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

1. Project Overview
This project aims to analyze the impact of various car features on pricing and profitability. By exploring trends, correlations, and predictive insights, we assist manufacturers in optimizing pricing strategies and product development decisions.

2. Data Cleaning & Preparation
- **Missing Values:** Handled via median imputation for numerical fields and mode imputation for categorical fields.
    - **Excel Function Used:** IF(ISNA(value), MEDIAN(range), value) for numerical data.
    - **For categorical fields:** IF(A2="", MODE(range), A2)

Also Added a column for Effective MPG by averaging of Highway MPG and City MPG.

- In Verona I have filled the blanks with relative Engine Fuel Type for Verona i.e. regular unleaded.
- In Engine HP the blanks are replaced by median i.e. 227

- In Engine Cylinders blanks are For electric replaced by 0 and for rest it is replaced by median i.e. 6.

- In no. of doors blanks are replaced by median i.e. 4

- In Marketing Category we go to power query I replaced N/A with null and use fill up in transform tab and then split the column using delimiter.

- **Column Name Formatting:** Standardized for consistent analysis.
- **Outlier Detection:** Extreme values in MSRP and Engine HP were detected and considered in analysis.
    - **Excel Function Used:** IF(OR(A2>upper_limit, A2<lower_limit),"Outlier", A2)

Columns	Outliers
Engine HP	953
MSRP	1885

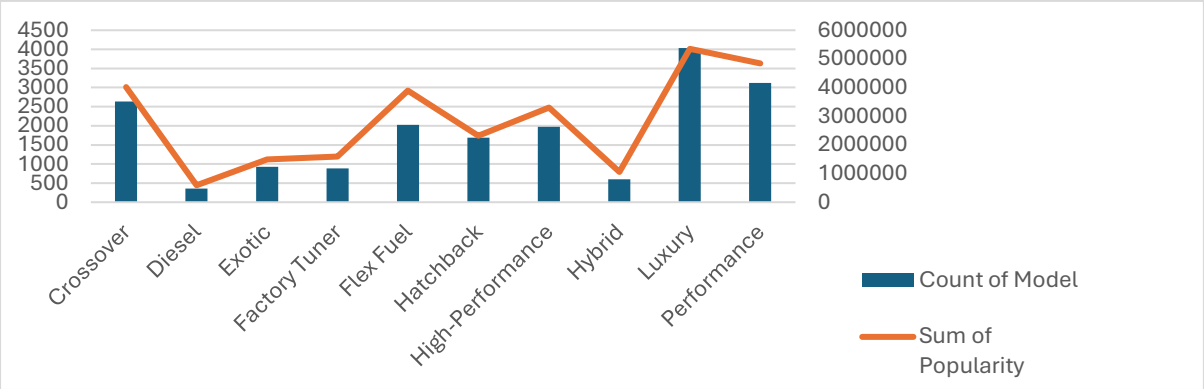
There are Outliers in Engine HP and MSRP but we will ignore them as they are ther according to parts specification

3. Key Insights & Visualizations

Task 1 : Market Category vs. Popularity

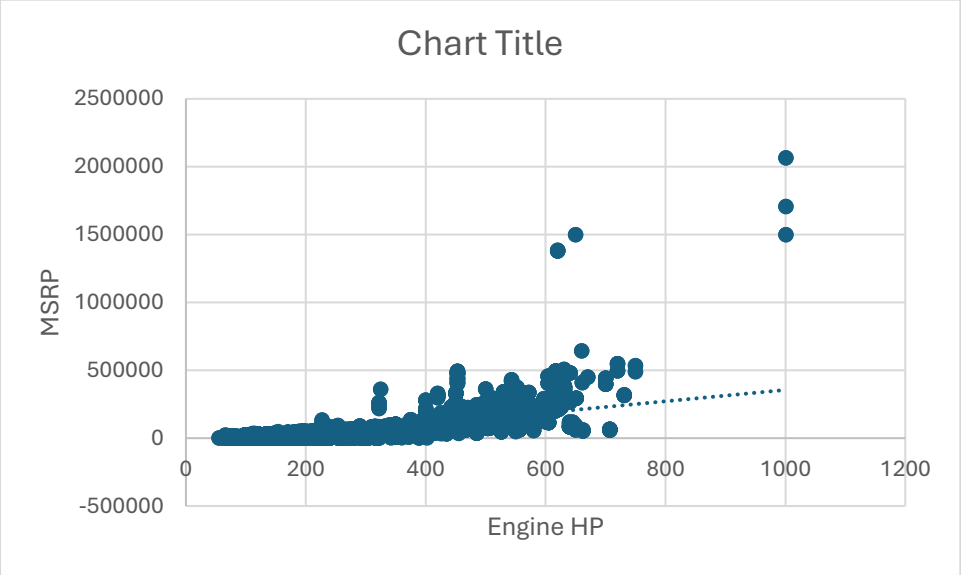
> Luxury cars are most popular category
> Luxury and Performance categories rank high in popularity.
> Hatchback, Flex Fuel, and Diesel-based models are also popular.

