

ANALYZING THE IMPACT OF CAR FEATURES ON PRICE & PROFITABILITY

PROJECT DESCRIPTION :

Overview :

This project aims to analyze the relationship between various car features and their impact on the price and profitability of cars. By understanding these correlations, car manufacturers and dealers can make informed decisions on product development, marketing strategies, and pricing models.

Business Problem / Question :

The primary question this project addresses is: How do specific car features influence the price and profitability of cars? This includes examining factors like engine type, fuel efficiency, brand, body style, and technological features to determine their impact on the market value and profitability.

Description of the Data Sources:

The data used in this project is sourced from:

- Automotive Industry Databases: Comprehensive data on car features, prices, and sales figures.
- Manufacturer Reports: Information on production costs, profit margins, and technological advancements.
- Market Surveys: Consumer preferences and willingness to pay for different car features.

Data Cleaning and Preprocessing Steps :

- Data Cleaning: Removed duplicates, handled missing values, and corrected any inconsistencies.
- Normalization and Scaling: Standardized numerical data to ensure consistency and comparability across different features.

Assumptions Made During the Project :

- Market Stability: Assumed that the automotive market conditions remain relatively stable during the analysis period.
- Consumer Behavior: Assumed that consumer preferences for certain car features are consistent and not influenced by short-term trends.

By conducting this analysis, the project aims to provide actionable insights into how car features impact price and profitability, ultimately helping stakeholders make data-driven decisions

APPROACH :

1. Analytical Methods:

- Descriptive Statistics: Utilized to summarize and understand the basic features of the data. This includes measures of central tendency (mean, median), dispersion (standard deviation, range), and frequency distributions.
- Visualization: Employed various visual tools like bar charts, scatter plots, histograms, and heatmaps to identify patterns, correlations, and trends in the data.

2. Reasoning Behind Analytical Methods:

- Descriptive Statistics: Chosen to provide a clear summary of the data and to identify any immediate insights or anomalies.
- Visualization: Selected to make the data more understandable and to reveal insights that are not immediately apparent from raw data.

3. Modeling Techniques:

- Linear Regression: Used for predicting car prices based on continuous variables.

4. Challenges and Limitations:

- Data Quality: Encountered issues with missing, inconsistent, or inaccurate data, which required extensive cleaning and preprocessing.
- Feature Selection: Determining the most relevant features from a large dataset was challenging and required careful analysis.
- Assumptions: The analysis made several assumptions (e.g., market stability, consumer behavior) that may not hold in all scenarios, potentially affecting the results.

This approach ensures a comprehensive analysis of how car features impact price and profitability, providing actionable insights for decision-makers in the automotive industry.

TECH-STACK USED:

1. Tools, Languages, and Software:

- Microsoft Excel 365: The primary tool used in this project for data analysis, visualization, and reporting. Excel 365 provides robust capabilities for handling large datasets, creating charts, and performing complex calculations.

2. Reasoning Behind the Choice of Tech Stack:

- Accessibility: Excel 365 is widely available and accessible, making it a practical choice for many users and stakeholders.

- **Functionality:** Excel 365 offers a comprehensive suite of features including PivotTables, data analysis tools, and a variety of chart types, which are essential for detailed data exploration and visualization.
- **Ease of Use:** Excel's user-friendly interface allows for efficient data manipulation and analysis without the need for extensive programming knowledge.

3. Additional Libraries :

- **Excel Add-ins:** Various Excel add-ins, such as the Analysis ToolPak, were employed to extend Excel's functionality and provide additional analytical tools.

By leveraging Microsoft Excel 365 and its powerful features, this project ensures comprehensive data analysis and effective visualization of insights. The chosen tech stack provides the necessary capabilities to explore and understand the impact of car features on price and profitability.

INSIGHTS:

1. Key Insights:

- **Feature Impact on Price:** Luxury features such as high horsepower, advanced technology (e.g., autopilot), and premium interiors significantly increase car prices.
- **Fuel Efficiency and Price:** Cars with higher fuel efficiency, such as electric and hybrid vehicles, tend to have higher initial prices but lower long-term costs, which can enhance profitability.
- **Brand Influence:** Premium brands like Bugatti and Maybach command higher prices due to their reputation, performance, and exclusivity. In contrast, brands like Plymouth and Oldsmobile have lower average prices.
- **Body Style Preferences:** Convertibles and coupes are priced higher due to their sporty appeal and lower production volumes. Conversely, more practical body styles like SUVs and hatchbacks are priced more affordably.

2. Explanation of Insights Relating to Business Problem:

- **Price Determination:** Understanding how specific features influence car prices helps manufacturers set competitive yet profitable pricing strategies.
- **Targeted Marketing:** Insights into fuel efficiency and brand influence enable targeted marketing campaigns that highlight the unique selling points of each model.
- **Product Development:** Knowledge of body style preferences and feature demand assists in making informed decisions regarding new model development and feature enhancements.

3. Recommendations and Conclusions:

- Focus on Premium Features: Manufacturers should invest in developing and marketing premium features that justify higher prices, such as advanced technology and superior performance.
- Promote Fuel Efficiency: Highlighting the long-term cost savings and environmental benefits of fuel-efficient models can attract environmentally conscious customers and justify higher prices.
- Leverage Brand Strength: Premium brands should leverage their reputation to maintain high prices, while more affordable brands can focus on value for money and practicality.
- Diversify Body Styles: Offering a diverse range of body styles, including sporty and practical options, can cater to a broader market and enhance overall sales.

By leveraging these insights, automotive manufacturers and dealers can make data-driven decisions to optimize pricing, enhance profitability, and meet consumer demands effectively.

RESULT :

1. Visualization of the Results:

Visual representations were created using Microsoft Excel 365 to clearly illustrate the findings:

- Tables: Summarize the average prices and fuel efficiencies of different car models and features.
- Graphs: Include bar charts showing the average prices by car brands, scatter plots displaying the relationship between horsepower and price, and pie charts representing the distribution of various body styles.
- Dashboards: Interactive dashboards in Excel aggregate these visualizations, providing an easy-to-navigate interface for exploring the data.

2. Discussion of the Results and Their Implications:

- Impact of Features on Price: The analysis highlighted that premium features such as high horsepower, advanced technology, and luxurious interiors substantially raise car prices.
- Fuel Efficiency: Cars with higher fuel efficiency, particularly electric and hybrid models, have higher initial prices but lower running costs, which enhance profitability over time.
- Brand Influence: Premium brands like Bugatti and Tesla command higher prices due to their reputation for performance and innovation, whereas brands like Plymouth and Oldsmobile are more affordable.
- Body Style Preferences: Convertibles and coupes are more expensive due to their sporty appeal, while practical options like SUVs and hatchbacks are more budget-friendly.

3. Limitations or Uncertainties:

- Data Quality: The accuracy of the analysis relies heavily on the quality of the data used. Inconsistent or incomplete data could skew the results.

4. Future Directions or Additional Analysis:

- Expanded Dataset: Incorporating additional data points, such as maintenance costs and resale values, could provide a more comprehensive analysis.
- Advanced Machine Learning: Utilizing more sophisticated machine learning algorithms, such as neural networks, could improve predictive accuracy.
- Longitudinal Studies: Conducting time-series analysis to observe trends over multiple years would offer deeper insights into market dynamics.
- Customer Sentiment Analysis: Analyzing customer reviews and feedback could provide qualitative insights into consumer preferences and satisfaction.

