Moladin Case Study

CAR BUYOUT QUALITY

ANALYSIS AND MODELING

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Project Overview

Background

Moladin provides capital for agents to buy used cars and in return Moladin charges fees (admin fee & aging fee) to agents when the cars are successfully sold. Every car buyout proposal by an agent has to be approved by the branch manager. In order to make an informed decision, the branch manager has to consider several parameters.

Project Overview

Project Task

As a data scientis we are going to analyze the reason on why some care are selling below target, and create a model to help prevent and mitigate other poor quality buy happen in the future.
There are several steps that will be taken in this project:

1. Analyze the given datasets to gain insight on car buyout quality
2. Perform a regression modeling to predict the car sale price

Project Overview

Project Task

For the modeling we are going to use 4 base model, which is:

1. Linear Regression
2. Decision Tree
3. Random Forest
4. XGBoost

From these 4 model we are going to choose the best one based on the **MAE** metrics to then perform parameter tuning

Project Overview

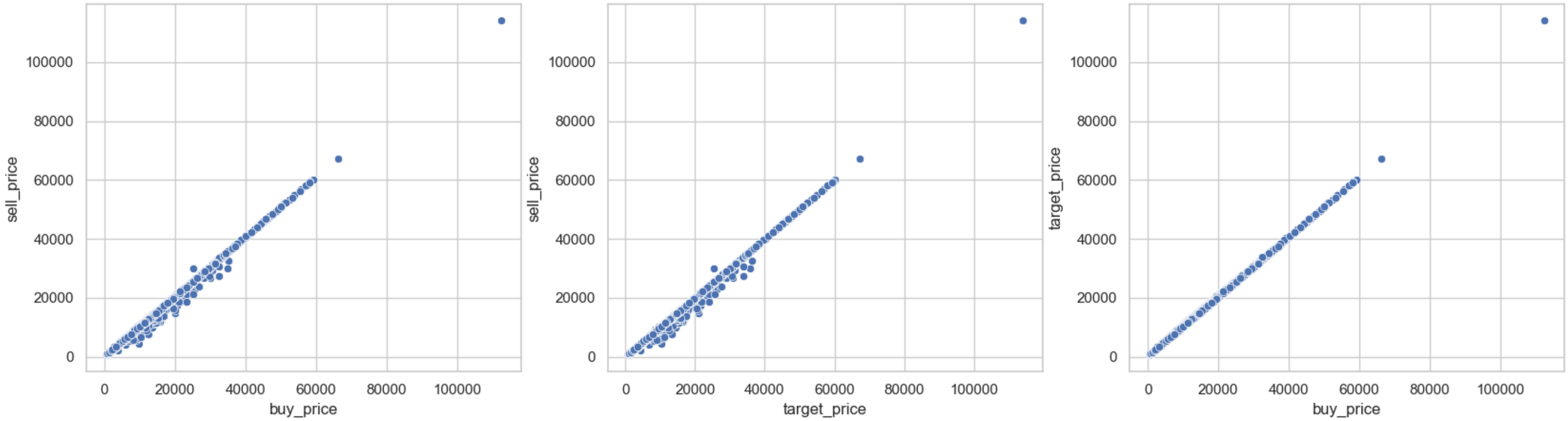
Data Definition

Column	Description
product_id	Unique identifier for every buyouts
inspection_score	- Measurement of the car condition - Higher score corresponds to better car condition
buy_price	Car buying price - Price at the
admin_fee	- Fee charged based on car buying price - Charged in front (when bought)
aging_fee	- Fee charged based on inventory days - Charged at the end (when sold)
sell_price	Car actual selling price

