Big Mountain

Predicting Ticket Price and Facilities Analysis and Recommendations

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Problem Statement

Can ticket prices can be adjusted to capitalize on the existing facilities?
What changes can be made to the facilities that would improve profitability or support a higher ticket price?

Objective

The objective is to create a model that find the most important facilities that drive price and that can then predict price increases based on existing facilities or changes to facilities.

Scope

No operational cost (except for the newest chairlift)
Information about facilities such as lodging, restaurants, or distance to major airport/city

Data sources & other important information

Ski_resort_data.csv: data set containing U.S. ski resorts and data on various relevant facilities
State population and area from wikipedia:
https://simple.wikipedia.org/w/index.php?title=List_of_U.S._states&oldid=7168473
Visitors per year:350,000
Operational cost of newest lift: $1,540,000

Modeling Results and Analysis

Some data was dropped and some features were calculated and added to the data set. Refer to appendix for more information..

Key modeling steps

Principal component analysis (PCA)

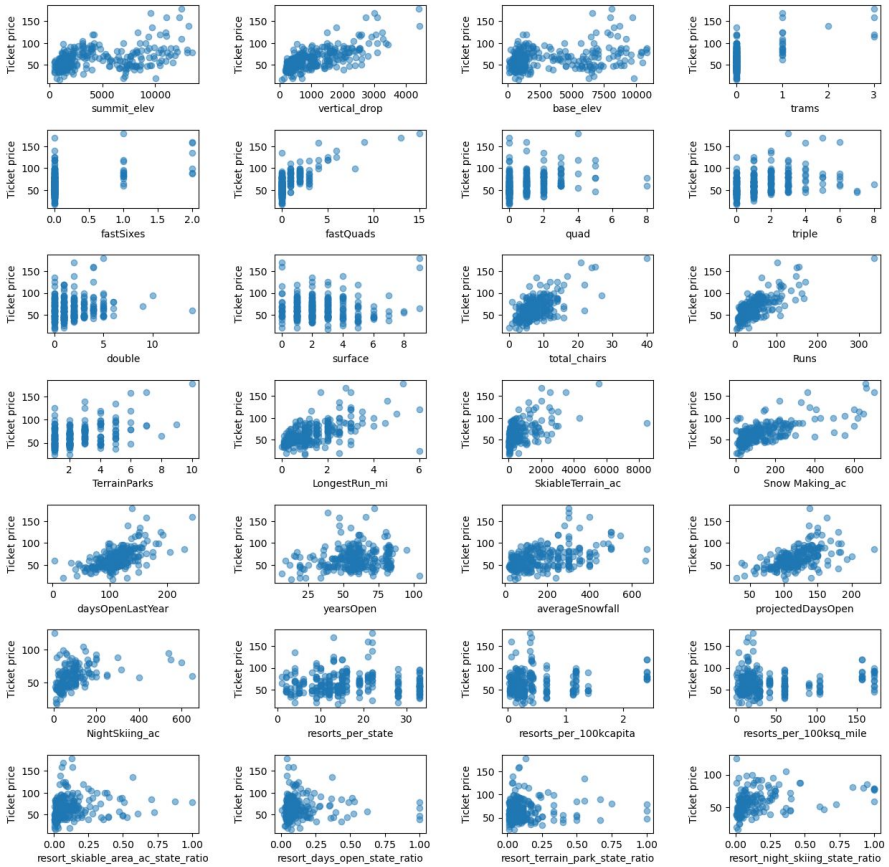
Models: mean, linear regression, random forest

Metrics: r squared, mean absolute error, and mean squared error

Cross validation was used on the linear regression and random forest models to evaluate best model.

