Cars Auctions

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Introduction

The car auction market has become a significant part of the global automotive industry, with billions of dollars' worth of cars sold every year. In recent years, there has been a growing interest in using data visualization techniques to analyze and interpret large datasets related to the car auction market.

In this paper, we aim to test several hypotheses related to the car auction market using data visualization techniques.

To accomplish our goals, we will use a dataset that contains information on the prices, models, mileage, engine volume, damage type, and fuel type of cars sold in various car auctions around the world. We will use different data visualization techniques, including histograms, box plots, scatter plots, and bar charts, to compare and contrast data from different countries and analyze the relationships between variables.

We will first investigate whether damaged cars are more profitable to resell in Armenia than undamaged ones by comparing the prices of damaged and undamaged cars in the dataset. Next, we will examine the repair costs of Japanese and German cars in different countries to determine if there is a significant difference in repair expenses. Then, we will explore the impact of car color, mileage, and damage type on its price using regression models and scatter plots.

Finally, we will investigate whether most cars with less engine volume have petrol as a fuel type, by analyzing the distribution of engine volume and fuel type across different car models.

Overall, our study will demonstrate the importance of data visualization in analyzing the car auction market and provide valuable insights into the industry. By using a combination of data visualization techniques, we hope to gain a comprehensive understanding of the dataset and offer new insights into the car auction market.

Datasets

This study uses two datasets that were scraped from car auction websites in the United States and Armenia. The US dataset includes information on 749 cars sold in various auctions across the country, while the Armenian dataset includes data on 1407 cars sold in different auctions in Armenia.

Both datasets contain information on the car's make and model, year of manufacture, mileage, engine volume, damage type, and fuel type, as well as the sale price at the auction. The data was cleaned and preprocessed to remove any inconsistencies or errors and to estimate the importing price of each car, which takes into account taxes, customs duties, and other expenses related to importing a car into a particular country.

Hypotheses

Heavily damaged cars are more profitable to resell in Armenia.

Imported car price vs local market price
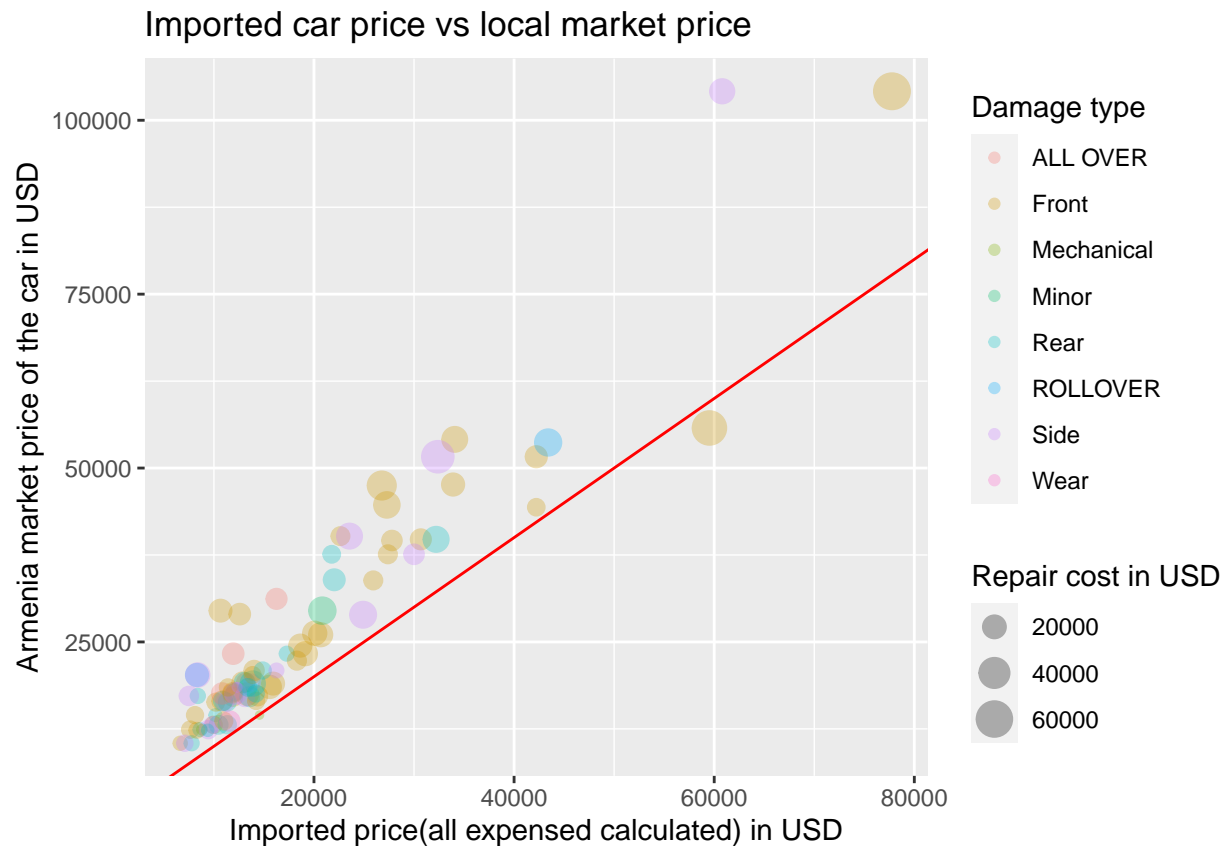
As we can see most of the cars regardless of damage type are profitable to bring and resell in Armenia, but we have a few cars, where the damage is from front and their market price is lower than the price of the same car, when imported from US. We can see that in general if the repair cost is high, the profit can be higher, which leads to an idea that the repair cost in US is higher than in Armenia, as almost all of the cars imported to Armenia are damaged are repaired in Armenia for later usage or profitable sale.

