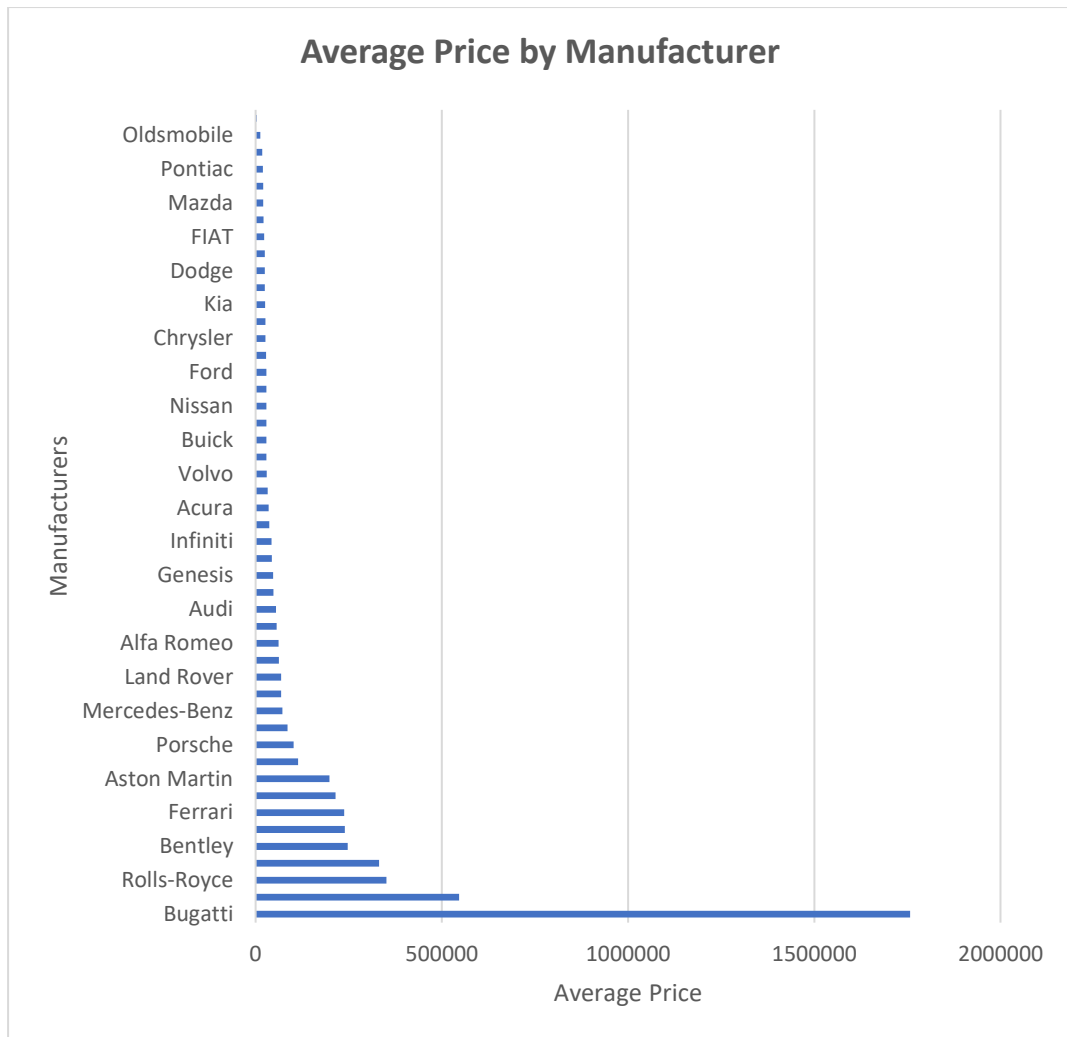
Task 4: Average Price by Manufacturer

How does the average price of a car vary across different manufacturers?

Approach:

- Used a pivot table to get average MSRP by manufacturer.
- Visualized it using a horizontal bar chart.

Insight:



- Luxury and exotic brands like **Bugatti, Maybach, Rolls-Royce, Lamborghini** have the highest average prices.
- Mass-market manufacturers brands like **Ford, Fiat, Pontiac** and **Kia** offer vehicles at substantially lower average prices.
- This disparity reflects differences in brand positioning, vehicle performance, design quality, and target market segments.