Target Selling Price = Buying Price + Admin Fee + Aging Fee

Buyout Quality Analysis

Price Correlation



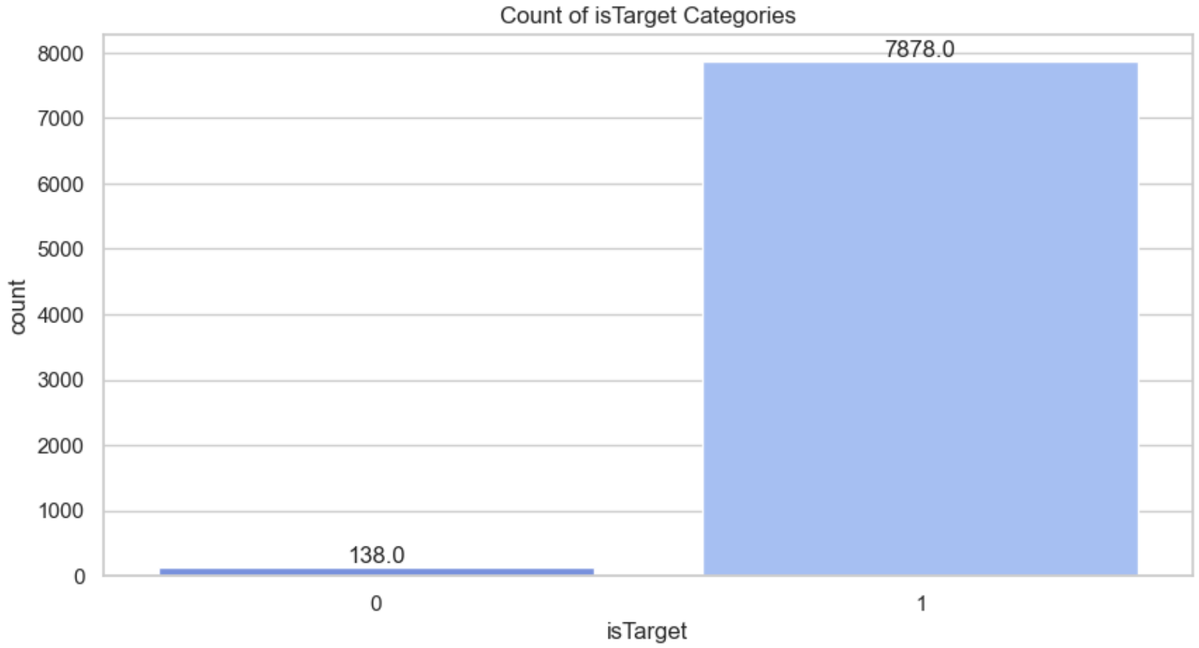
Target price and Buy Price should be perfectly linear, however, in reality there are some cars that sold not on the targeted price, and many are sold below the targeted price

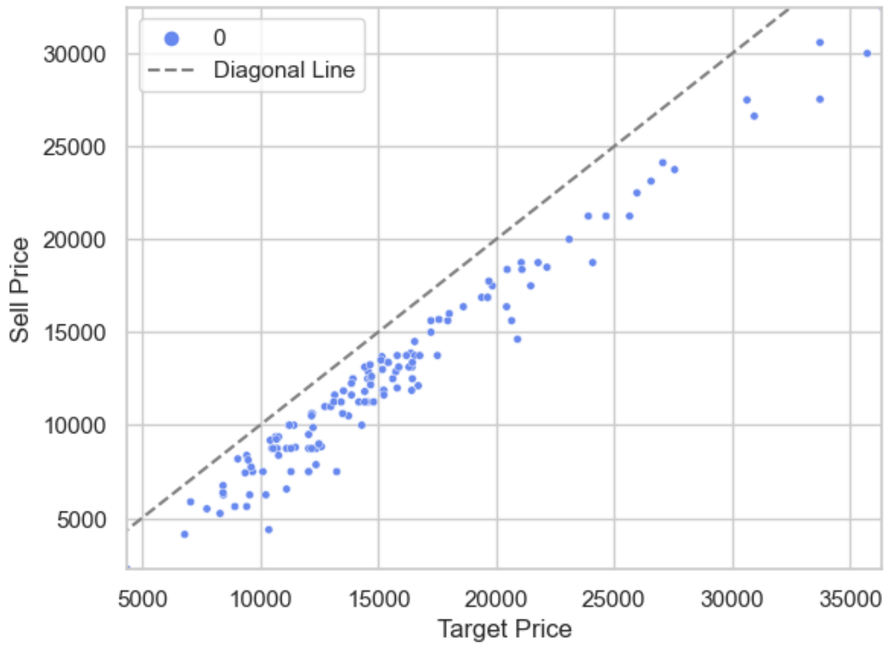
We will mark this as poor quality buyout

Buyout Quality Analysis

Poor Quality Buyout

We assume that the tolerable revenue loss is 10%* from the targeted price, so any car that sold below that would be marked as not fulfilling target, there found 138 cars that meets those criteria