Imported car price vs local market price
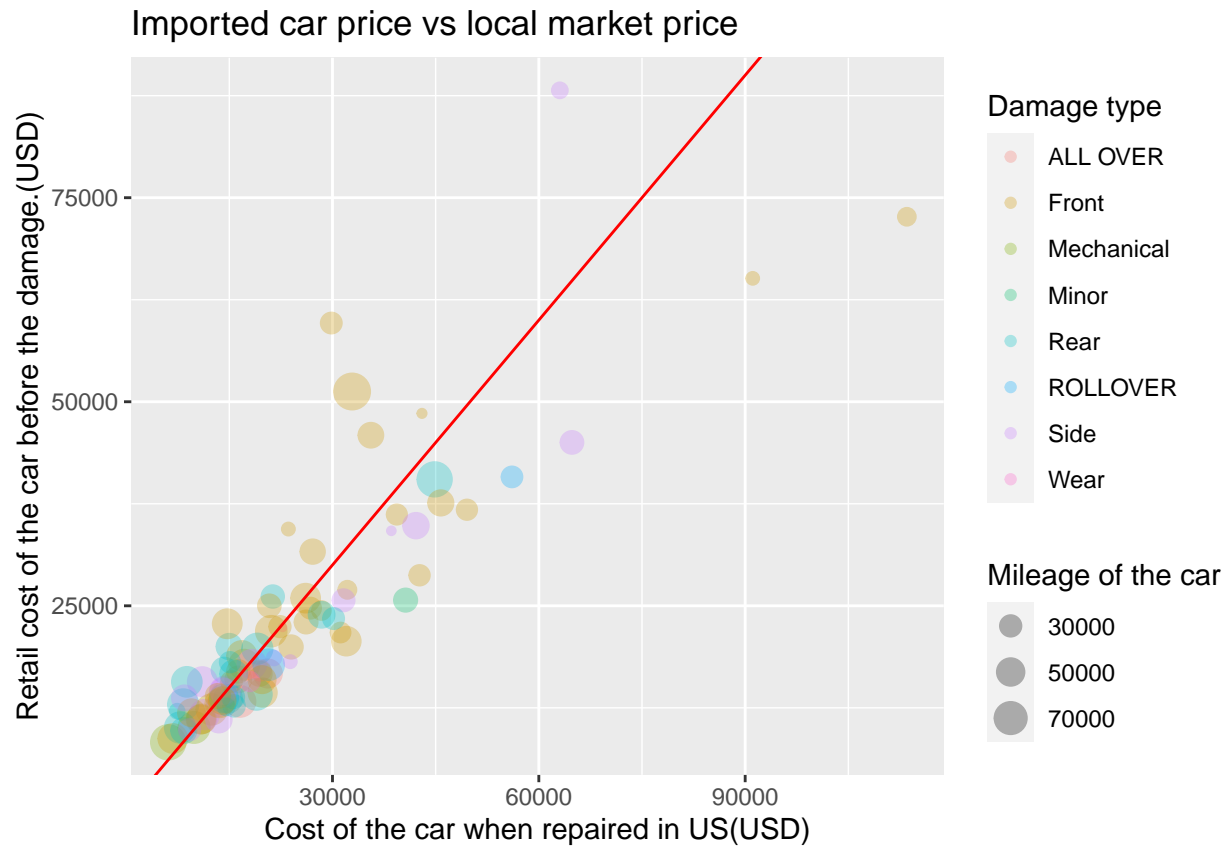
As we can see the the observations are equally distributed along the y = x line, meaning that depending on the type of the damage, the repair may be or may not profitable. We can see that the repair is mostly profitable for cars with higher mileage, as most probably the parts can be bought from the OEM used market and the material cost will be cheap. We can see that most of the cars that are worth repairing in US are damaged from the Front side. As the material cost is going to be the same in Armenia and US, and actually in US the material cost may be even lower, as the market is more advanced there.