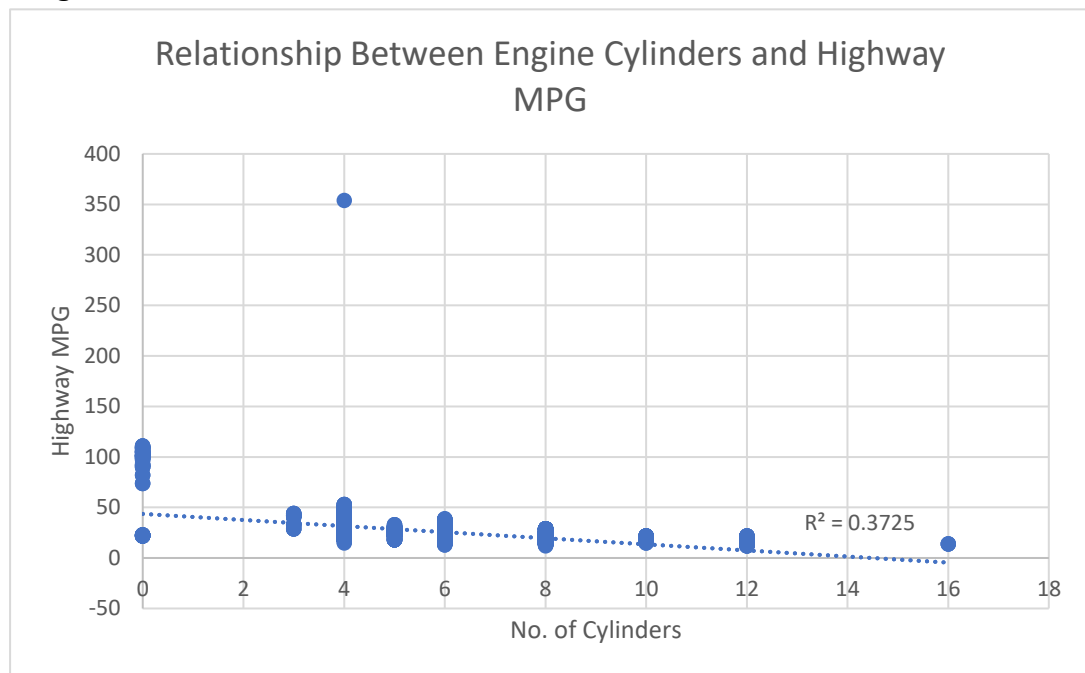
Task 5: Cylinders vs. Highway MPG

What is the relationship between fuel efficiency and the number of cylinders in a car's engine?

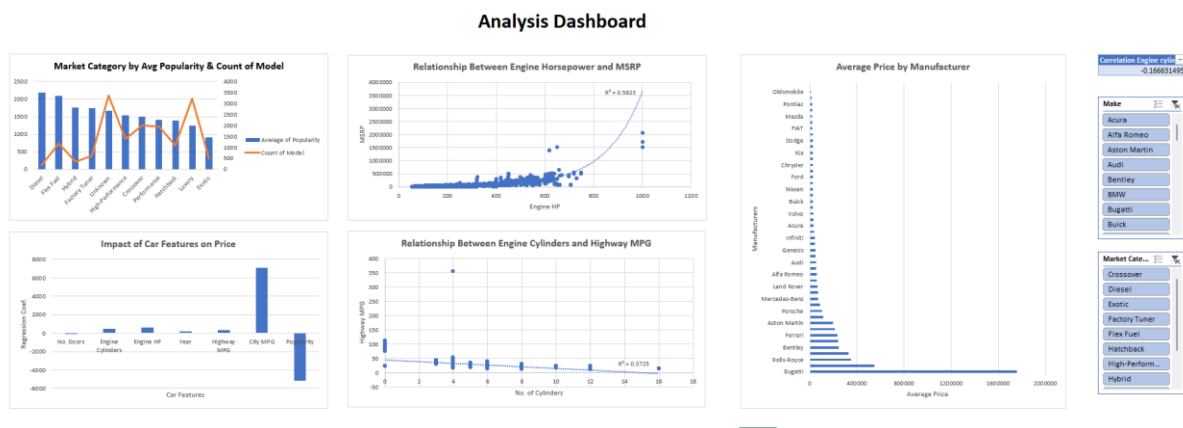
Approach:

- Created a scatter plot for **No. cylinders** vs. **highway MPG** from `car_data_clean`.
- Added a trendline (and R^2 value).
- Calculated Correlation between them using Excel's `CORREL()` formula.