- **Visualization: Combo Chart (Bar + Line Graph)**
  - **Excel Function Used:** Pivot Table to summarize data & Insert Combo Chart.



Task 2 :Engine Horsepower vs. MSRP

- **Strong positive correlation** between **Engine HP and MSRP**.
- Luxury and Sports cars drive prices up sharply beyond **400 HP**.
- **Visualization: Scatter Plot with Trendline**
  - **Excel Function Used:** Insert Scatter Chart + Add Trendline

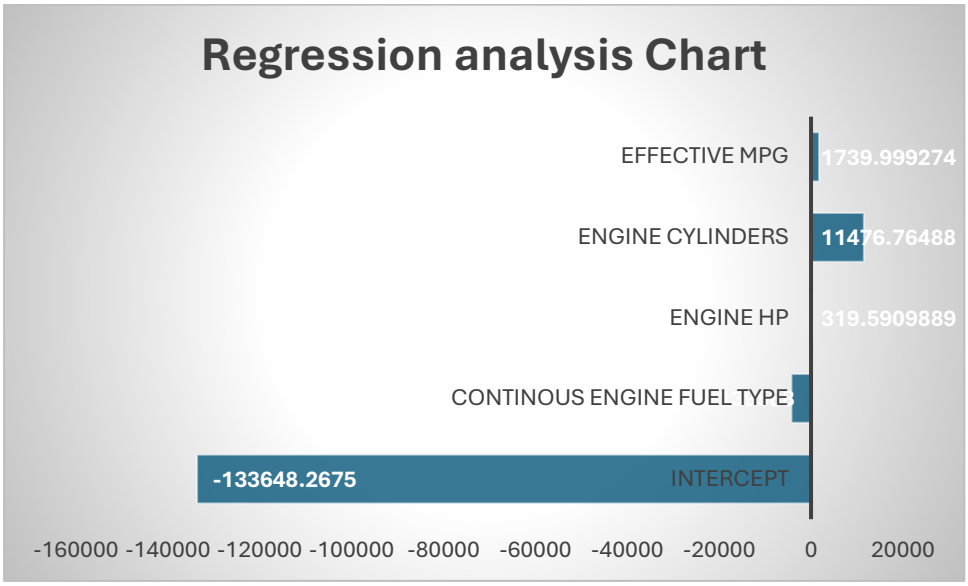


Task 3 :Regression Analysis: Key Determinants of Price

Note: In this we have done Regression analysis for price on the factors Engine HP, Engine Cylinders, Effective MPG and Engine Fuel Type.

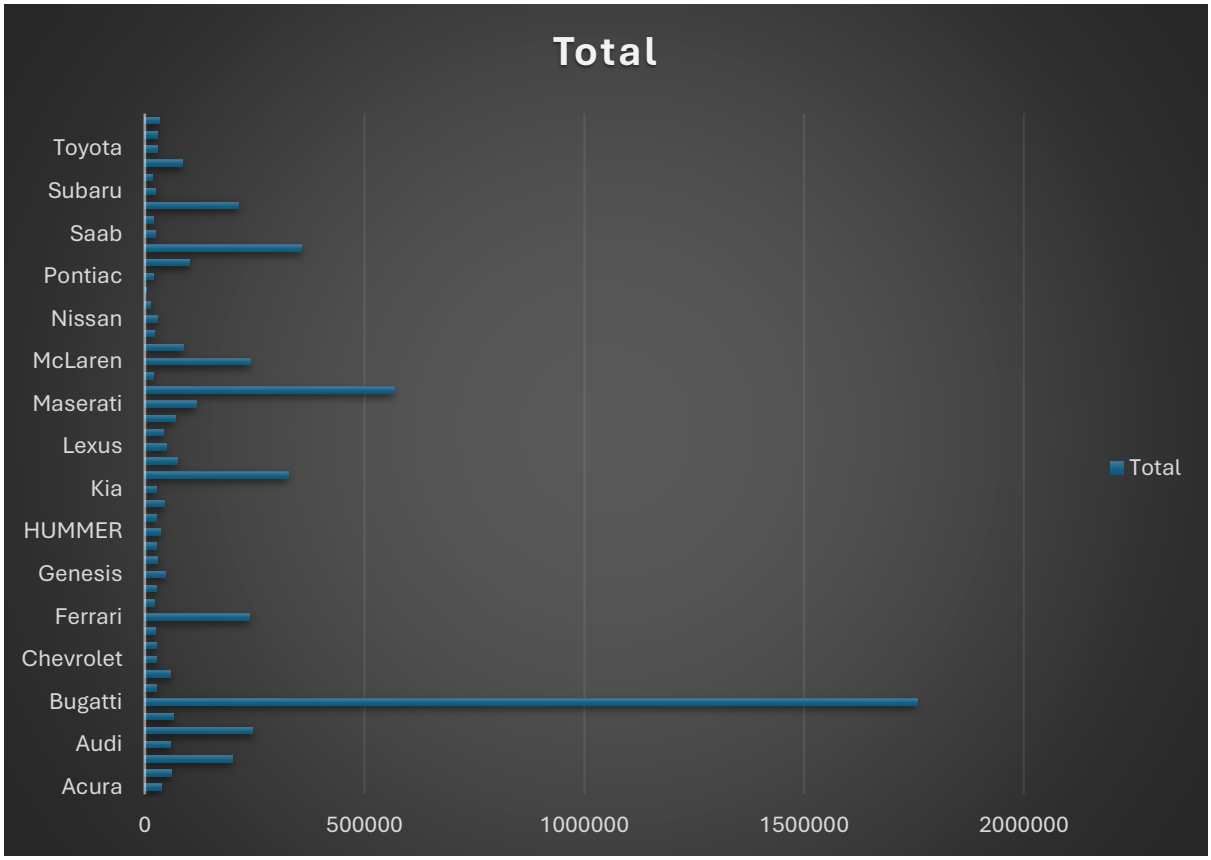
Key Insights:

