Guided Capstone Project Report

Abstract

Big Mountain Resort, a ski resort in Montana with 105 trails, has been charging a premium above the average price of resorts in its market segment for their ticket prices. They recognize that this is not an optimal pricing strategy and are looking to identify which of their facilities are more important than others and capitalize on that. Big Mountain also recently installed an additional chair lift, which increases their operating costs by $1,540,000 this season. They are hoping to use the data to select a better value for their ticket price, cut costs without undermining this ticket price, or make changes that will support an even higher ticket price.

Using the data of all ski resorts in the same market share, we've identified that the top four features to determine ticket pricing are the number of fast quad chairs, the total number of runs, the total acres of snow making, and the vertical drop.

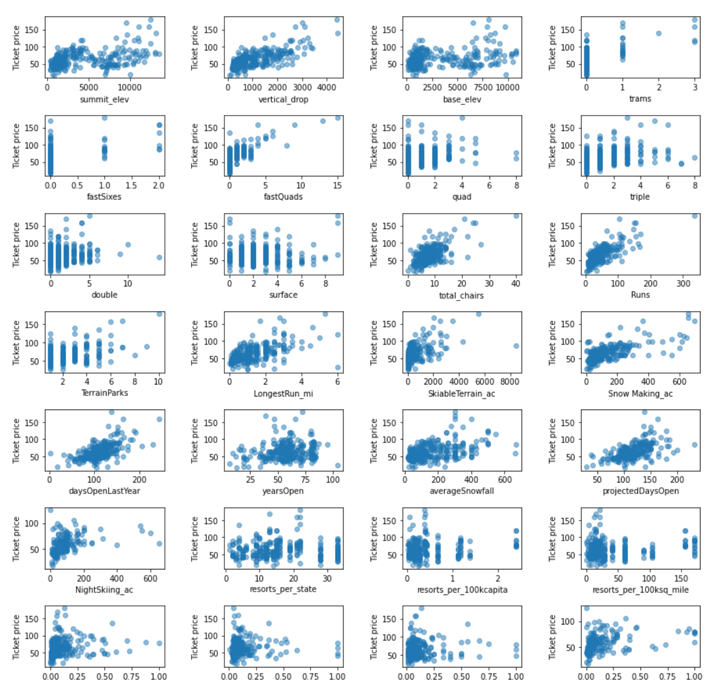
Based on our modeling of these features, we've determined that Big Mountain Resort should charge $95.87 for their adult weekend tickets.

Exploratory Data Analysis

For our key data source, we used a csv file from Alesha Eisen (database manager) containing information from 330 US resorts in the same market share, including information from Big Mountain Resort. We also used data on the population and size of each state to augment our dataset to determine whether the state could be a predictor of ticket prices.

Based on our analysis, there were no obvious groupings between states and their respective ticket prices. As a result, we treated all states equally and worked toward building a pricing model that did not take in state as a factor.

During our exploratory data analysis stage, we constructed scatter plots of each of the numeric features in the dataframe against ticket prices, producing the following set of graphs:



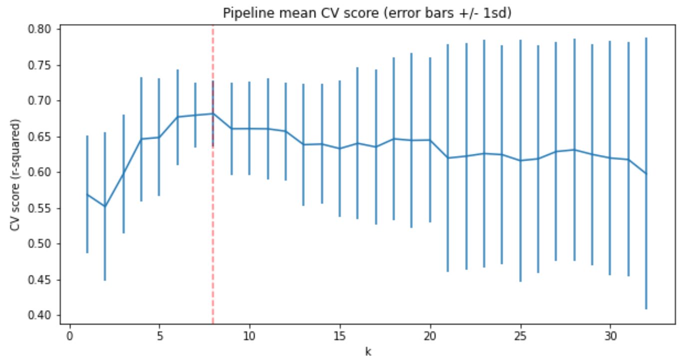
This initial analysis led us to believe that there may be high correlations between ticket prices and the following features:

- Vertical drop
- Total number of fast quad chairs
- Total number of runs
- Total number of chairs