Insight:



- Clear negative correlation; cars with fewer cylinders have better fuel efficiency.
- Correlation coefficient = **-0.166**, indicating weak but negative relation.



Client Dashboard Tasks

Task 1: Distribution of Car Prices by Brand and Body Style

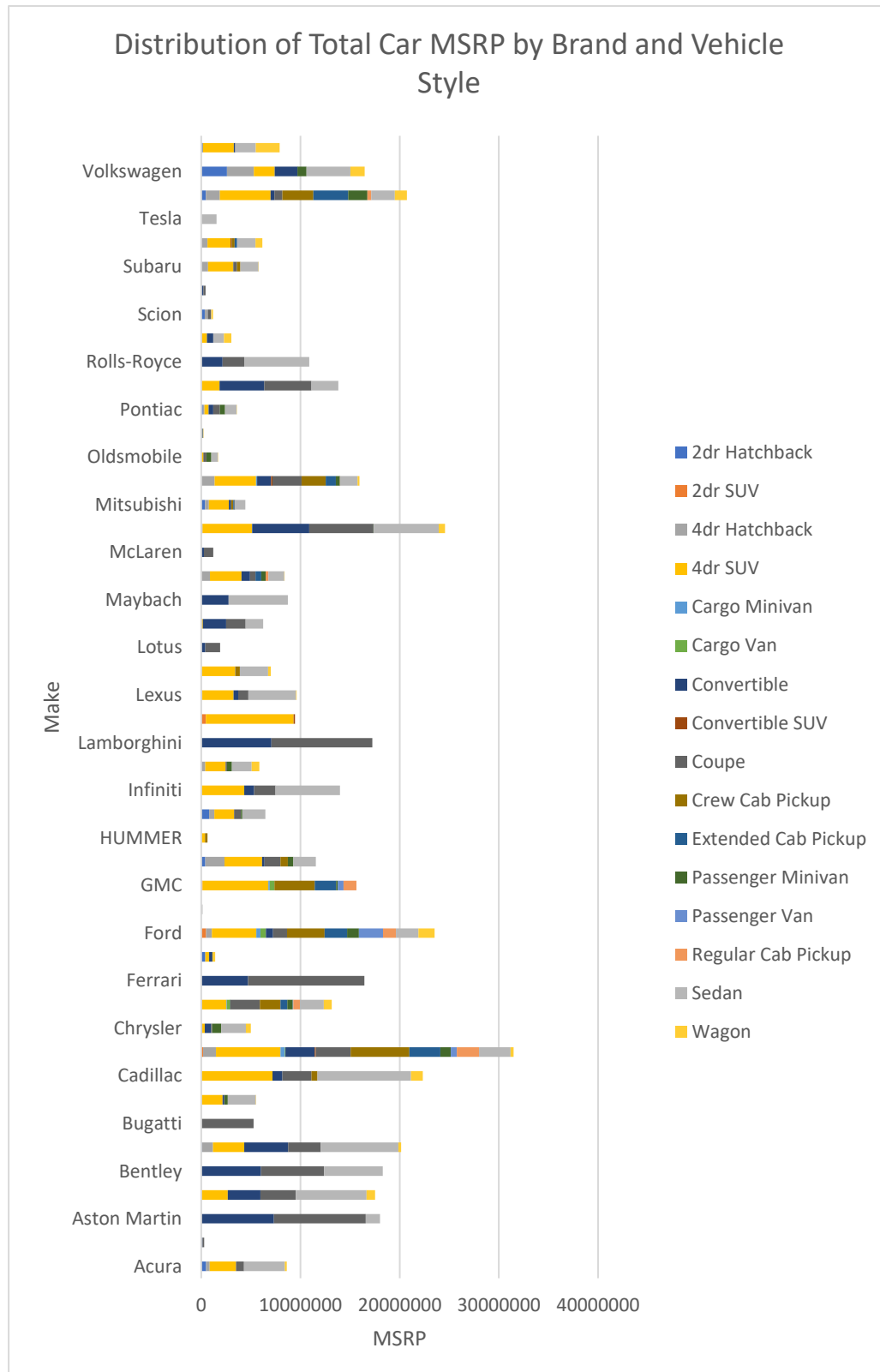
How does the distribution of car prices vary by brand and body style?