By clearly presenting the results, discussing their implications, and acknowledging limitations, this project offers valuable insights into how car features impact price and profitability. The findings can help stakeholders make informed, data-driven decisions in the automotive industry.

DRIVE LINK :

ANALYZING THE IMPACT OF CAR FEATURES ON PROFITABILITY & PRICE **GIVEN DATASET**

EXCEL FILE LINK :

<https://docs.google.com/spreadsheets/d/1ybx8jsOaGGchvAyHhs-1BDWn9PlxV13N/edit?usp=sharing&oid=101204343036685814262&rtpof=true&sd=true>

ANALYZING THE IMPACT OF CAR FEATURES ON PROFITABILITY & PRICE **PDF REPORT LINK :**

<https://drive.google.com/file/d/196mbAqhl67fUpCsi6ubeEbjAVQZFWv28/view?usp=sharing>

ANALYZING THE IMPACT OF CAR FEATURES ON PROFITABILITY & PRICE **EXCEL FILE OUTPUT(REPORT) LINK :**

Kindly open All the sheets in given link below in Microsoft Excel to view outputs

https://docs.google.com/spreadsheets/d/1HLrxtV5M_DTvM3FmR9XLtVx3Ep9xnZfd/edit?usp=sharing&oid=101204343036685814262&rtpof=true&sd=true

ANALYZING THE IMPACT OF CAR FEATURES ON PROFITABILITY & PRICE **POWERPOINT PRESENTATION LINK :**

<https://docs.google.com/presentation/d/1ih9XHR613brtLSOO2UviCFoq9iDvb5UK/edit?usp=sharing&oid=101204343036685814262&rtpof=true&sd=true>

ANALYZING THE IMPACT OF CAR FEATURES ON PROFITABILITY & PRICE **SCREENREC**

VIDEO PRESENTATION LINK :

https://drive.google.com/file/d/1_--sX-V941m4ggKpZ_aB9T2G8mUINjQ1/view?usp=sharing

Kindly open All the sheets in given hyperlink below in Microsoft Excel to view



[ANALYSIS EXCEL FILE](#)

PRESENTATION FILE

[REPORT PDF LINK](#)

[VIDEO PRESENTATION FILE](#)

Tasks: Analysis

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

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

OUTPUT :

To find how the popularity of a car model vary across different market categories we first have to use pivot table to find the popularity of a car model across different market categories

The columns used to create a pivot table are Model,Market category &Popularity columns

	A	B	C
1	Model	Market Category	Popularity
2	1 Series M	Factory Tuner,Luxury,High-Performance	3916
3	1 Series	Luxury,Performance	3916
4	1 Series	Luxury,High-Performance	3916
5	1 Series	Luxury,Performance	3916
6	1 Series	Luxury	3916
7	1 Series	Luxury,Performance	3916
8	1 Series	Luxury,Performance	3916
9	1 Series	Luxury,High-Performance	3916
10	1 Series	Luxury	3916
11	1 Series	Luxury	3916

The columns used to make pivot tables are given in the **Sheet 1** in link below :

Kindly open sheet 1 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The pivot table created :

3	Row Labels	Count of Model	Average of Popularity
4	Crossover	1103	1529.0
5	Crossover,Diesel	7	873.0
6	Crossover,Exotic,Luxury,High-Performance	1	238.0
7	Crossover,Exotic,Luxury,Performance	1	238.0
8	Crossover,Factory Tuner,Luxury,High-Performance	26	1823.5
9	Crossover,Factory Tuner,Luxury,Performance	5	2607.4
10	Crossover,Factory Tuner,Performance	4	210.0
11	Crossover,Flex Fuel	64	2073.8
12	Crossover,Flex Fuel,Luxury	10	1173.2
13	Crossover,Flex Fuel,Luxury,Performance	6	1624.0
14	Crossover,Flex Fuel,Performance	6	5657.0
15	Crossover,Hatchback	72	1675.7
16	Crossover,Hatchback,Factory Tuner,Performance	6	2009.0

The pivot table created are given in the **Sheet 3** in link below :

Kindly open sheet 3 given link below in Microsoft Excel to view charts & Data

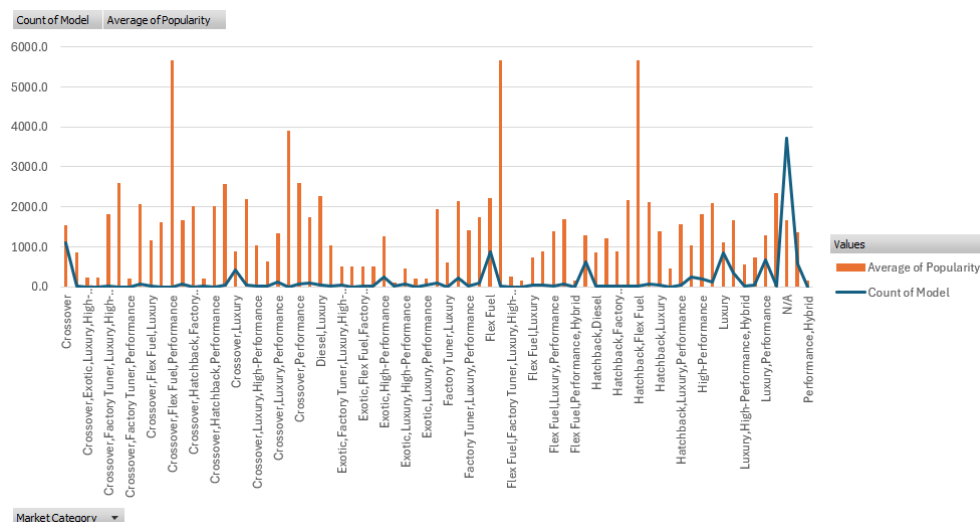
<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

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

OUTPUT :

The Combo chart is created to visualize the relationship between market category & popularity using the pivot table columns

The combo chart created :



The combo chart which shows the relationship between market category & popularity created is given in the **Sheet 3** in link below :

Kindly open sheet 3 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The greatest popularity was for “crossover.Flex,fuel,performance”, “Flex Fuel,Diesel”, “Hatchback, Flex Fuel” markets

This concludes that the varied degrees of popularity of different automobile modes in different market segments offers insights into customer preferences in this sector.

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

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.