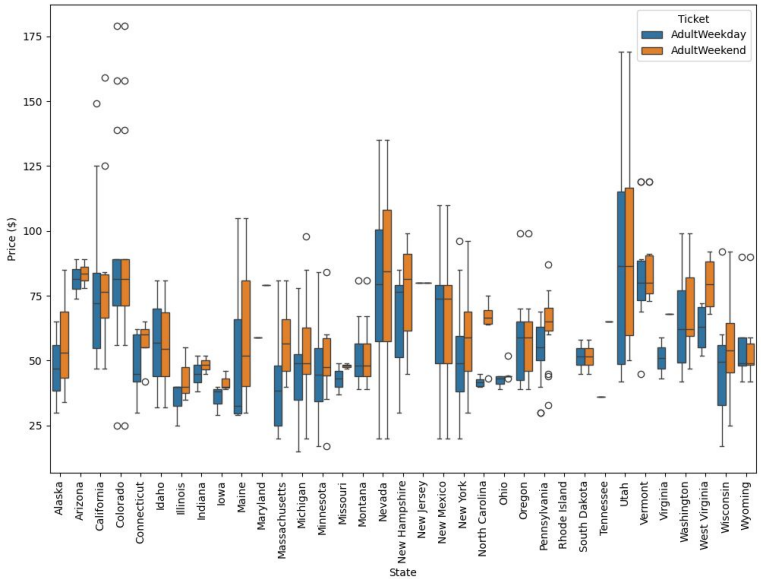
Result

The best model was the random forest model.

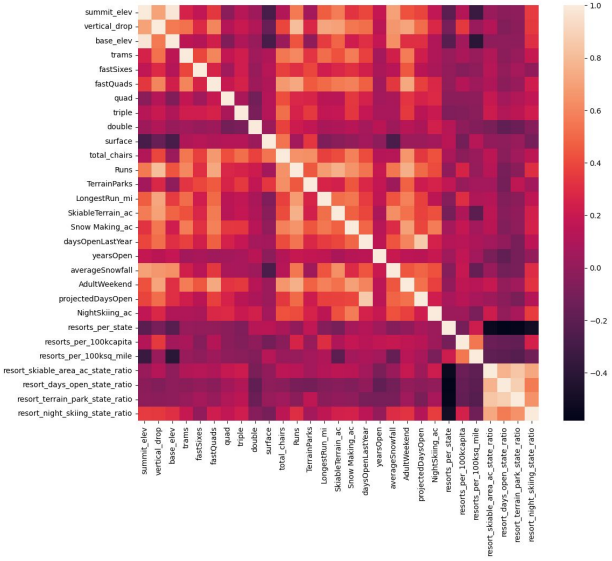


Recommendations and Key Findings

- There is no relationship between price and state
- New York has the most resorts; California, Colorado and Utah have the highest ticket prices
- Montana is in the top five for total state area and total skiable area
- The most important facilities for determining price are vertical drop, snow-making, fast quads, runs, total chairs, longest runs, trams, and skiable terrain.



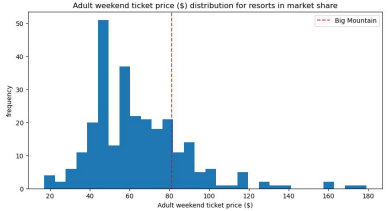
Box plot of price versus state

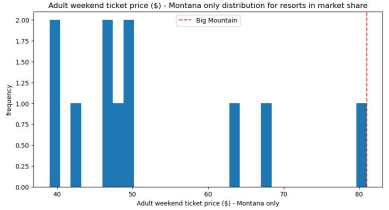


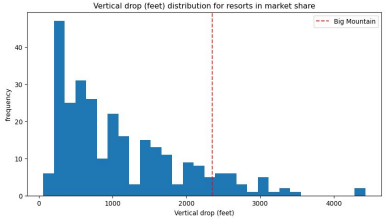
Heatmap showing correlations between features. Lighter colors mean stronger correlation. Darker colors are weaker.

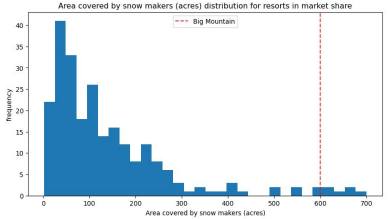
Recommendations and Key Findings

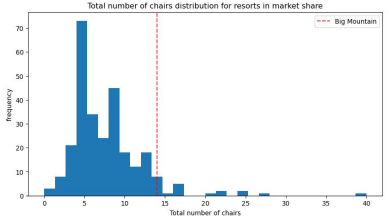
The figures below show the distributions of the most important facilities across the data set, and highlights with an orange line, where Big Mountain lands in each. Big Mountain is high in most of them from price to vertical drop to number of fast quads.

