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| TIRE PRICE ANALYSIS | Abstract  This project analyzes tire pricing and customer preferences in the automotive industry using a dataset of 4350 samples with 11 attributes. Through exploratory data analysis, we examine key metrics such as selling price distribution, load index frequencies, and customer ratings. Our findings provide actionable recommendations for optimizing tire procurement processes, enhancing product quality, and improving customer satisfaction. |

# Project Title

* Tire Price Analysis

# Contributors

* Joyce Kihodu
* Manasa Kathula
* Tobi Oladimeji
* Mohammed Arsad

# Introduction:

Our dataset comprises 4350 samples detailing various attributes of automotive tires, from brand and model to pricing and customer ratings. We chose this dataset to explore the dynamics of tire pricing and customer preferences within the automotive industry.

Our decision stems from the critical role tires play in vehicle performance and safety, making understanding market trends essential for manufacturers and suppliers. With a focus on data-driven decision-making, our project aims to provide actionable insights to optimize procurement processes and enhance product quality.  
  
**Dataset**: <https://www.kaggle.com/datasets/devsubhash/car-tyres-dataset/data>  
  
**Dataset description:** The "Tire Price Analysis" dataset provides comprehensive information on tire products, including pricing details, attributes, and customer ratings. With a focus on automotive tires, this dataset offers valuable insights into market trends, pricing dynamics, and customer preferences within the tire.  
  
**About Dataset**

This dataset contains 4350 samples with 11 attributes. There are some missing values in this dataset. Here are the columns in this dataset-

1. Brand: This indicates the Automotive Brand for which the product i.e. Tyres are suitable.
2. Model: This is the Car model for which the Tyres are a good match.
3. Submodel: This indicates the type of vehicle model i.e. Diesel, Petrol etc.
4. Tyre Brand: This column has the names of major Tyres manufacturers for this particular Brand - Maruti.
5. Serial No.: This is the Tyre model number.
6. Type: This indicates the type of Tyres i.e. Tube or Tubeless.
7. Load Index: This is the maximum weight that each tyre of the vehicle can carry at the maximum speed limit as specified by the manufacturer.
8. Size: This is the standard tyre size indicating the width, profile, radial construction and rim size.
9. Selling Price: This is the selling price of the tyre.
10. Original Price: This is the actual/ original price of the tyre.
11. Rating: Average customer ratings on a scale of 5.

# Client

The ideal end user of our analysis findings is the Chief Procurement Officer (CPO) of a major automotive manufacturer, specifically focusing on tire procurement. This executive is tasked with optimizing the company's tire selection process to ensure both cost-effectiveness and performance quality across various car models.

# Operational Analytics Problem Statement

The automotive manufacturer is facing challenges in efficiently selecting tires for their vehicle models, resulting in potential cost inefficiencies and suboptimal performance for their customers. With a vast array of tire options available in the market, the company needs to identify the key factors influencing tire pricing and customer satisfaction to streamline their procurement process and enhance overall product quality.

# Key Metrics

* Summary Statistics for Selling Price
* Summary Statistics for Original Price
* Summary Statistics for Load Index
* Frequency Counts for Brand
* Frequency Counts for Tyre Brand
* Frequency Counts for Type
* Frequency Counts for Size
* Frequency Counts for Rating

# Data Analysis

We utilized various tools for our data analysis including excel where we did data cleaning, What IF analysis(Scenario Manager, Goal Seek) & charts and also used Python for data cleaning, EDA(Exploratory Data Analysis and Logistic Regression.

**What-If analysis – Scenario Manager**  
  


We looked at a scenario trying to find how the Chief Procurement Officer of the automotive manufacturer optimize tire selection to achieve a profit margin of 70% while maintaining cost-effectiveness and performance quality across various car models, considering the current profit per tire of $4,745 and a profit margin of 59%?   
  
  
  
After checking the numbers, it's clear the CPO needs to make changes to hit a 70% profit margin. Right now, they're making $4,745 per tire, which gives them a 59% margin. To reach that 70% goal, they'd need to sell each tire for $10,700, keeping the cost at $3,255. This way, they'd make $7,445 per tire, hitting the target margin. To get there, the CPO might need to shop around for better deals on tires or find ways to cut costs in production. They'll also need to think about what customers want and what the competition is doing. By making smart choices, they can boost profits without sacrificing quality.  
  
**Goal Seek**

We tried to determine the necessary adjustments in the selling price and profit margin to achieve a profit per tire of $5,000, while keeping the original price constant at $3,255.