Profit of reselling baed on damage type in USD
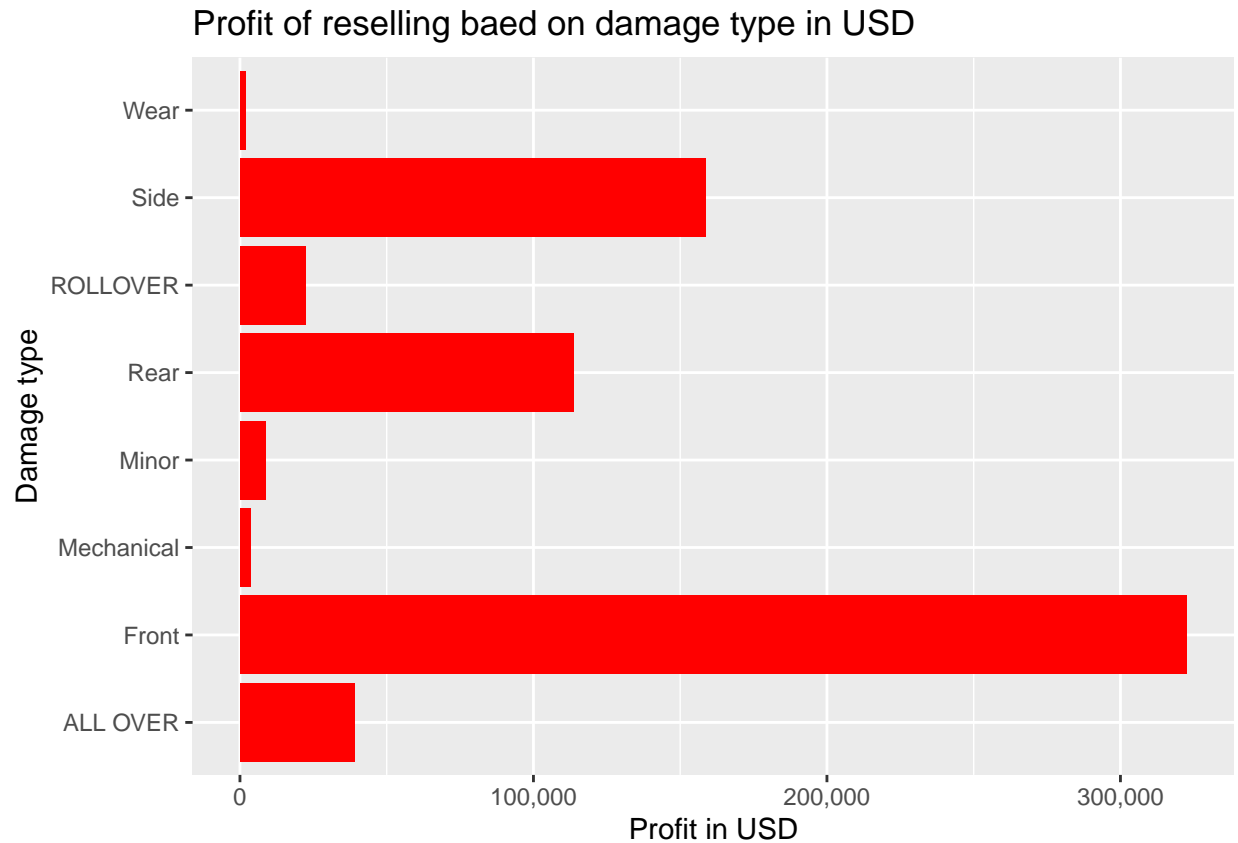
As we can see the cars that are damaged from the front side are most profitable to resell in Armenia, whereas the cars with minor damages are not that profitable, as probably the repair cost is almost identical in United States. Also the cars that are hit from the front side, can have some technical problems with the engine, transmission or other technical components of the car, whereas the rear, side or minor damages are less likely to cause technical problems.