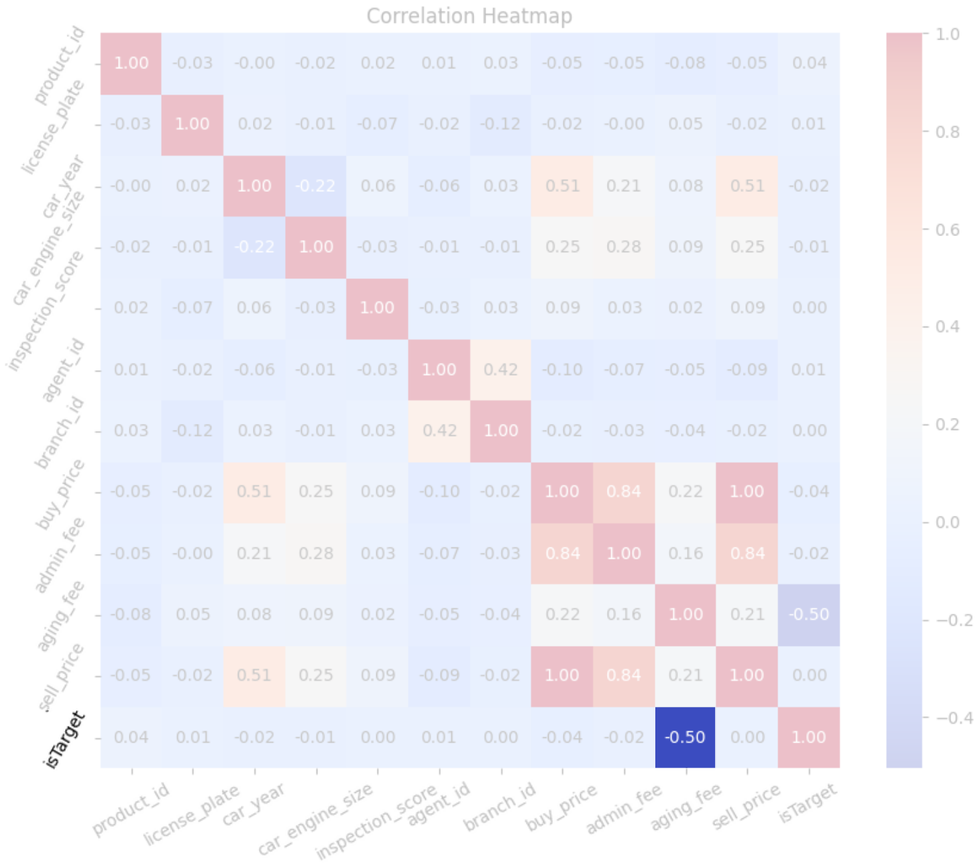




***note:** this 10% value is assumption and need to be validated accordingly

Buyout Quality Analysis

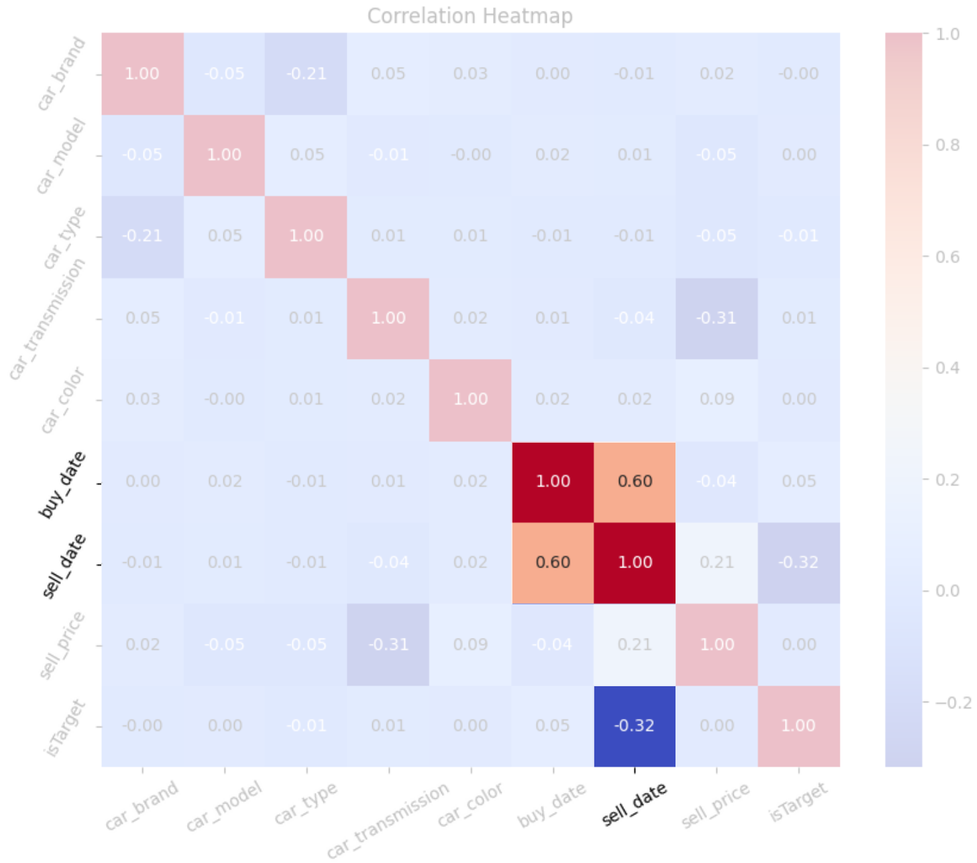
Poor Quality Buyout Factors



From the numerical columns. we gain insight that there are one columns that have high correlation with Target which is aging_fee with negative value, this might indicate that the higher the aging fee, the more likely the car is not going to sell at the target price, we are going to inspect this aspect further