To reach a profit per tire of $5,000, the CPO needs to bump up the selling price to $8,255 from $8,000. The original price remains the same at $3,255. This tweak boosts the profit margin slightly to 61% from 59%. To make this happen, the CPO might need to find ways to either make the tires more appealing to customers or cut costs in production. It's all about balancing what customers are willing to pay with how much it costs to make the tires. By understanding what customers want and finding efficiencies in production, the company can hit that profit target and stay competitive in the market.

**Python EDA**

Average Original Price by Top 20 Car Models

**Top Luxury Models**: With average original costs of $13,653.57 and $12,586.23, respectively, luxury models like "Kizashi" and "Grand Vitara" attract the highest prices, showing their premium status in the market.

**SUV prices**: Prices for SUV models vary greatly; for example, the average original price of a "Vitara Brezza" is $8,304.15, while the price of a "Grand Vitara 2003-2007 XI" is $10,471.50. This implies that different SUV models have different features, specs, or market positioning.

**Popular Mid-range Models**: The "Baleno" and "Ertiga" models, with average original prices of $5,734.40 and $5,421.96 respectively, are popular among customers looking for good value. They are classified as mid-range models.

**A graph of a number of people

Description automatically generated with medium confidence**

Average Rating by Car Model and Tyre Brand  
  
**Brand Superiority:** A few tyre brands are rated higher than others on a variety of automobile types. For example, "Apollo" and "Firestone" have higher average ratings across a range of car models, suggesting that these brands may provide better customer satisfaction or performance than others.

**Model-Specific Performance:** Depending on the brand of tyres used, ratings for various automobile models vary. For example, "Baleno" and "Swift Dzire" have ratings that vary between different tyre brands, indicating that the tyre selection may have an impact on these models' performance.

**Outliers:** Some automobile models and tyre manufacturers have ratings that are noticeably higher or lower than others, making them stand out from the crowd. For instance, the "Swift Deca" with "Ultra Mile" tyres has a rating that is significantly lower than the overall grade (3.0), suggesting that there may be problems or discontent unique to this combination.

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Distribution of Tyre Brands

The distribution of tyre brands within the dataset is shown as a pie chart, which provides information on the relative popularity of each brand.

**Bridgestone:** With a distribution of 14.1%, Bridgestone is the most well-known tyre brand in the collected data. It leads the pack. Given the dataset's context, its considerably larger representation indicates that it is either a widely used or well-liked option among customers.

**Maxxis:** On the other hand, Maxxis has the least distribution, making up only 0.4% of the total. This implies that, in comparison to other brands, Maxxis tyres are comparatively less common in the sample.

**MRF and Falcon:** At 6.1%, the distributions of MRF and Falcon are identical. This suggests that their market share in the dataset is equal, indicating a mild presence in contrast to Bridgestone.  
  
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**Logistic Regression  
  
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The logistic regression analysis on the tire dataset reveals that 'Load Index' and 'Original Price' predict tire procurement likelihood for an automotive manufacturer. However, the Mean Squared Error (MSE) of 19438.21 suggests that other factors, such as manufacturing costs, seasonal demand, brand reputation, distribution and marketing costs, government regulations, technological advancements, supply chain efficiency, market competition, inflation, and customer preferences, also influence tire pricing and procurement. The analysis, based on a dataset with 11 attributes, aims to inform the procurement process for the manufacturer's CPO, helping ensure cost-effectiveness and performance quality while considering these additional factors.

# Insights

* Analysis of Selling Price vs. Original Price
  + Identifying price discrepancies and outliers
* Average Original Price by Top 20 Car Models
  + Highlighting trends in pricing across different car models
* Average Rating by Car Model and Tyre Brand
  + Understanding brand performance and model-specific ratings
* Original Price vs. Selling Price by Tyre Brand
  + Evaluating pricing consistency and variability among brands
* Distribution of Tyre Brands
  + Illustrating the relative popularity of different tyre brands

# Recommendations

* Adjust pricing strategies for items with significant price discrepancies to align with market trends.
* Consider special promotions or discounts for items with consistently high original prices compared to selling prices.
* Explore opportunities to enhance product offerings or marketing efforts for top-performing car models and tyre brands.
* Analyze factors contributing to high or low ratings for specific car models and tyre brands, and implement improvements accordingly.
* Review pricing policies for tyre brands with notable differences between original and selling prices to ensure competitiveness and consistency.
* Identify opportunities to expand or diversify product range based on the popularity and distribution of tyre brands.

# Value Proposition

Our solution provides actionable insights that empower decision-making in tyre procurement and pricing strategies. By analyzing key metrics, uncovering insights, and offering strategic recommendations, our project enables automotive stakeholders to optimize their operations, enhance product quality, and maximize customer satisfaction, ultimately driving business success and competitive advantage.