Features Selection

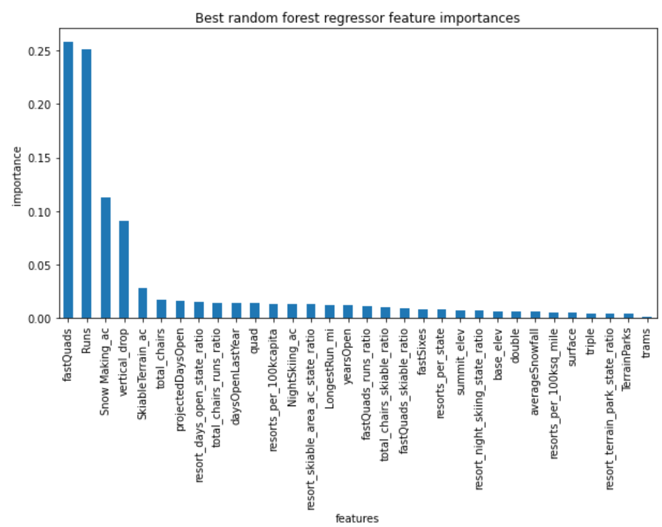
To determine the best number of features and the features themselves that would best model our adult weekend ticket prices, we tested a linear model and a random forest model. According to our linear model, the best number of features to consider was 8. This produced the highest value for the coefficient of determination with the least amount of variation, as shown by the graph below. Those 8 features are listed below:

- Vertical drop
- Total acres of snow making
- Total number of chairs
- Total number of fast quad chairs
- Total number of runs
- Length of longest run
- Total number of trams
- Total acres of skiable terrain



Our analysis of the random forest model indicated that there were four features that had the best importances:

- Total number of fast quad chairs
- Total number of runs
- Total acres of snow making
- Vertical drop



Model Selection

Ultimately, we decided to use the random forest model moving forward. In comparison to the linear model, it exhibited less variability and had a lower mean absolute error by almost $1. In addition, when training the model and then testing the model, the random forest model produced performance that was more consistent between the test set and train set.

Results

Big Mountain Resort's current adult weekend ticket price is $81. Our model indicates that Big Mountain Resort's ticket price should be $95.87. This has an expected mean absolute error of $10.39, which means that even at the lowest end of the spectrum for error, there is still room for an increase in ticket price.

In addition, we tested four scenarios to see if Big Mountain can make any changes that could support an even higher ticket price.

Scenario 1: Permanently closing down up to 10 of the least used runs

We discovered that closing one run makes no difference in predicted ticket price. Closing 2 and 3 runs successively reduces support for ticket price and so revenue. After that, closing 3, 4, or 5 runs all result in the same decrease in ticket price and revenue.

Scenario 2: Increase the vertical drop by adding a run to a point 150 feet lower down, which would requiring the installation of an additional chair lift to bring skiers back up, without additional snow making coverage

Our model indicates that adding a run, increasing the vertical drop by 150 feet, and installing an additional chair lift supports an increase of ticket price by $1.99. Over the season, this could be expected to amount to an increase of $3,474,638 in revenue.

Scenario 3: Same as scenario 2, but adding 2 acres of snow making cover

This additional increase in snow making area made no difference in ticket price increase compared to scenario 2.

Scenario 4: Increase the longest run by 0.2 mile to boast 3.5 miles length, requiring an additional snow making coverage of 4 acres

This did not support any difference in ticket price.

Conclusion

The newly installed chair lift increases Big Mountain's operating costs by $1,540,000 this season. If we assume that there will be 350,000 visitors this season purchasing, on average, 5 day tickets, an increase of merely $0.88 per ticket would cover this cost. Based on our model, this can be easily handled with an increased ticket price at $95.87, even with the consideration of the mean absolute error of $10.39.

Additionally, out of the four scenarios we tested, our recommendation is that Big Mountain resort follows a combination of scenario 1 and 2. We suggest that Big Mountain close only one run (its least used run), add a run to a point 150 feet lower down, and install an additional chair lift for skiers to access this run. No additional snow making coverage is necessary. By doing so, Big Mountain Resort can increase their adult weekend ticket price by another $1.99, which is expected to amount to an increase of $3,474,638 in revenue.