OUTPUT :

To find the relationship between a car's engine power and its price we first have to use the scatter plot to find the relationship between a car's engine power & its price

The columns used to plot scatter plot are engine HP & MSRP columns

	A	B
1	Engine HP	MSRP
2	335	46135
3	300	40650
4	300	36350
5	230	29450
6	230	34500
7	230	31200
8	300	44100
9	300	39300
10	230	36900
11	230	37200
12	300	39600

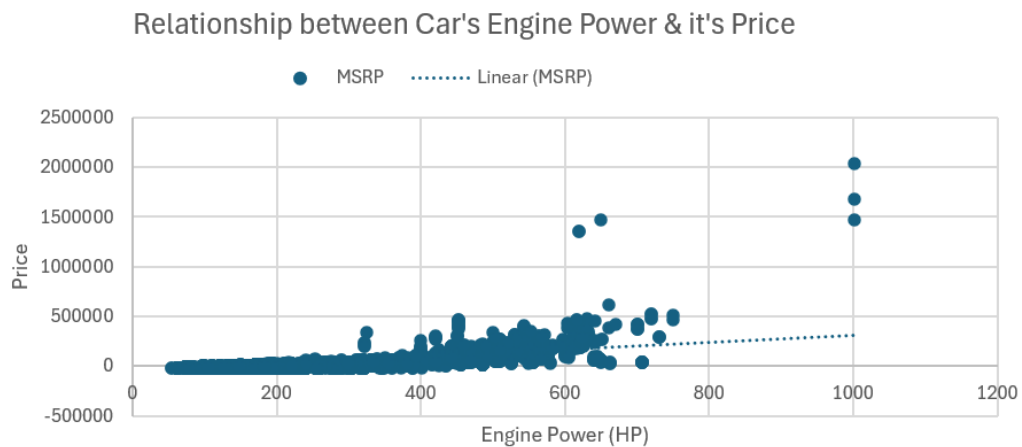
The columns taken to plot a scatter plot are in the **sheet 4** in the given link below :

Kindly open sheet 4 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The scatter plot is created to visualize the relationship between engine power & price using the columns Engine HP & MSRP

The scatter plot created :



The Scatter plot chart which shows the relationship between Engine power & price created is given in the **Sheet 4** in the link below :

Kindly open sheet 4 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The scatter plot shows a general upward trend. This indicates that as the engine power of a car increases, its price also tends to increase.

Correlation: The trendline further supports this positive correlation. The upward slope of the trendline suggests that there's a positive association between engine power and price.

The scatter plot reveals a positive correlation between engine power and price, meaning that generally, cars with higher engine power tend to be more expensive. However, the spread of data points indicates that other factors also contribute to the price variation.

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

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.

OUTPUT :

To find which car feature is most important in determining a car's price we first use Regression analysis to identify the variables that have the strongest relationship with a car's price

The columns used to do regression analysis are Engine HP, Engine Cylinders, Number of Doors, Highway MPG, City Mpg, MSRP columns

	A	B	C	D	E	F
1	Engine HP	Engine Cylinders	Number of Doors	highway MPG	city mpg	MSRP
2	335	6	2	26	19	46135
3	300	6	2	28	19	40650
4	300	6	2	28	20	36350
5	230	6	2	28	18	29450
6	230	6	2	28	18	34500
7	230	6	2	28	18	31200
8	300	6	2	26	17	44100

The columns taken to do Regression analysis are given in **Sheet 5** in the link below :

Kindly open sheet 5 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The Regression Analysis which is performed on Engine HP,Engine Cylinders,Number of Doors,Highway MPG,City Mpg,MSRP columns :

	A	B	C	D	E	F			
1	SUMMARY OUTPUT								
2									
3	Regression Statistics								
4	Multiple R	0.680708139							
5	R Square	0.46336357							
6	Adjusted R Square	0.463136297							
7	Standard Error	44170.77827							
8	Observations	11812							
9									
10	ANOVA								
11		df	SS	MS	F	Significance F			
12	Regression	5	1.98891E+13	3.97782E+12	2038.799457		0		
13	Residual	11806	2.30342E+13	1951057653					
14	Total	11811	4.29233E+13						
15									
16		Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
17	Intercept	-101601.736	3684.351697	-27.57655738	2.765E-162	-108823.673	-94379.799	-108823.673	-94379.79896
18	Engine HP	322.7465574	6.01767382	53.63310924	0	310.9509241	334.5421906	310.9509241	334.5421906
19	Engine Cylinders	6989.177662	439.6449924	15.89732121	2.53591E-56	6127.400961	7850.954363	6127.400961	7850.954363
20	Number of Doors	-4472.158125	465.7180593	-9.602715711	9.35015E-22	-5385.042338	-3559.27391	-5385.042338	-3559.273912
21	highway MPG	570.1808088	105.7839778	5.390048859	7.17937E-08	362.826764	777.5348535	362.826764	777.5348535
22	city mpg	1163.755457	121.9978136	9.539150113	1.72109E-21	924.61962	1402.891294	924.61962	1402.891294

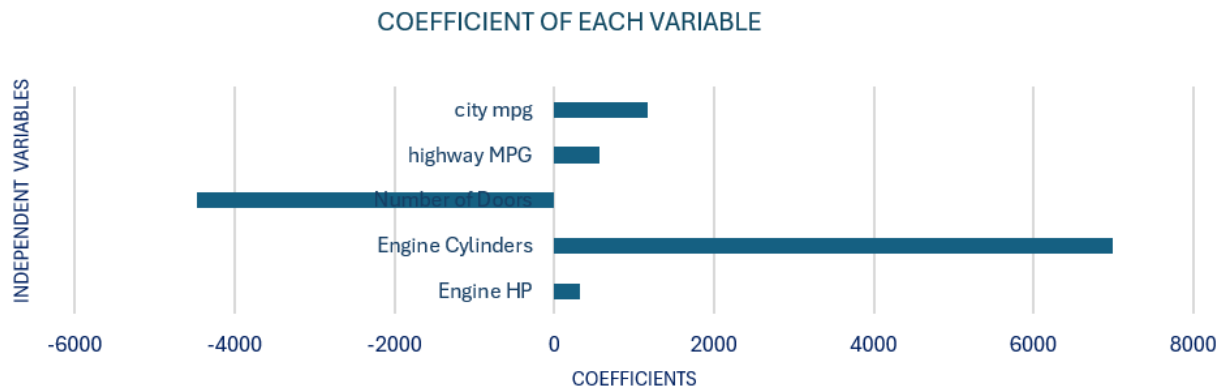
The Regression Analysis is done in the **sheet 6** in the given link below :

Kindly open sheet 6 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

A bar chart is created to visualize the variables relative importance & the bar chart is created using columns Engine HP, Engine cylinders ,no of doors, highway MPG,city MPG& MSRP

The bar chart created :



The Bar chart which shows the variables relative importance created is given in the **Sheet6** in the link below :

Kindly open sheet 6 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

- Engine Cylinders: With a high coefficient of 6989.177662 , the number of engine cylinders has the largest correlation with a car's price. This means that as the number of engine cylinders increases, the car's price tends to be higher.

- Number of Doors: This factor has a negative coefficient of -4472.158125, indicating that it has the least correlation with car pricing. More doors are associated with a decrease in the car's price.

the price of a car is mostly influenced by the number of engine cylinders, whereas the number of doors has a minimal impact.