Approach:

- Used a pivot table to sum total MSRP for each brand and body style.

- Created a stacked column chart.

Insight:



- Brands like Cadillac and Acura have high MSRP totals for multiple body styles.
- **SUVs (2dr, 4dr)** and **Sedans** dominate the price distribution across many brands.
- Luxury brands like **Bentley, Ferrari, and Lamborghini** contribute large amounts to high-MSRP vehicle styles like **Coupes and Convertibles**.
- Brands like **Ford, Chevrolet, and GMC** show broad distribution across multiple body styles, especially in **pickup** and **utility vehicle segments**.
- **Volkswagen** and **Tesla** have **high MSRP totals** concentrated in **Sedan** and **Hatchback** categories, indicating focused model strategies.

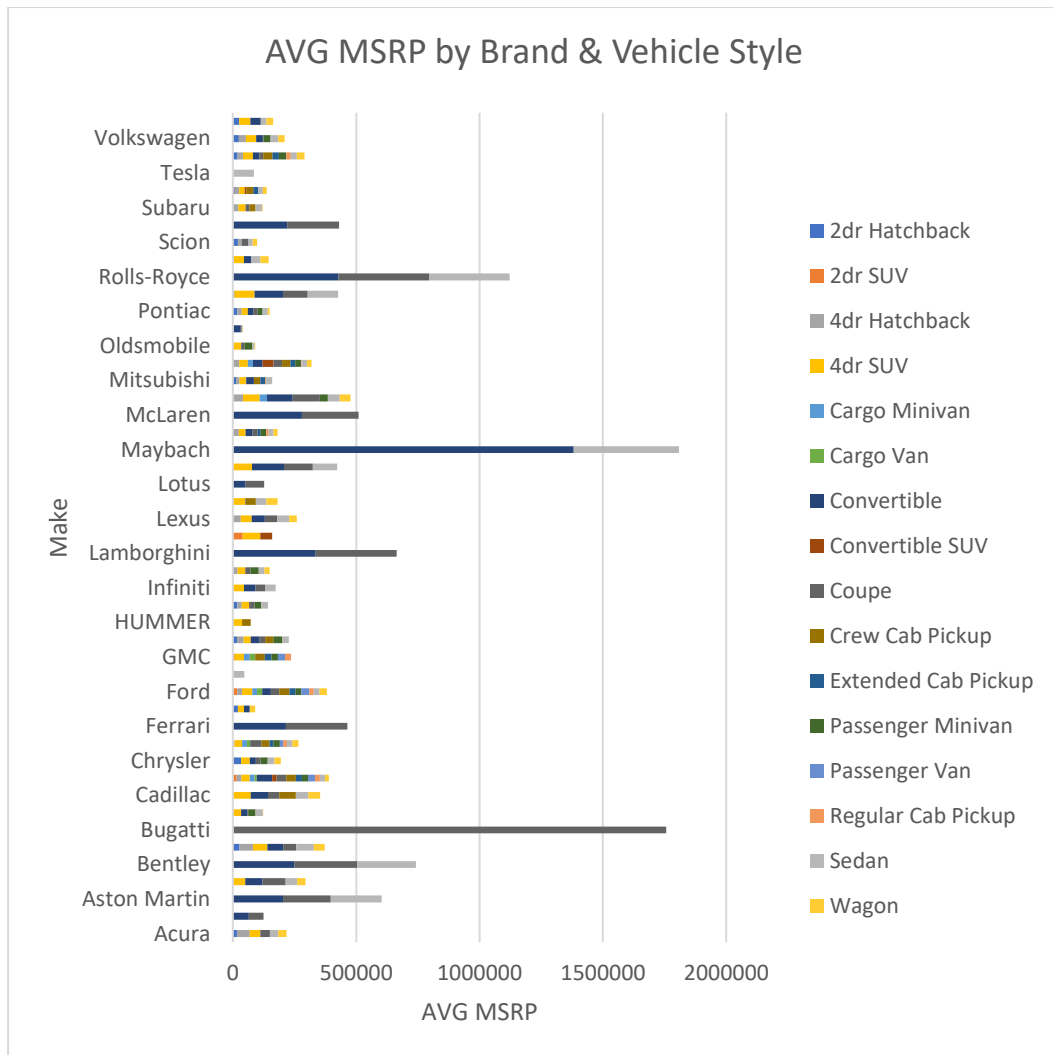
Task 2: Average MSRP by Brand and Body Style

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

Approach:

- Used pivot tables to calculate average MSRP.
- Plotted a clustered column chart.