Japanese cars are cheaper to repair compared to German cars in Armenia.

## Distribution of repair costs for German cars
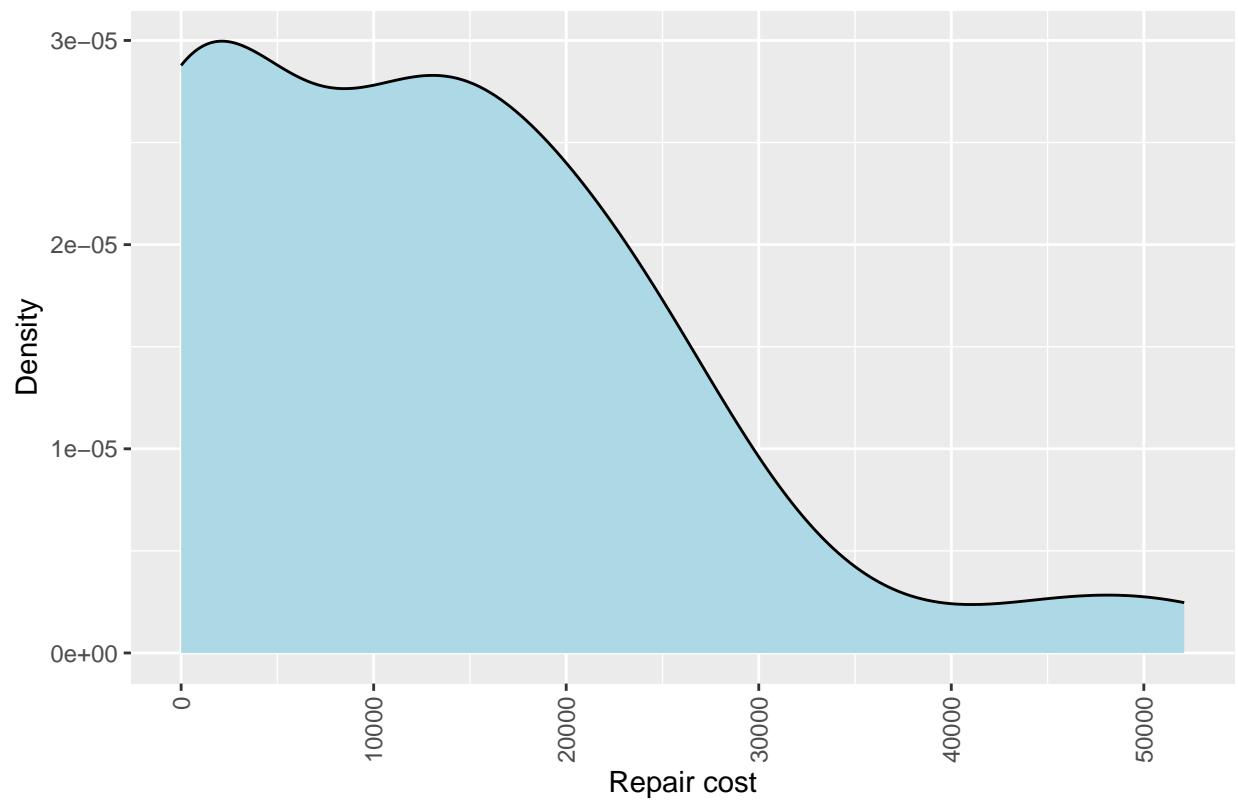
## Distribution of repair costs for Japanese cars
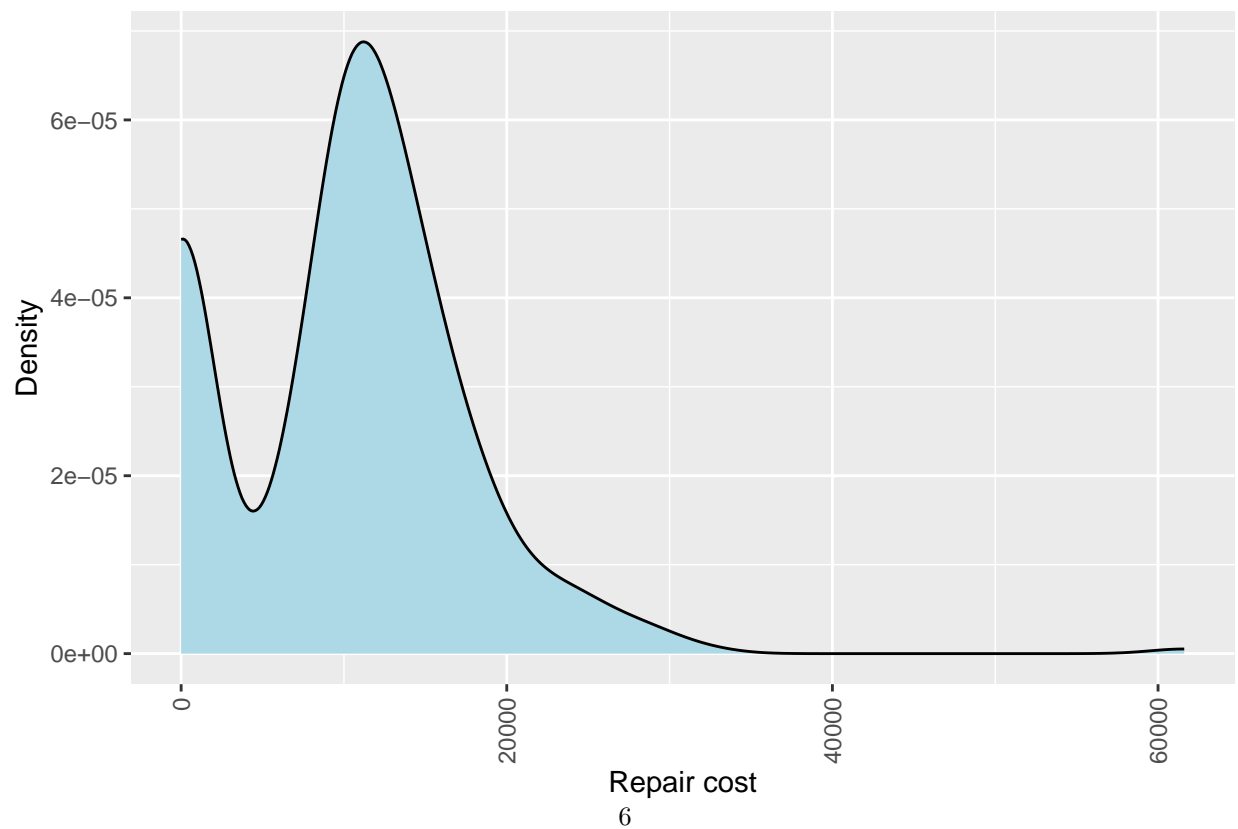
We can see the distribution plots of the repair costs both for Japanese and German cars. For the Japanese cars we can see that most of the observations are within the region of [0, 20000] dollars. Nevertheless, for the German cars the range is much wider reaching up to 35000-40000 dollars for most of the observations. This supports the claim that in general Japanese cars are cheaper to repair compared to German cars in Armenia.