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

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

OUTPUT :

To find how the average price of a car vary across different manufacturers we first have to use pivot table to visualize the average price of the cars for each manufacturer

The columns taken to create the pivot table are Make ,MSRP columns

	A	B
1	Make	MSRP
2	BMW	46135
3	BMW	40650
4	BMW	36350
5	BMW	29450
6	BMW	34500
7	BMW	31200
8	BMW	44100
9	BMW	39300
10	BMW	36900
11	BMW	37200
12	BMW	39600
13	BMW	31500
14	BMW	44400
15	BMW	37200

The columns taken to create a pivot table is given in **Sheet 7** in the link below :

Kindly open sheet 7 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The pivot table created :

3	Make	Average of MSRP
4	Acura	34887.5873
5	Alfa Romeo	61600
6	Aston Martin	197910.3763
7	Audi	53452.1128
8	Bentley	247169.3243
9	BMW	61546.76347
10	Bugatti	1757223.667
11	Buick	28206.61224
12	Cadillac	56231.31738
13	Chevrolet	28273.35695
14	Chrysler	26722.96257
15	Dodge	22390.05911
16	Ferrari	237383.8235
17	FIAT	22206.01695
18	Ford	27393.42051
19	Genesis	46616.66667
20	GMC	30493.29903
21	Honda	26629.81879
22	HUMMER	36464.41176
23	Hyundai	24597.0363
24	Infiniti	42394.21212

The pivot table created is in **Sheet 8** in the given link below :

Kindly open sheet 8 given link below in Microsoft Excel to view charts

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

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

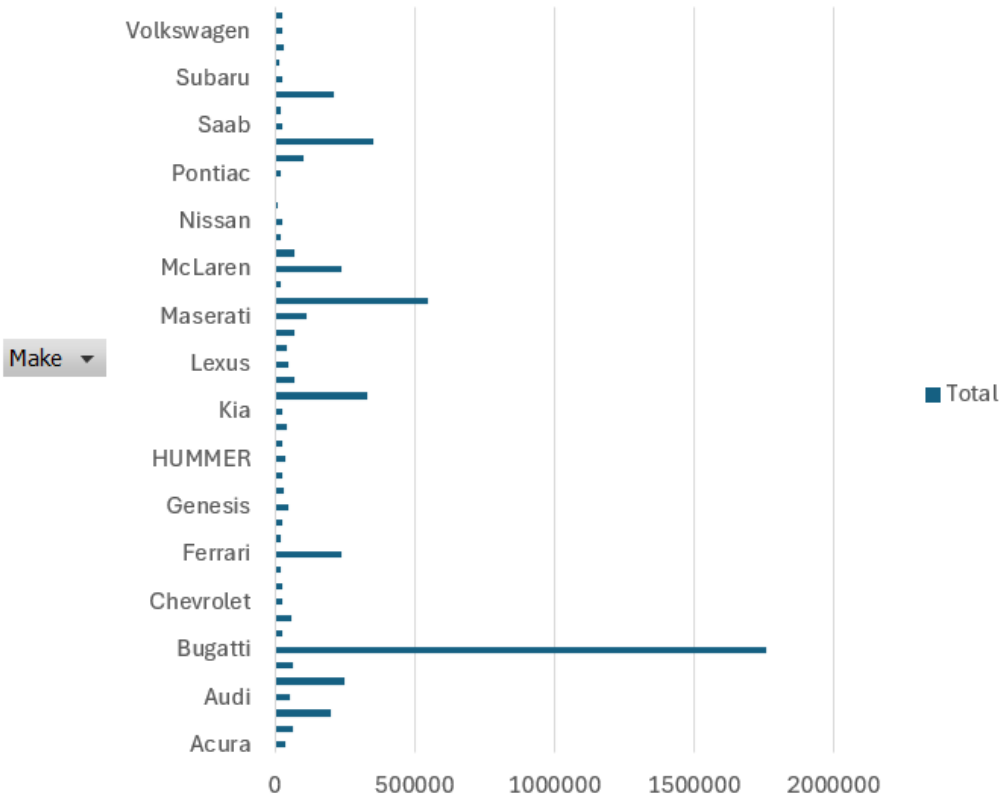
OUTPUT :

A bar chart is created to visualize the relationship between manufacturer and average price using the pivot table columns .

The bar chart created :

Average of MSRP

Relationship between the manufacturer & Average Price



A bar chart which is created to visualize the relationship between manufacturer and average price is in **sheet 8** in the given link below :

Kindly open sheet 8 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

- Bugatti: Has the highest average price of any brand, which is \$1,757,223.667
- Maybach: Follows with an average price of \$546,221.875

This information can help car manufacturers with pricing and positioning initiatives. By analyzing average car prices, manufacturers can gain insights into the automotive industry's pricing landscape. This helps them position their products strategically, adjust pricing to align with consumer expectations and competitor prices, and ultimately enhance their competitiveness and profitability.

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

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

OUTPUT :

To find the relationship between fuel efficiency and the no of cylinders in a car's engine we have to first use scatter plot to visualize the relationship between the no of cylinders & highway MPG and use a trendline to estimate the slope of the relationship and assess its significance

The Columns used to plot a scatter plot are Engine Cylinders & Highway MPG columns

	A	B
1	Engine Cylinders	highway MPG
2	6	26
3	6	28
4	6	28
5	6	28
6	6	28
7	6	28
8	6	26
9	6	28
10	6	28
11	6	27
12	6	28
13	6	28
14	6	28
15	6	28
16	6	28
17	6	25

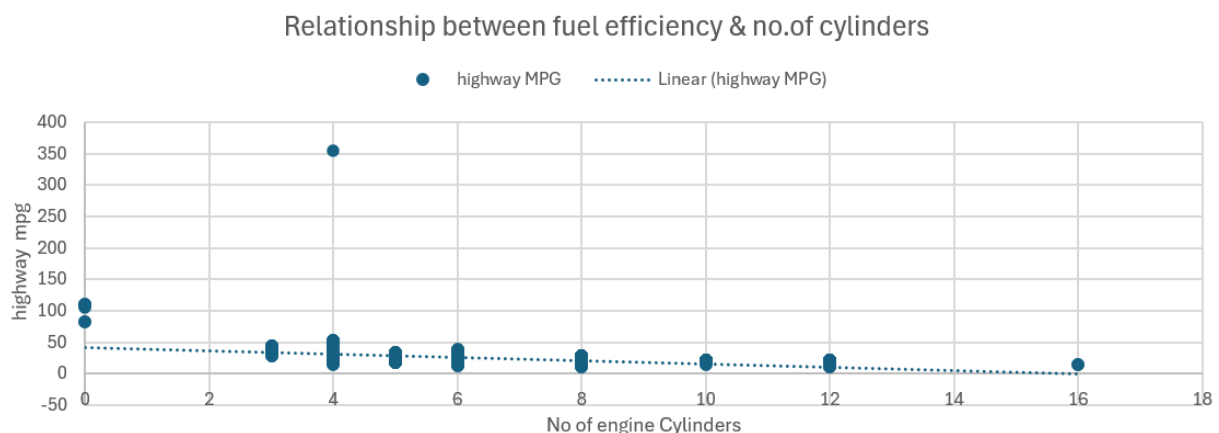
The Columns used to plot a scatter plot are in the **Sheet 9** in the given link below :

Kindly open sheet 9 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

A scatter plot is created to visualize the relationship between the no of cylinders & highway MPG and a trendline on the scatter plot is created to estimate the slope of the relationship and assess its significance & the scatter plot is created using Engine cylinder & Highway MPG columns

The scatter plot created :



A Scatter plot which is created to visualize the relationship between no of cylinders and highway MPG is in **sheet 9** in the given link below :

Kindly open sheet 9 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

the correlation coefficient is found between the number of cylinders and highway MPG to quantify the strength and direction of the relationship.

The Correlation Coefficient of Engine Cylinders & Highway MPG column is found using CORREL function :

= CORREL(A2:A11813,B2:B11813)

= -0.620312551

The Correlation Coefficient of Engine Cylinders & Highway MPG column is -0.620312551. The investigation shows a negative relationship between highway MPG and the number of engine cylinders, meaning that as the cylinder count increases, highway MPG decreases. For example, cars with 16 cylinders have the lowest highway MPG of 14, illustrating the impact of engine capacity on fuel economy.