Insight:



- Brands like **Bugatti**, **McLaren** and **Maybach** have significantly higher average MSRPs.
- While brands like **Subaru** and **Volkswagen** are on the lower end.

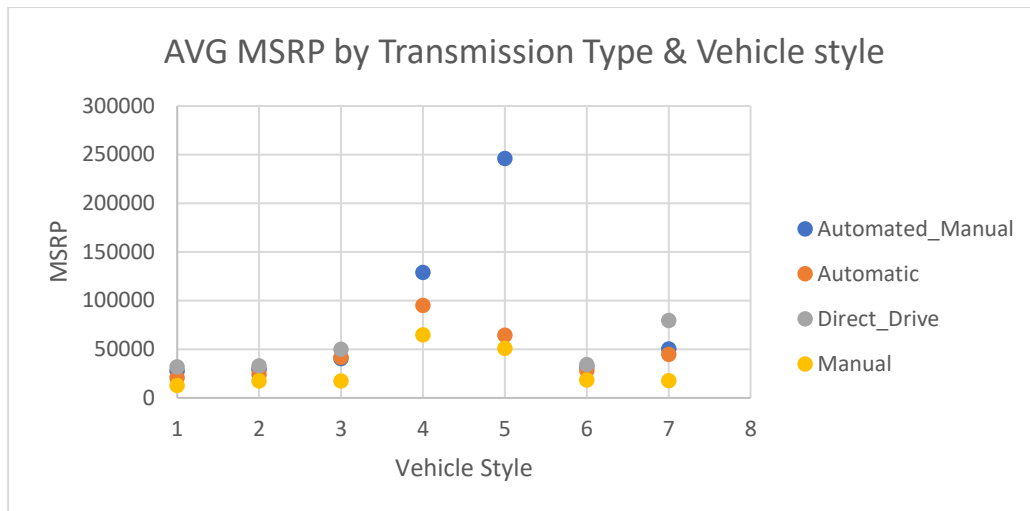
Task 3: MSRP vs. Transmission Type and Body Style

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

Approach:

- Created a helper table from pivot output
- Then inserted a scatter plot with color-coded symbols by transmission and style.

Insight:



- **Automated Manual transmissions** have the **highest MSRP**, especially in **Coupes and Convertibles**, indicating premium or performance vehicles.
- **Direct Drive** also shows **high prices**, likely due to **electric vehicles**.
- **Manual transmissions** are the **most affordable**, common in budget cars.
- **Automatic transmissions** are **moderately priced**, typical for mass-market models.
- Overall, **transmission type strongly impacts price**, with high-tech or performance types driving costs up.

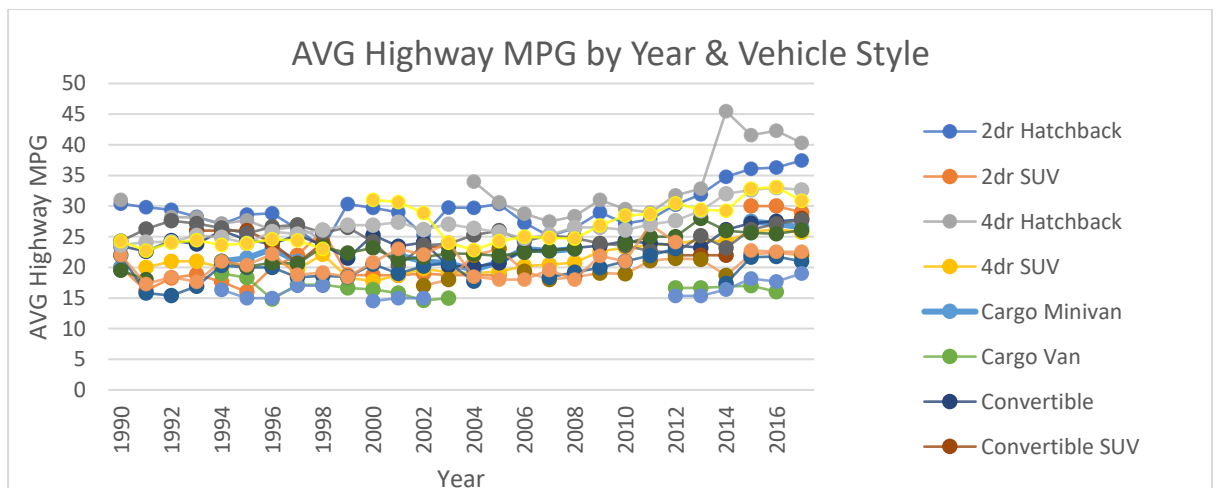
Task 4: Fuel Efficiency Trends by Year and Body Style