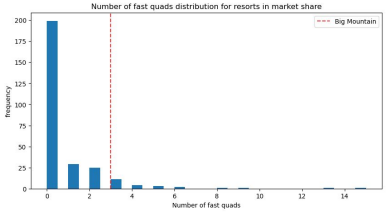


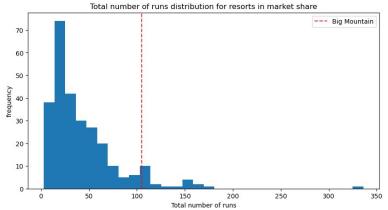


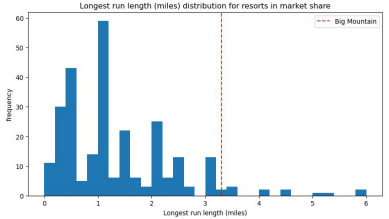


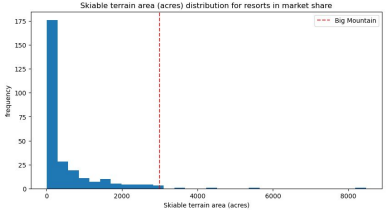










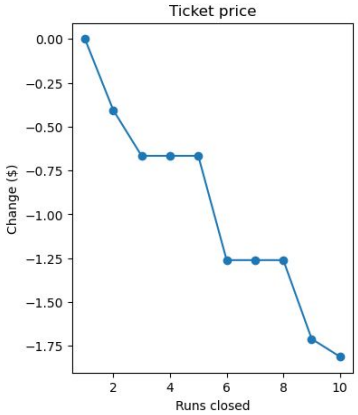


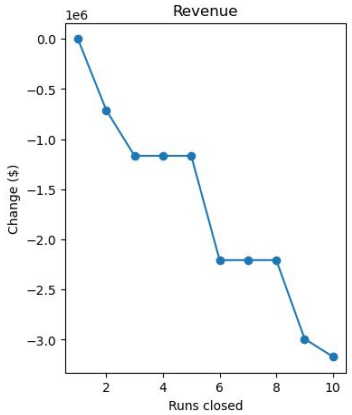
Recommendations and Key Findings

Scenario 1

Permanently closing down up to 10 of the least used runs. This doesn't impact any other resort statistics.

The graphs below show how ticket price and revenue would decrease with increasing the number of runs closed.





Scenario 2

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

- Supports an increase in ticket price of $1.99
- $3,482,500.increase revenue per year

Recommendations and Key Findings

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

- No resultant increase in ticket price

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

- No resultant increase in ticket price
- The random forest model ranked longest run as a much less important feature, compared to the linear regression model.