- **Engine HP (319.59) & Cylinders (11,476.76)** → Strong positive impact on price.
- **Fuel Type (-4254.13)** → Certain fuel types decrease car value.
- **MPG (1739.99)** → Higher fuel efficiency slightly increases price.
- **R^2** = 50.26% → Still, 49.74% of variance is unexplained.



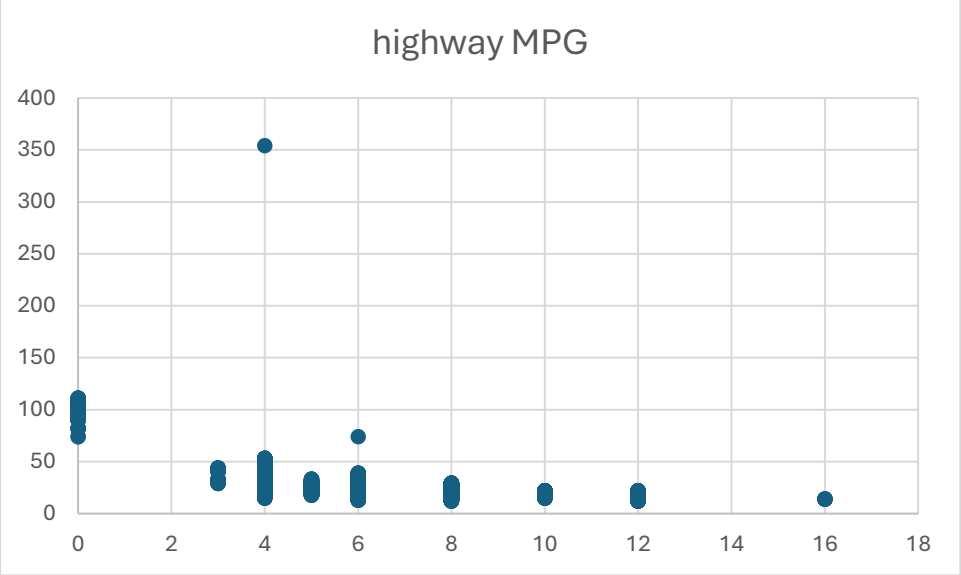
Task 4 : Manufacturer-Wise Price Trends

- Manufacturers like **Porsche, Ferrari, and Rolls-Royce** have the highest average MSRPs.
- Brands like **Hyundai, Ford, and Honda** have lower average MSRPs.
- **Visualization: Bar Chart with Average MSRP per Manufacturer**
    - **Excel Function Used:** AVERAGEIF(range, criteria, average_range)
    - **Pivot Table for Summarization**



Task 5: Fuel Efficiency vs. Engine Cylinders

- A **negative correlation** exists between **Highway MPG and the number of cylinders** = -0.62118
- **Visualization: Scatter Plot with a Trendline + Correlation Coefficient**
    - **Excel Function Used:** Insert Scatter Chart + CORREL(range1, range2)



Recommendations & Business Impact

- **Luxury & Performance Categories:** Drive profitability, and manufacturers should focus on them.
- **Fuel Efficiency:** Significant but not a dominant price driver; marketing should highlight its benefits.
- **Engine HP & Cylinders:** Strong price influencers; manufacturers should consider this when pricing high-performance models.
- **Popularity Factor:** An unexpected finding that should be explored further for consumer preference insights.

Related Excel File
Interactive Dashboard