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

Approach:

- Used AVERAGEIFS with pivot tables to plot a multi-line chart showing yearly trends in **highway MPG** across body styles.

Insight:



- **Overall fuel efficiency** (AVG Highway MPG) has **improved steadily** from 1990 to 2016 across all vehicle styles.
- **2dr Hatchbacks** and **Convertibles** show the **highest MPG**, indicating better fuel efficiency in lighter, compact vehicles.
- **Cargo Vans** and **SUVs** (especially 4dr SUVs and Convertible SUVs) consistently have **lower MPG**, reflecting their larger size and weight.
- A noticeable **spike post-2012** suggests growing adoption of **fuel-efficient technologies**.

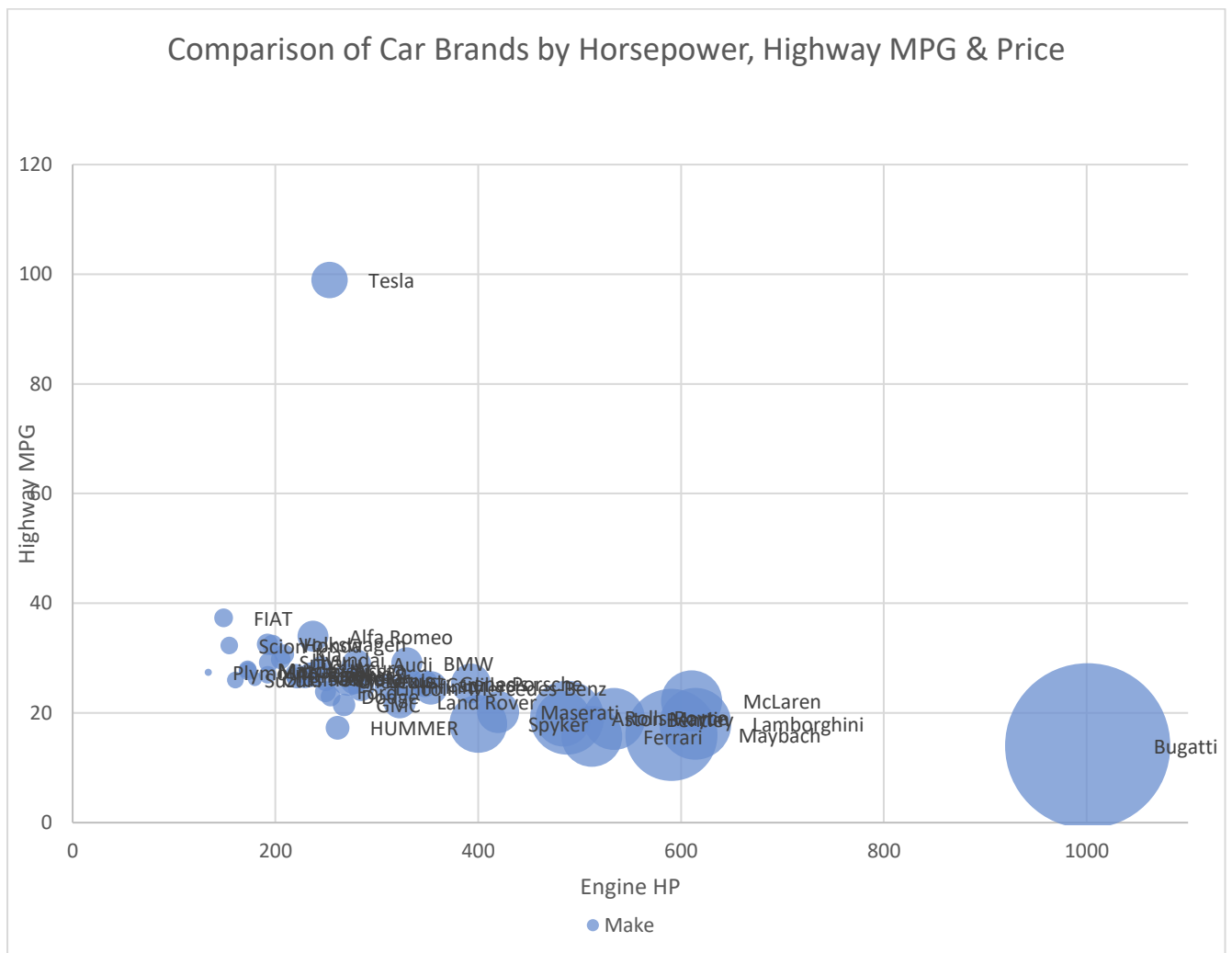
Task 5: Horsepower, MPG, and Price by Brand