Buyout Quality Analysis

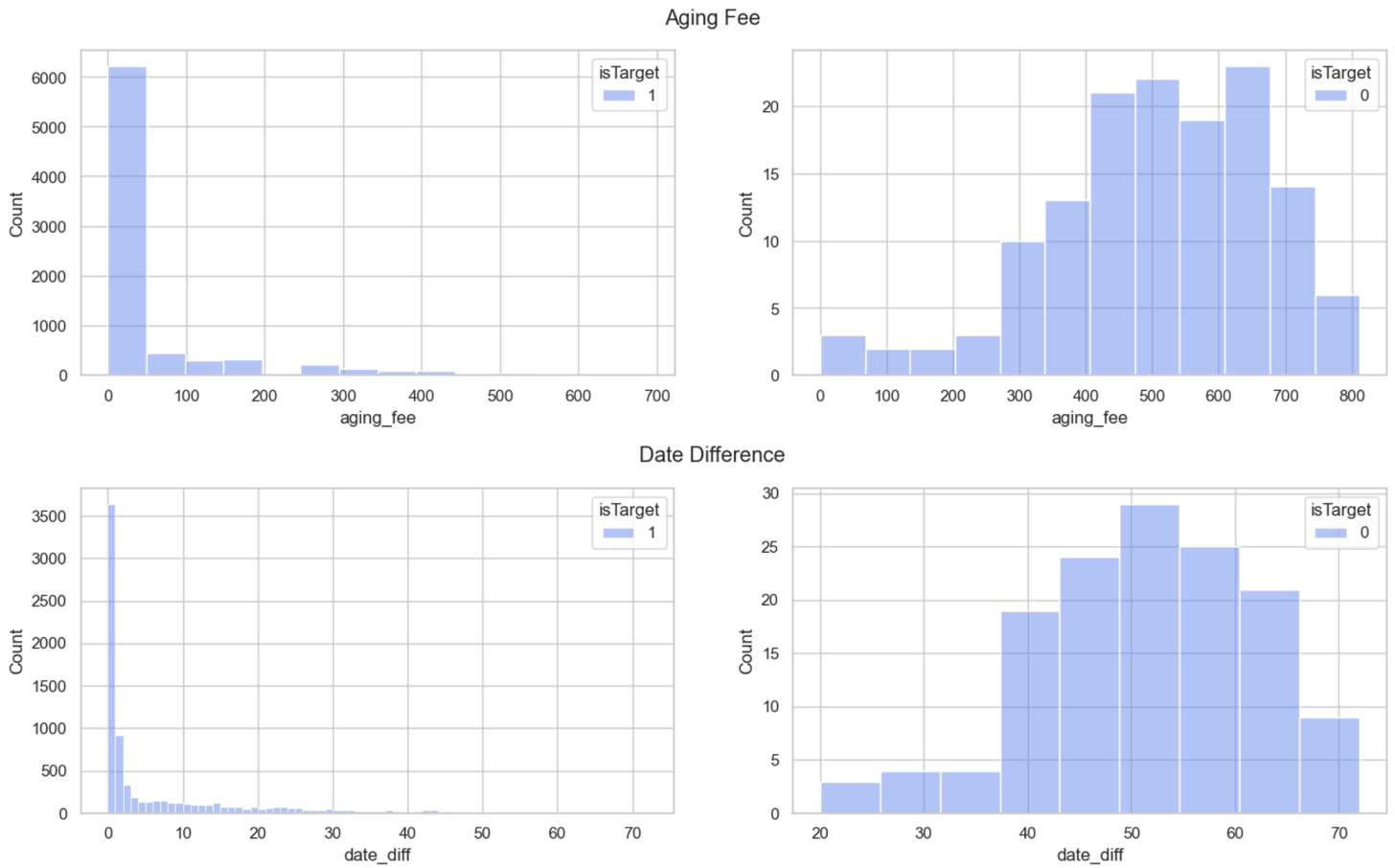
Poor Quality Buyout Factors



As for the categorical column, we can see that the sell date have high correlation with target and buy date, this might affect the aging fee stated above