A correlation coefficient of -0.62 confirms this significant negative relationship, indicating that higher cylinder counts generally lead to lower highway fuel efficiency.

This analysis quantifies how higher cylinder counts typically result in lower highway fuel efficiency.

Building the Dashboard :

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

OUTPUT :

To find how the distribution of car prices vary by brand and body style, we first have to use pivot tables to find the total MSRP for each brand and body style.

The columns used to create pivot tables are Make, Vehicle Style, MSRP columns.

	A	B	C
1	Make	Vehicle Style	MSRP
2	BMW	Coupe	46135
3	BMW	Convertible	40650
4	BMW	Coupe	36350
5	BMW	Coupe	29450
6	BMW	Convertible	34500
7	BMW	Coupe	31200
8	BMW	Convertible	44100
9	BMW	Coupe	39300
10	BMW	Convertible	36900
11	BMW	Convertible	37200
12	BMW	Coupe	39600

The columns used to create pivot tables are in the **Sheet 10** in the given link below :

Kindly open sheet 10 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The pivot table created :

4	Sum of MSRP	Column Labels																	
5	Make	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger Van	Regular Cab Pickup	Sedan	Wagon	Grand Total	
6	Acura	480917		357440	2663505					793748						4294702	201360	8791672	
7	Alfa Romeo							129800		178200								308000	
8	Aston Martin							7321655		9635275						1448735		18405665	
9	Audi	4000			2674900			3291405		3556290						7158348	847350	17532293	
10	Bentley							6012870		6356760						5620900		18290530	
11	BMW	80097		1144950	3160950			4502671		3419051						7989300	259600	20556619	
12	Bugatti									5271671								5271671	
13	Buick				2141770			179325		18534					330065	2850590	8212	5528496	
14	Cadillac				7182555			985607		2953574		599150				9418847	1184100	22323833	
15	Chevrolet	8000	213310	1209735	6569568	420150	78688	2953245	106300	3504525	5927617		3117951	1178515	607670	2260032	3068812	300675	31524793
16	Chrysler	98805			250545			630105		114510				922295		2479859	501075	4987194	
17	Dodge	48000	44000	18000	2572405	60520	338497	12000		3264627	2235775		864172	557425	70708	719408	2417585	793055	14016177
18	Ferrari							4723811		11418289									16142100
19	FIAT	325315			369305			327965									287570		1310155
20	Ford	36000	479873	480155	4370871	680770	566351	730007		1398144	3812353	2285584	1271330	2431898	1299240	2299348	1635565	23777489	
21	Genesis																139850		139850

The pivot table is in the **sheet 11** in the given link below

Kindly open sheet 11 given link below in Microsoft Excel to view charts & Data

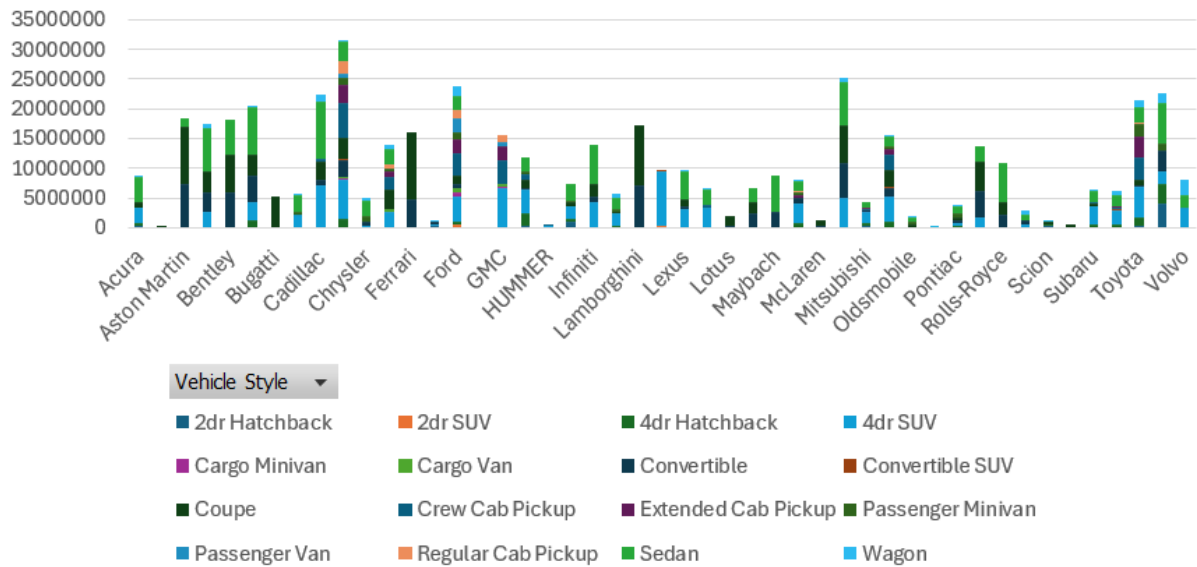
<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

Stacked column chart is created to show the distribution of car prices by brand and body style and slicers are used to make the chart interactive and Stacked column chart is created using the pivot table columns

Stacked column created with sliders :

Sum of MSRP

Distribution of car prices by brand & body style



Make

Make	Vehicle Style
Acura	2dr Hatchback
Alfa Romeo	2dr SUV
Aston Martin	4dr Hatchback
Audi	4dr SUV
Bentley	Cargo Minivan
BMW	Cargo Van
Bugatti	Convertible
Buick	Convertible SUV

Stacked column chart which is created to show the distribution of car prices by brand and body style and slicers is in the **sheet 11** in the given link below :

Kindly open sheet 11 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtmpof=true&sd=true>

Chevrolet leads with the highest total prices amounting to \$31524793

- Mercedes-Benz follows with a total price of \$25181309
- Sedan have the highest total cost among car types, totaling \$117474790
- Four-door SUV come next with a total of \$100258517

These insights are valuable for the car industry's marketing strategies, product development, and pricing decisions.

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

OUTPUT :

To find Which car brands have the highest and lowest average MSRPs, and how does this vary by body style we have to first use Pivot tables to find the average MSRP for each brand and body style

The columns used to create pivot table are Make,Vehicle Style & MSRP columns

	A	B	C
1	Make	Vehicle Style	MSRP
2	BMW	Coupe	46135
3	BMW	Convertible	40650
4	BMW	Coupe	36350
5	BMW	Coupe	29450
6	BMW	Convertible	34500
7	BMW	Coupe	31200
8	BMW	Convertible	44100
9	BMW	Coupe	39300
10	BMW	Convertible	36900
11	BMW	Convertible	37200
12	BMW	Coupe	39600

The columns used to create a pivot table is in **sheet 12** in the given link below :

Kindly open sheet 12 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The pivot table created :