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

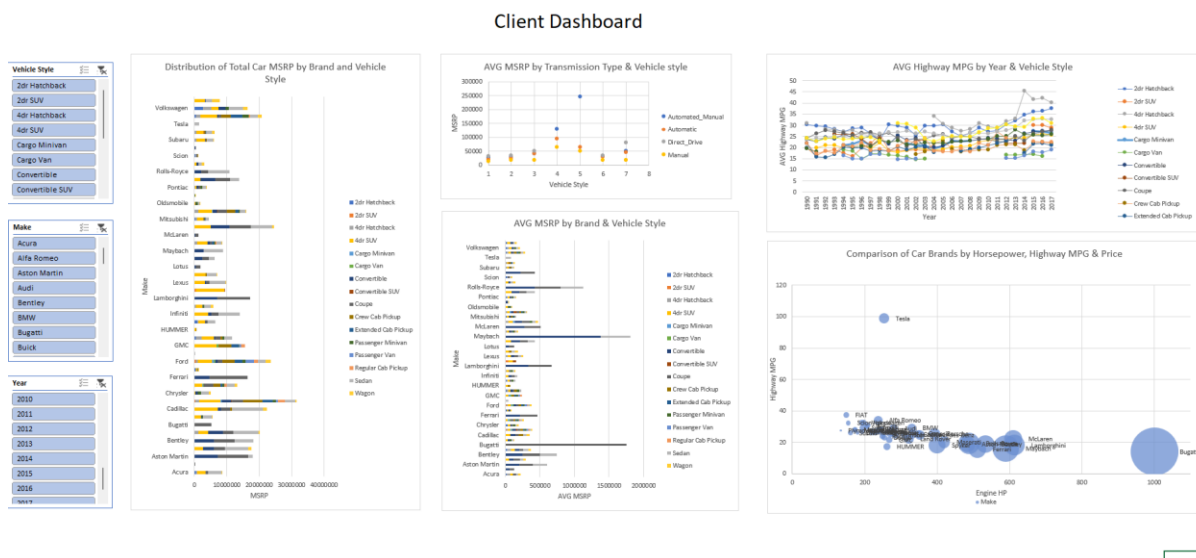
Approach:

Created a bubble chart from *pivot values* of Engine HP, highway MPG, and MSRP for each brand.

Insight:



- **Tesla** has the **highest fuel efficiency (MPG)** with moderate horsepower and price.
- **Bugatti** has the **highest horsepower and price**, but the **lowest MPG**.
- In general, **higher horsepower = lower MPG and higher price**.
- Luxury brands (Ferrari, Lamborghini, McLaren, etc.) cluster at **high HP and low MPG**.
- Economy brands (FIAT, Scion, Honda) have **lower HP but better MPG and smaller prices**.



5. Summary of Insights

- **Diesel and Flex Fuel vehicles are the most popular**, despite being mid-priced — ideal for targeting high-volume, cost-sensitive customers.
- **Hybrid and Factory Tuner cars are gaining popularity**, indicating growing interest in fuel efficiency and performance — worth expanding offerings.
- **Luxury and Exotic vehicles have low popularity but high prices** — remain niche, premium-market products.
- **Higher engine power increases MSRP**, but **City MPG and Horsepower** are the **top price drivers** — optimize power-efficiency balance in new models.
- **Automated Manual and Direct Drive transmissions** are linked to high-end models — use these in premium/electric segments.
- **Fuel efficiency is steadily improving**, especially post-2012 — continue investing in fuel-saving technology.