Buyout Quality Analysis

Poor Quality Buyout Factors

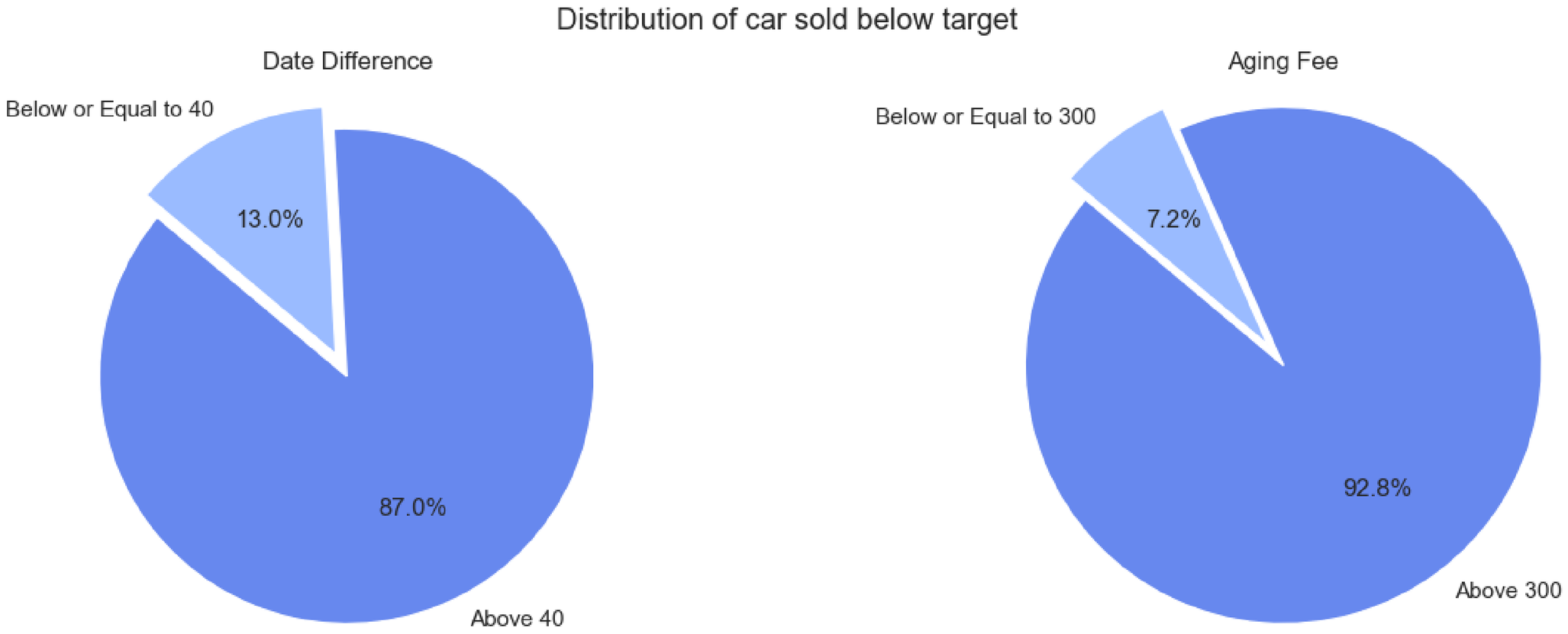


From the histogram, it can be seen that cars sold below target have high aging fees and high differences between buy and sell dates.