Color, Mileage and damage type have a lot of impact on the cars price.

Prices of the cars by color in Armenia

### Prices of the cars by color in US
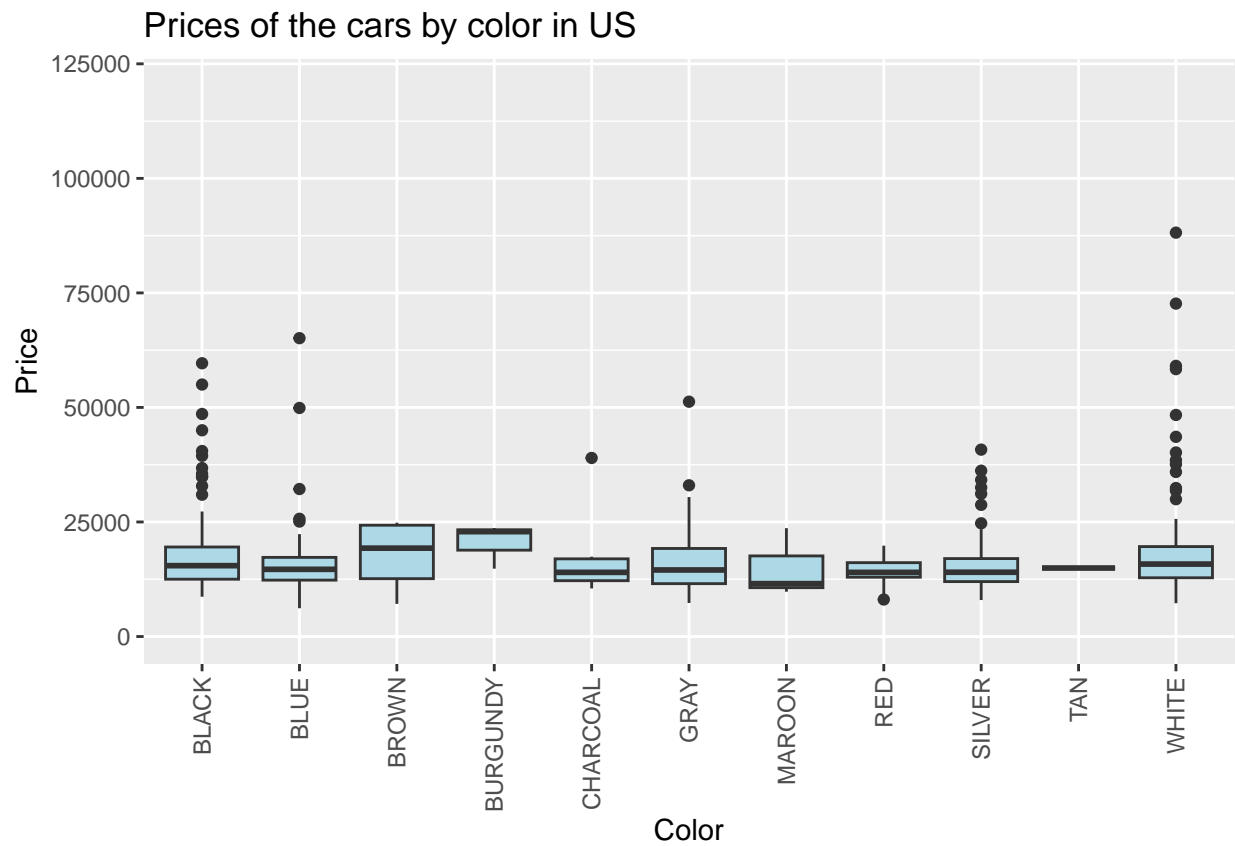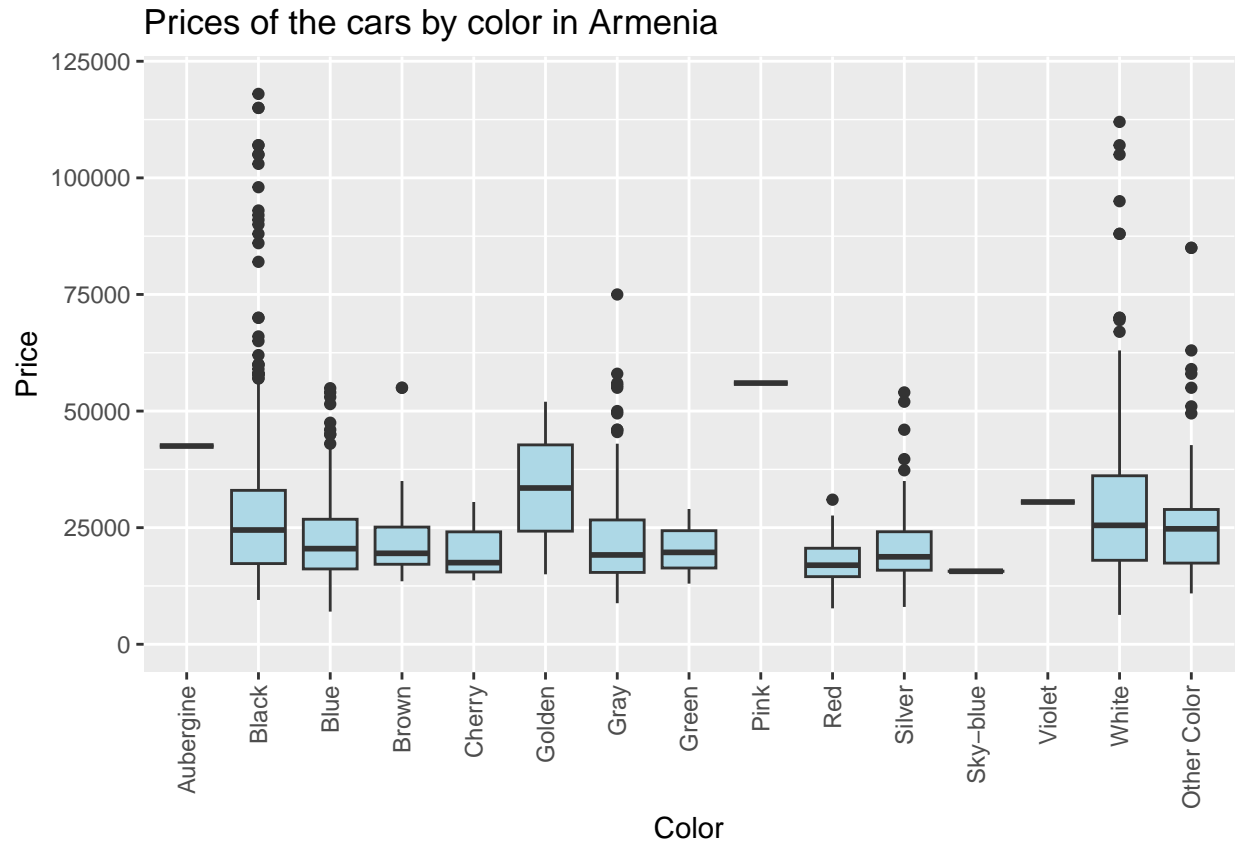
We can see the boxplots of the prices for each color both plotted using Armenian and US cars datasets. We can see that the overall picture is quite similar for both countries. However, for Armenia we can notice that Golden color has the highest median compared to US where Burgundy has the highest median. In Armenia, however the price difference between colors and their corresponding price ranges is way more noticeable as such colors as Black and White also have comparably higher prices. Note that we don't take into account the colors which have very few observations.