3	Average of MSRP Column Labels														
4	Make	2dr Hatchback	2dr SUV	4dr Hatchback	4dr SUV	Cargo Minivan	Cargo Van	Convertible	Convertible SUV	Coupe	Crew Cab Pickup	Extended Cab Pickup	Passenger Minivan	Passenger Van	Regular Cab Pickup
5	Acura	17175.60714		51062.85714	42959.75806					39687.4					
6	Alfa Romeo							64900		59400					
7	Aston Martin							203379.3056		192705.5					
8	Audi	2000			48634.54545			70029.89362		93586.57895					
9	Bentley							250536.25		254270.4					
10	BMW	26699		54521.42857	58536.11111			63417.90141		51803.80303					
11	Bugatti									1757223.667					
12	Buick				33996.34921			25617.85714		2059.333333			30005.90909		
13	Cadillac				72551.06061			70400.5		45439.6	66572.22222				
14	Chevrolet	2000	8887.916667	18329.31818	32046.67317	20007.14286	7153.454545	62835	17716.66667	38939.16667	39255.74172	24170.16279	24552.39583	24306.8	19824.84211
15	Chrysler	32935			35792.14286			24234.80769		19085			29751.45161		
16	Dodge	2000	2000	2000	30992.83133	20173.33333	12536.92593	2000		45980.66197	31052.43056	13938.25806	25337.5	14141.6	9342.961039
17	Ferrari							214718.6818		248223.6739					
18	FIAT	19136.17647			24620.33333			23426.07143							
19	Ford	2000	13710.65714	18467.5	42027.60577	21274.0625	17698.46875	34762.2381		34101.07317	41438.61957	23808.16667	23115.09091	32425.30667	17797.80822

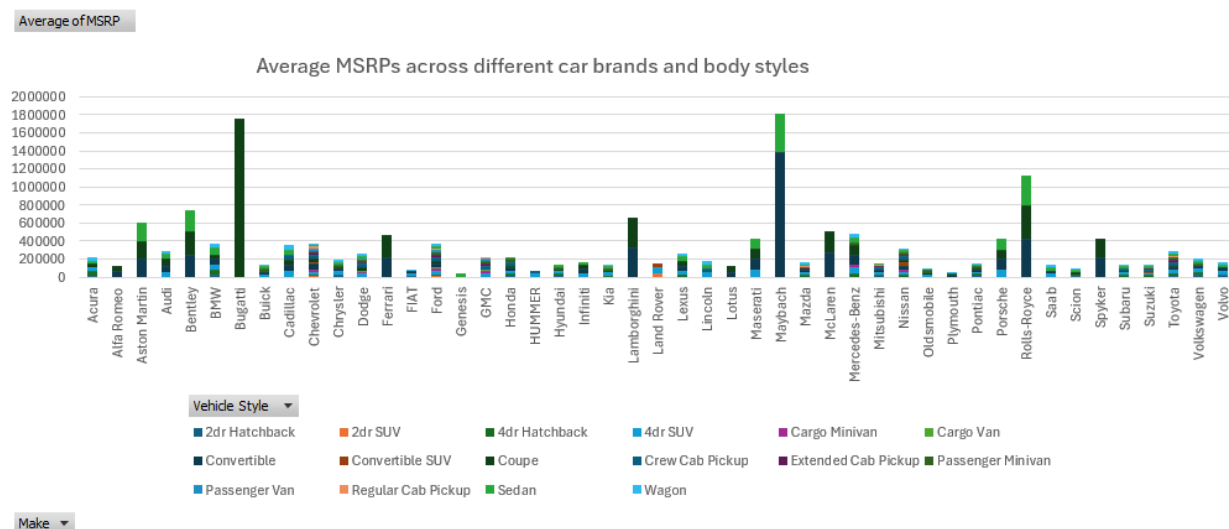
The pivot table is in the **sheet 13** in the given link below :

Kindly open sheet 13 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The Clustered column chart is created to compare the average MSRPs across different car brands and body styles and Clustered column chart is created using the pivot table columns

The clustered column chart created:



The Clustered column chart which is created to compare the average MSRPs across different car brands and body styles are in the **sheet 13** in the given link below :

Kindly open sheet 13 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

Brand Analysis:

- Bugatti : Highest average price of \$1757223.667
- Maybach: Second highest average price at \$546221.875
- Plymouth: Lowest average price per brand at \$3122.902439
- Oldsmobile: Second lowest average price at \$11542.54

- Body Style Analysis:

- Convertibles: Highest average price at \$84224.28499
- Coupes: Second highest average price at \$76900.70504
- 2-door SUVs: Most affordable at \$. 10115.18841
- 2-door Hatchbacks: Second most affordable at \$16778.65408

This research provides valuable insights into price patterns across various car markets.

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

OUTPUT :

To find How different feature such as transmission type affect the MSRP, and how does this vary by body style we have to first use Pivot tables to find the average MSRP for each combination of transmission type and body style

The columns used to create pivot tables are Transmission type ,MSRP & vehicle style columns

	A	B	C
1	Transmission Type	MSRP	Vehicle Style
2	MANUAL	46135	Coupe
3	MANUAL	40650	Convertible
4	MANUAL	36350	Coupe
5	MANUAL	29450	Coupe
6	MANUAL	34500	Convertible
7	MANUAL	31200	Coupe
8	MANUAL	44100	Convertible
9	MANUAL	39300	Coupe
10	MANUAL	36900	Convertible
11	MANUAL	37200	Convertible
12	MANUAL	39600	Coupe
13	MANUAL	31500	Coupe
14	MANUAL	44400	Convertible
15	MANUAL	37200	Convertible
16	MANUAL	31500	Coupe
17	MANUAL	48250	Convertible

The columns used to create a pivot table are in **sheet 14** in the given link below :

Kindly open sheet 14 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The pivot table created :

Average of MSRP	Column Labels					
VEHICLE STYLE	AUTOMATED	MANUAL	AUTOMAT	DIRECT_D	MANUAL	UNKNOWN
Grand Total	27180.96491	20926.5	13353.7	7361.5	16778.65408	
2dr Hatchback		18615.2	6303.81	2371	10115.18841	
2dr SUV	29249.07407	23833.7	34511.9	17594.4	22086.30236	
4dr Hatchback	40451.15385	41555.2	15426.5		40426.82137	
4dr SUV		20910.9			20910.85714	
Cargo Minivan		15280.2			15280.22105	
Cargo Van	121256.6444	90637.4	62357.8	5783.5	84224.28499	
Convertible		38925.5	9233.14		17424.13793	
Convertible SUV	245588.3571	63852	51070.5	2000	76900.70504	
Coupe		37744.1	28360.5		37220.46696	
Crew Cab Pickup		30637.3	10884.2		22488.77689	
Extended Cab Pickup		26392	4405.33		25591.51214	
Passenger Minivan		29015.2			29015.20313	
Passenger Van		28536.8	7557.77	2000	15953.70918	
Regular Cab Pickup	47498.70813	43794.4	27822.5	17119.2	38989.30966	
Sedan	31985.27778	27613.2	17844.1		25483.90119	
Wagon						
Grand Total	99195.584	41137.3	33620	26671.4	3040.74	40559.93532