This means that the difference between the buy and sell date is correlated with the aging fee, so with more time the car is stored at the warehouse, it is more likely to be sold below the target price

Buyout Quality Analysis

Poor Quality Buyout Factors



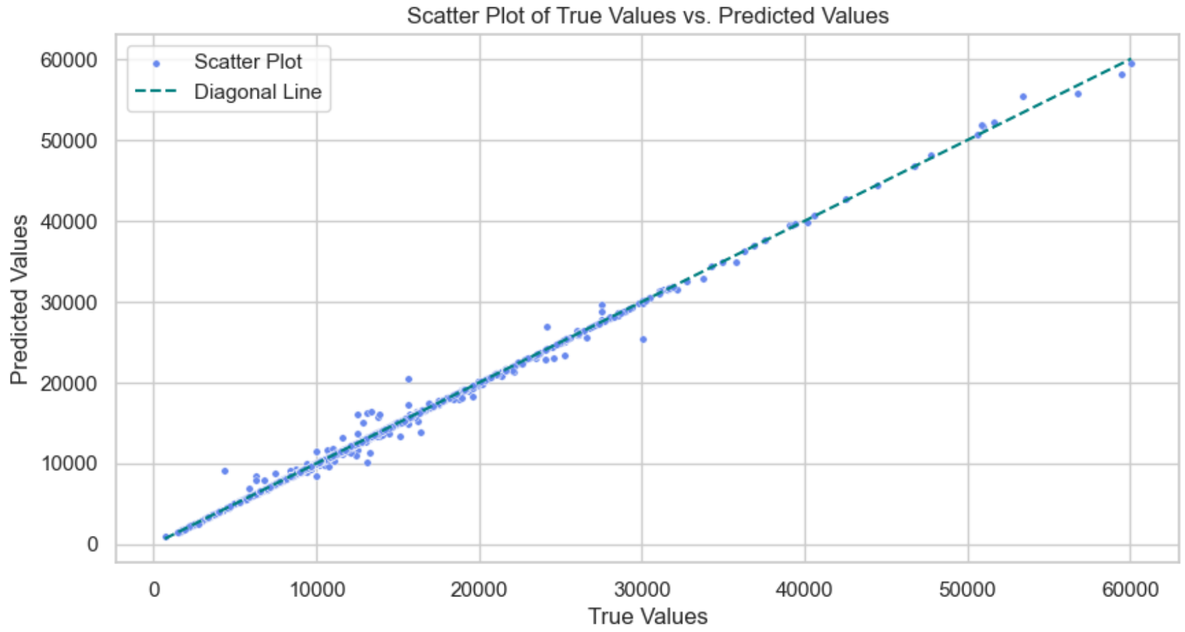
Best Model Result

Random Forest - Best Parameter

- **bootstrap** : True
- **max_depth** : None
- **min_samples_leaf** : 1
- **min_samples_split**: 2
- **n_estimators** : 100

Mean Absolute Error

- **79.9**



Compare

	mean	std	min	25%	50%	75%	max
actual data	12855.149002	6820.814929	688.000000	9000.0	11938.000000	15250.0	60069.000000
predicted data	12857.274873	6816.380040	987.286667	9000.0	11845.701667	15250.0	59585.783333

Conclusion

Key insight

- **Best-Performing Model**: After thorough analysis and testing, we identified Random Forest as the most effective model. This model, with optimized parameters, achieved an impressive MAE score of 79.9.

- **Insights into Buyout Quality**: During our data analysis, we discovered important insights into what influences cars selling below expected prices. Which is aging fee and date difference between buy and sell.

- **Enhancing Decision-Making:** By using this model, we could help branch managers to make informed decisions swiftly. By predicting the buyout quality value, they can reduce risks and optimize returns on car sales.

Conclusion

Suggestion

- **Improvement:** We suggest ongoing refinement of our predictive model to adapt to changing market conditions and business value, as some of this project decision is still not using real applicable data.

- **Data Enhancement:** Expanding and enriching the dataset can provide deeper insights and improve model performance on determining the quality of a car buyout.

THANK YOU

FEEL FREE TO ASK