## Prices of the cars by damage type in the US
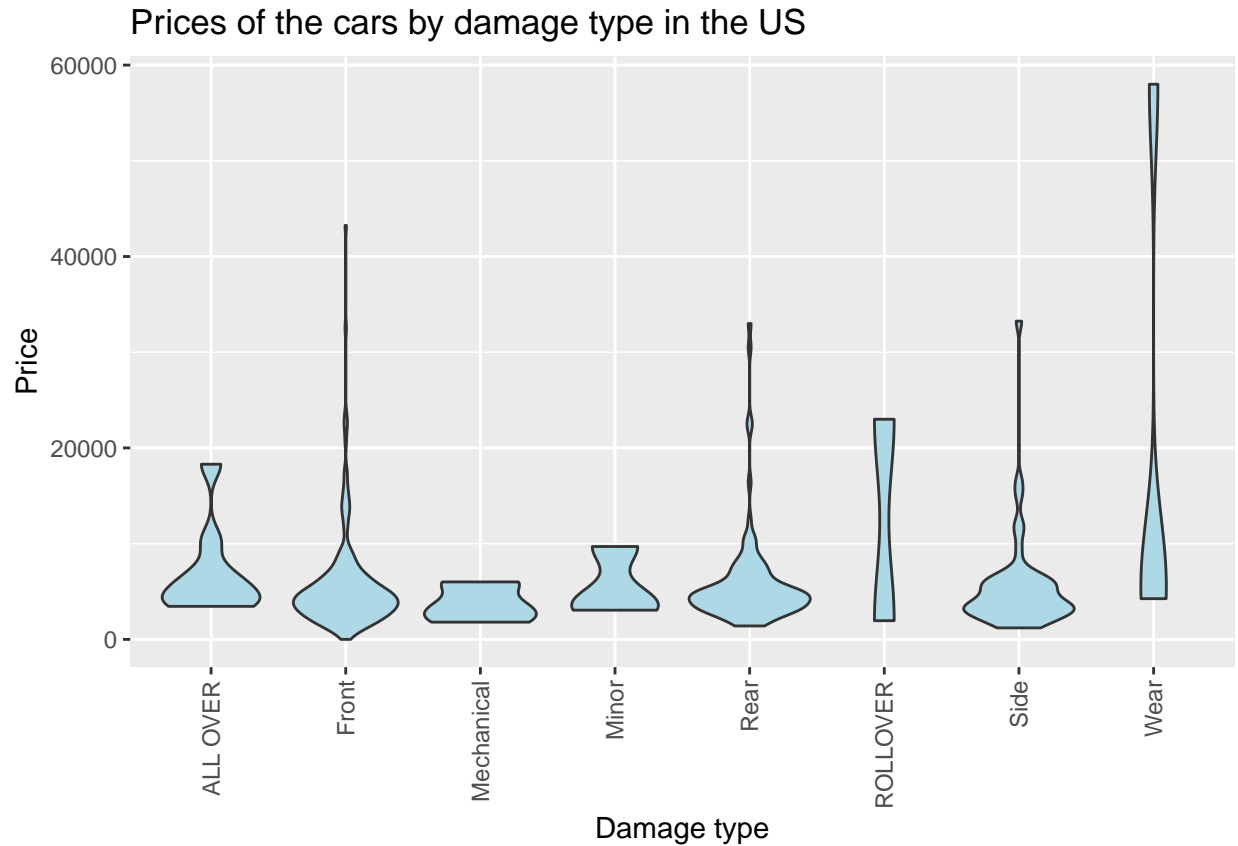
The violin plots above show the distributions of the price of the car by the damage types. As we can see for such damages as All Over, Mechanical and Minor the Price doesn't go higher than 20000 dollars. Yet, for all the other damage types the prices may go up to 58000 dollars. Therefore, we may claim that the damage type has an impact on the price.