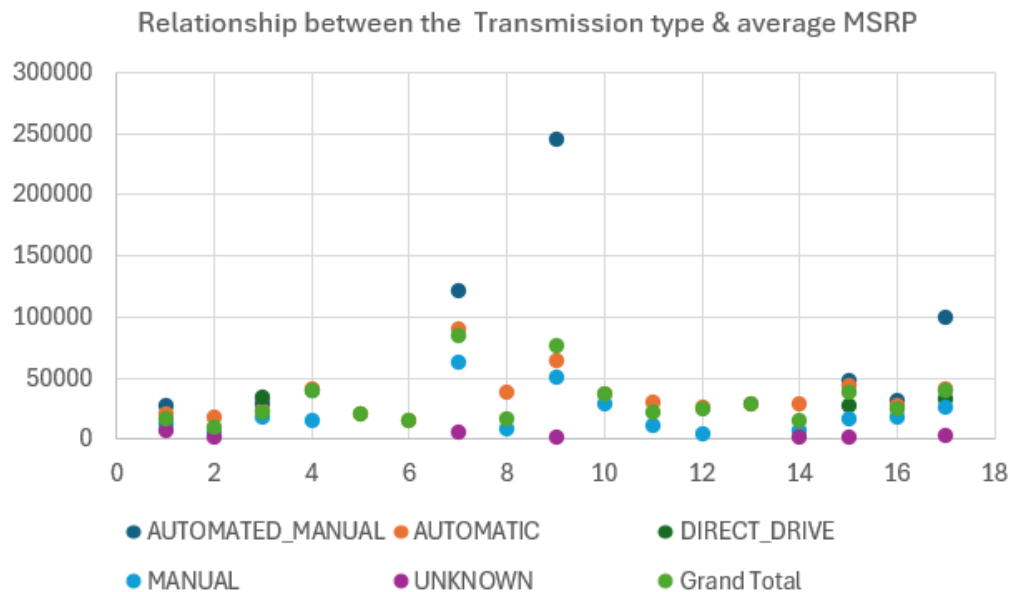
The pivot table is in the **sheet 15** in the given link below :

Kindly open sheet 15 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

Scatter plot chart is created to visualize the relationship between MSRP and transmission type, with different symbols for each body style and the scatter plot chart is created using the pivot table columns

The scatter plot chart created :



The Scatter plot chart which is created to visualize the relationship between MSRP and transmission type, with different symbols for each body style is in the **sheet 15** in the given link below :

Kindly open sheet 15 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

Transmission Types

- Direct Drive: Average price of \$33620
- Automated Manual: Highest average price at \$99195.584
- Manual : Second highest average price at \$26671.4
- Unknown: Lowest average price at \$3040.737

Body Shapes

- Coupes: Average price of \$76900.70504
- Convertibles: Highest average price at \$84224.28499
- 2-Door SUVs: Least expensive at \$10115.18841

- 2-Door Hatchbacks: Next most affordable at \$16778.65408

These insights provide useful information for understanding price trends in the car industry across various body shapes and gearbox types.

When considering transmission types, automated manual transmission has the highest average price, closely followed by direct drive transmission. In terms of body shape, convertibles have the highest average price, with coupes .Manual transmission ranks second, while unknown transmission has the lowest average price. Among body shapes, 2-door SUVs are the least expensive, followed by 2-door hatchbacks.

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

OUTPUT :

To find How the fuel efficiency of cars vary across different body styles and model years first we have to use Pivot tables to find the average MPG for each combination of body style and model year

The columns used to create pivot table are Year, vehicle style, Highway MPG & city MPG columns

	A	B	C	D
1	Year	Vehicle Style	highway MPG	city mpg
2	2011	Coupe	26	19
3	2011	Convertible	28	19
4	2011	Coupe	28	20
5	2011	Coupe	28	18
6	2011	Convertible	28	18
7	2012	Coupe	28	18
8	2012	Convertible	26	17
9	2012	Coupe	28	20
10	2012	Convertible	28	18
11	2013	Convertible	27	18
12	2013	Coupe	28	20
13	2013	Coupe	28	19
14	2013	Convertible	28	19
15	2013	Convertible	28	19
16	2013	Coupe	28	19

The columns used to create pivot table are in the **sheet 16** in the given link below :

Kindly open sheet 16 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The pivot table created :

3	Year	Average of highway MPG
4	1990	23.1
5	1991	22.2
6	1992	24.1
7	1993	24.2
8	1994	23.9
9	1995	23.2
10	1996	23.7
11	1997	22.3
12	1998	21.9
13	1999	23.0
14	2000	24.0
15	2001	23.7
16	2002	22.8
17	2003	22.7
18	2004	23.1
19	2005	23.6
20	2006	23.4
21	2007	21.9
22	2008	23.0
23	2009	23.9
24	2010	24.2
25	2011	25.2
26	2012	26.3
27	2013	27.4
28	2014	26.9
29	2015	28.5
30	2016	28.5
31	2017	28.3
32	Grand Total	26.3

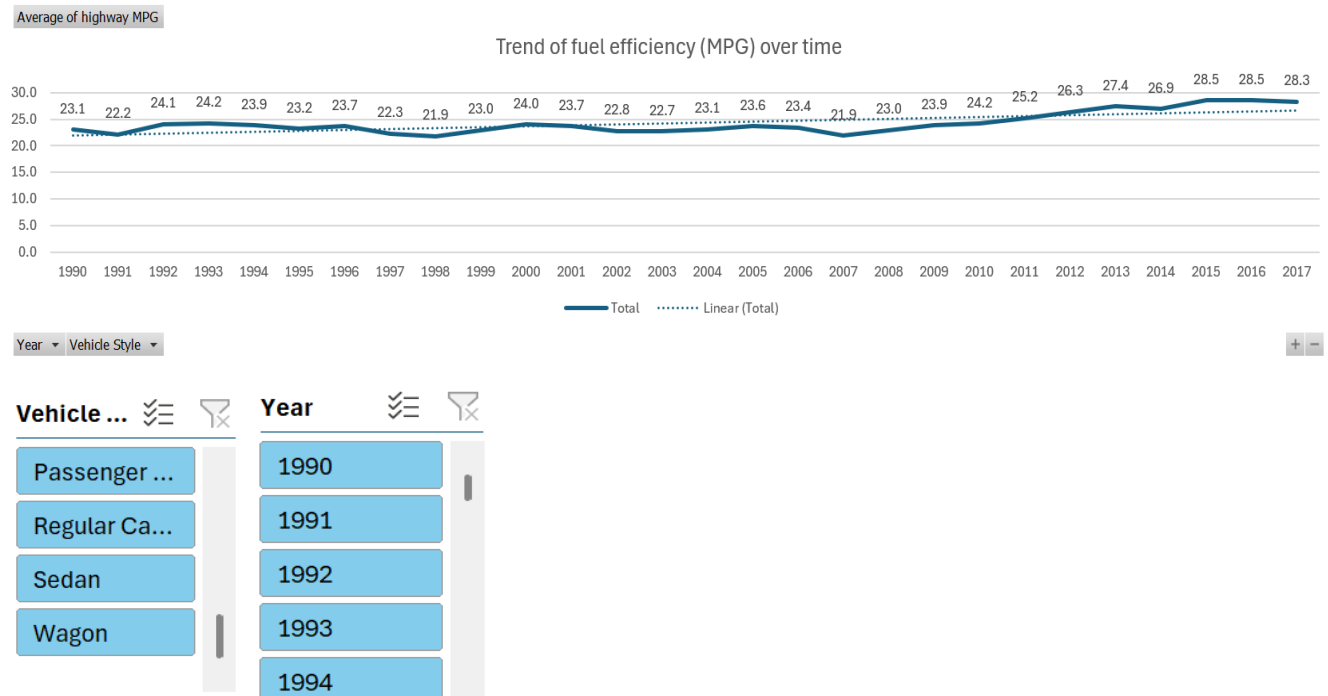
The pivot table is in the **sheet 17** in the given link below :

Kindly open sheet 17 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

Line chart is created to visualize the trend of fuel efficiency (MPG) over time for each body style and the line chart is created using the pivot table columns

The line chart created with Sliders :



The Line chart which is created to visualize the trend of fuel efficiency (MPG) over time for each body style is in the **sheet 17** in the given link below :

Kindly open sheet 17 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The data indicates a trend of increased fuel efficiency as car model years progress, likely due to advancements in automotive technology and regulations focused on reducing emissions and enhancing fuel economy. In 2016, the highest average highway fuel efficiency, with an average MPG was 28.5 , achieved by four-door hatchbacks, reflecting efforts to improve fuel efficiency. Conversely, cargo vans had the lowest average highway MPG at 16, highlighting variations in fuel efficiency across different vehicle categories.