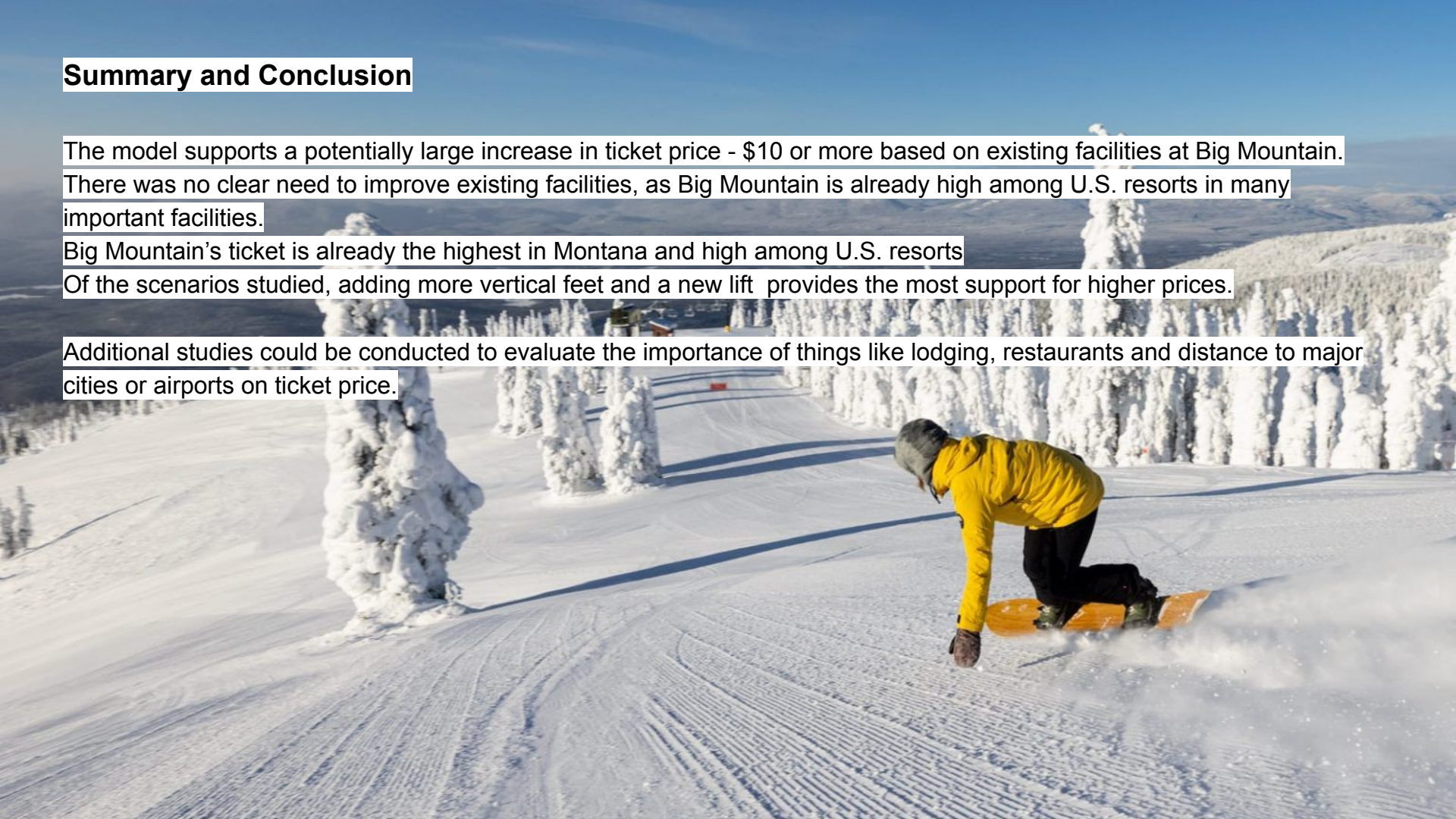
Recommendations and Key Findings

- Based on current facilities, Big Mountain could raise prices by $10.39 or even up to $95.87.
- Most promising scenario: Scenario 2 - increasing vertical drop and adding a new lift
- Scenario 1 shows that shutting down runs decreases support for increased ticket price. More information on operational cost saved would need to be known before moving forward.

Summary and Conclusion

The model supports a potentially large increase in ticket price - $10 or more based on existing facilities at Big Mountain.
There was no clear need to improve existing facilities, as Big Mountain is already high among U.S. resorts in many important facilities.
Big Mountain's ticket is already the highest in Montana and high among U.S. resorts
Of the scenarios studied, adding more vertical feet and a new lift provides the most support for higher prices.

Additional studies could be conducted to evaluate the importance of things like lodging, restaurants and distance to major cities or airports on ticket price.



Appendix

Data that was dropped	Reason
The feature “fastEights” (number of fast eight chair lifts per resort)	Over 50% of the data was missing
Adult weekday prices	Missing more data than Adult Weekend prices. In many cases Adult Weeday and Adult Weekend prices were the same.
A resort listed as open for 2019 years	Unknown how long it is actually open
Observations where Adult Weekend price was missing	As this is the target feature, it was important to use data that had this information

Appendix

Features that were calculated and added to the data set

resorts per state	resorts per 100kcapita	ratio of resort night skiing area to total state night skiing area
state total skiable area	resorts per 100k square miles	total_chairs_runs_ratio
state total days open	ratio of resort skiable area to total state skiable area	total_chairs_skiable_ratio
state total terrain parks	ratio of resort days open to total state days open	fastQuads_runs_ratio
state total night skiing	ratio of resort terrain park count to total state terrain park count	fastQuads_skiable_ratio