Prices of the cars by milage in the US

Prices of the cars by mileage in Armenia
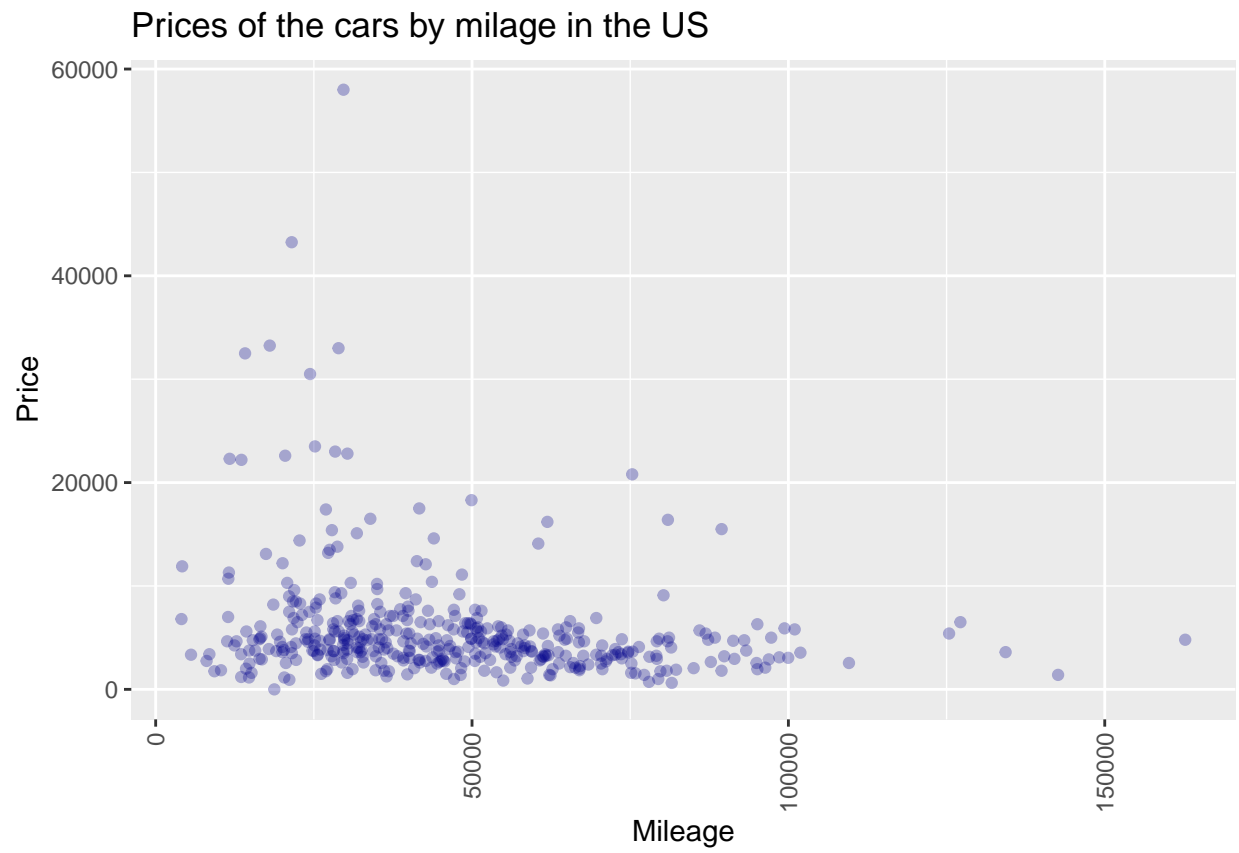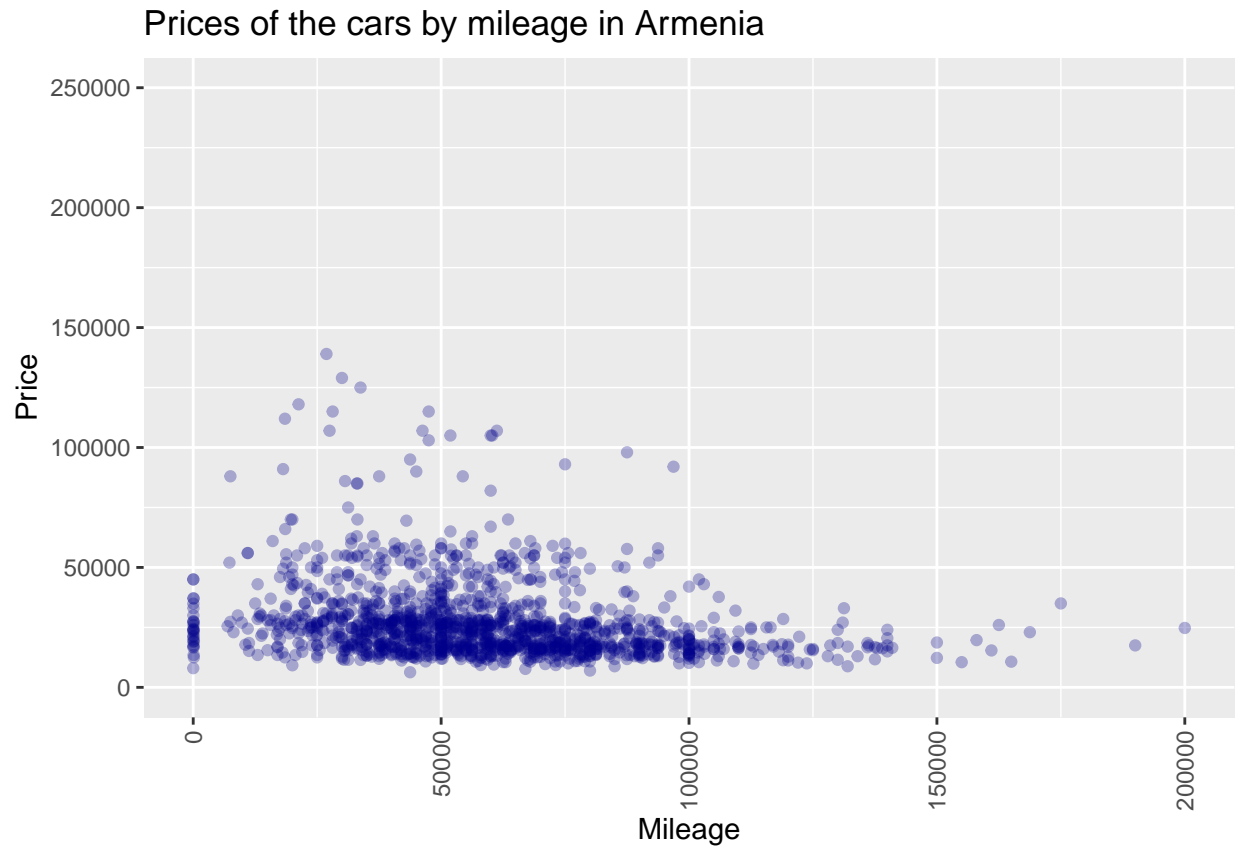
The scatterplots above show the relationship of the Mileage and the price of the cars in Armenia and US. Though we have much less observations for US cars, the overall picture is very much similar. We may notice that we have cars with higher price when the milage is low and as the Milage increases we have less and less cars with higher prices. Therefore, we may state that Mileage does have an impact on the price.