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

OUTPUT :

To find How the car's horsepower, MPG, and price vary across different Brands we first have to use pivot tables to find average horsepower, MPG, and MSRP for each car brand

The columns used to create pivot table are Make,Engine HP,Highway MPG,MSRP columns

	A	B	C	D
1	Make	Engine HP	highway MPG	MSRP
2	BMW	335	26	46135
3	BMW	300	28	40650
4	BMW	300	28	36350
5	BMW	230	28	29450
6	BMW	230	28	34500
7	BMW	230	28	31200
8	BMW	300	26	44100
9	BMW	300	28	39300
10	BMW	230	28	36900
11	BMW	230	27	37200
12	BMW	300	28	39600
13	BMW	230	28	31500
14	BMW	300	28	44400

The columns used to create a pivot table is in the **sheet 18** in the given link below :

Kindly open sheet 18 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The pivot table created :

3	Make	Average of Engine HP	Average of highway MPG	Average of MSRP
4	Acura	244.797619	28.11111111	34887.5873
5	Alfa Romeo	237	34	61600
6	Aston Martin	484.3225806	18.89247312	197910.3763
7	Audi	277.695122	28.82317073	53452.1128
8	Bentley	533.8513514	18.90540541	247169.3243
9	BMW	326.9071856	29.24550898	61546.76347
10	Bugatti	1001	14	1757223.667
11	Buick	219.244898	26.94897959	28206.61224
12	Cadillac	332.3098237	25.23677582	56231.31738
13	Chevrolet	247.0565022	25.6690583	28273.35695
14	Chrysler	229.1390374	26.36898396	26722.96257
15	Dodge	244.4153355	22.34504792	22390.05911
16	Ferrari	509.9117647	15.72058824	237383.8235
17	FIAT	143.559322	33.91525424	22206.01695
18	Ford	243.0979263	23.74078341	27393.42051
19	Genesis	347.3333333	25.33333333	46616.66667
20	GMC	259.8446602	21.4038835	30493.29903
21	Honda	195.7494407	32.25055928	26629.81879
22	HUMMER	261.2352941	17.29411765	36464.41176
23	Hyundai	201.9174917	30.39273927	24597.0363
24	Infiniti	310.0666667	24.77878788	42394.21212
25	Kia	206.8274336	29.29646018	25112.38938

The Pivot table created is in the **sheet 19** in the given link below :

Kindly open sheet 19 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/15EpHN5oN-UiHcCwMF3B81wkcF797FYg-/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>

The Bubble chart is created to visualize the relationship between horsepower, MPG, and price across different car brands. different colors has been assigned to each brand and

- Highest Average Highway MPG: 34

- Greatest Average Engine Horsepower: 237
- Highest Average Price: \$ 61600
- Bugatti is Known for high-performance cars with top-tier engine power and pricing, appealing to those seeking unmatched performance.
- Alfa Romeo emphasizes performance and style, with a range of gasoline and plug-in hybrid vehicles. They offer powerful engines and sporty designs, appealing to those who enjoy driving dynamics.

Alfa Romeo appeals to driving enthusiasts who value performance and design.

The comparison illustrates different goals and preferences within the automobile industry, catering to a broad spectrum of customers with varying requirements and interests.

BUILDING THE DASHBOARD:

you need to create the Interactive Dashboard.

OUTPUT :

To create a interactive dashboard filters and slicers are used in the dashboard .

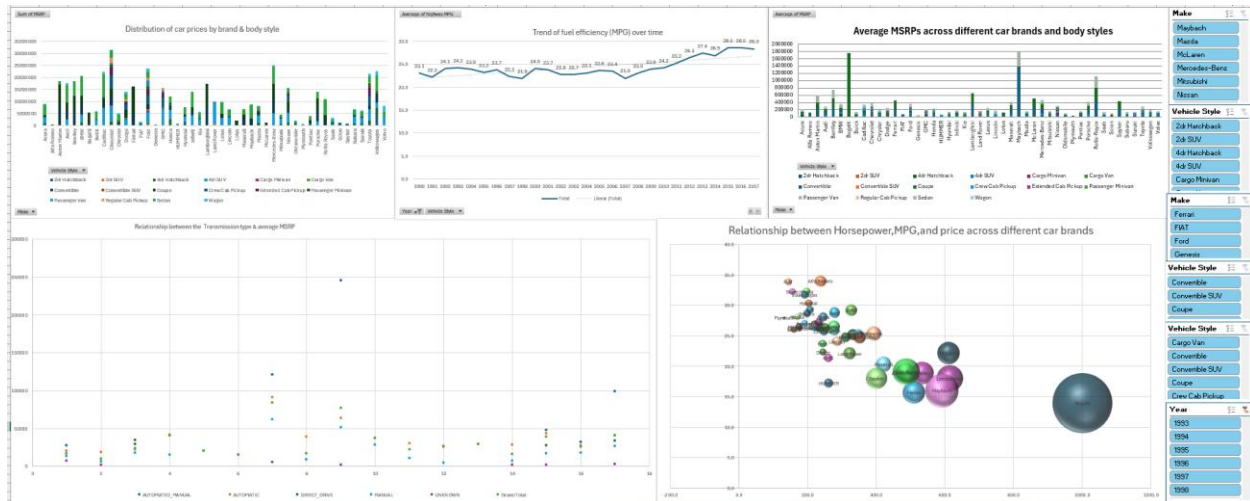
DASHBOARD :

The interactive dashboard is created by combining all the last 5 charts which are :

- 1.Distribution of car prices by brand & body style Chart
- 2.Trend of Fuel efficiency over Time Chart
- 3.Average MSRPs across different car brands & body styles Chart
- 4.Relationship between Transmission type & average MSRP Chart
- 5.Relationship between Horsepower, MPG and price across different car brands chart

Along with their respective sliders attached and the necessary filters can be applied

The Interactive Dashboard created :



The Interactive Dashboard which is created by combining all the 5 last charts with sliders attached is in the **sheet 22** in the given link below :

Kindly open sheet 22 given link below in Microsoft Excel to view charts & Data

<https://docs.google.com/spreadsheets/d/1dGZTFve0RqLlgmviySxQ3sDRz2nMmot4/edit?usp=sharing&ouid=101204343036685814262&rtpof=true&sd=true>