The popular cars in US and Armenia are quite different

Popular cars in US

Popular cars in Armenia
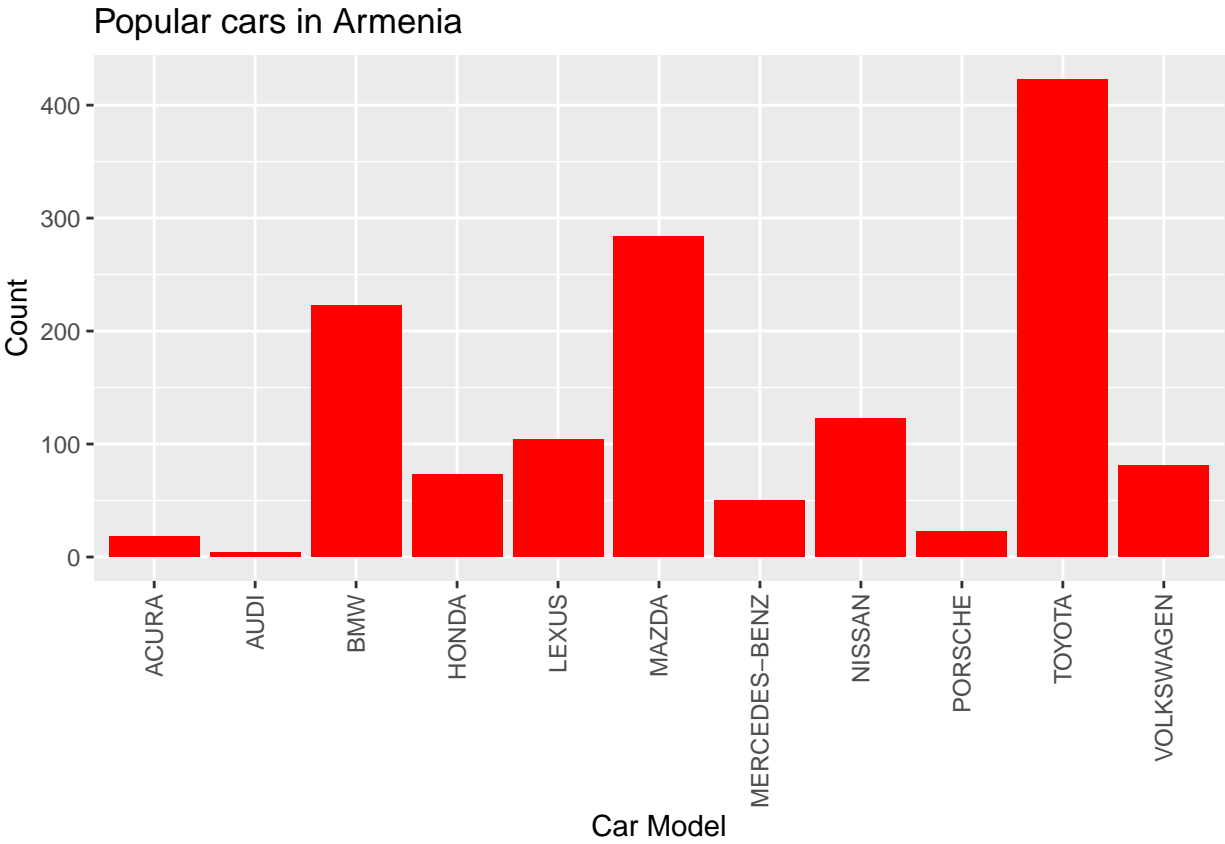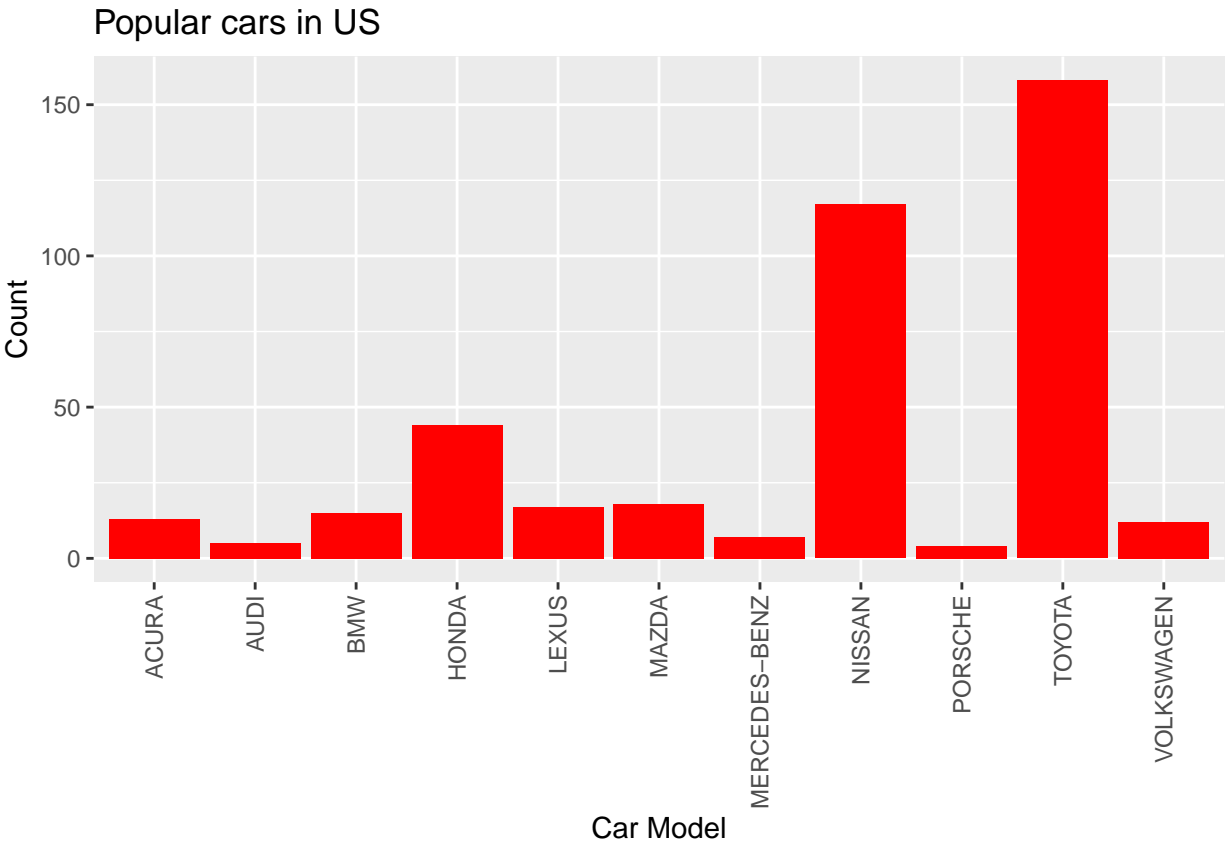
The barplots above displays the counts of the cars by car models for Armenia and US. For most of the cars which don't have high counts the results are very much alike (Acura, Audi, Mercedes-Benz, Volkswagen). For Toyota, it's nearly the same, since this is the car which appears the most in the auctions both for Armenia and US. Yet, for such car models as BMW, Lexus, Mazda the picture is different for Armenia compared to US, since the numbers are higher for the former. In US, Toyota is followed by Nissan and Honda.

Conclusion