Data Driven Insights for

Big Mountain Resort

Whitefish Mountain Resort (2007)

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Problem Identification

Big Mountain Resort (BMR) requested guidance on how to value and properly charge visitors for resort tickets. In addition, management is looking into ways to reduce operating costs, and evaluate the effect of any future changes to BMR's feature offering to visitors.

1. What price should Big Mountain Resort charge visitors?

2. Which Resort Features correlate with Value?

3. What can we expect with the addition of Big Mountain Resort's newest lift?

Key Findings

1. What price should Big Mountain Resort charge visitors?

$95.87/ticket

2. Which Resort Features correlate with Value?

Vertical_drop **fastQuads** **Total_chairs**

Runs **Snow Making_ac**

3. What can we expect with the addition of Big Mountain Resort's newest lift?

Negligible impact to pricing/sales volume. The additional overhead may actually result in lower overall profitability

Recommendations

Pricing Strategy

- **Incrementally raise and evaluate ticket price increases** (up to ~$96)
  - Test pricing increases against different groups (locals, students, seniors, etc.)

Opex Savings Strategy

- **Ski Run closure test** (105 total runs)
  - Phased approach to close 1-5, and possibly up to 8, total ski runs
- *Assumes the operating cost of maintaining a Ski Run is relatively high*

Future Improvements

- *High Quality*, long **Runs** with higher **Vertical_drop**s
  - *High Utilization*, **fastQuads**, for especially popular runs
- *Operational Extending*, **Snow Making_ac** machines

Data Driven Process

In order to provide our models with the cleanest set of data to train and test against, we methodically went through the following process.

Step 1: Data Wrangling, we reviewed and cleaned up the data provided to us by the team. We looked for concerns like duplicates, missing data, and outliers. We reviewed basic metrics and distributions from this cleaned up database to infer general assumptions about what features seemed to be key indicators of a resorts value; also noting key differences in resorts in particular states/geographies.

Step 2: Exploratory Data Analysis, by scaling and normalizing the data using Principal Component Analysis, we compared and visualized the associations between various features and ticket pricing. These findings strengthened some of our original conclusions as to which resorts features would likely be key to using in our models.

Step 3: Preprocessing & Training, we created training and test datasets for our models, by removing Big Mountain Resort and calculating the MAE of various regression models, ultimately choosing the Random Forest model to evaluate our expected BMR ticket price.

Pricing Model

Predicting an expected Ticket Price for Big Mountain Resort:

By comparing Big Mountain Resort's key features against others in their market, we created multiple pricing models and ultimately chose a Random Forest model that resulted in a Mean Absolute Error (MAE) closest to 1 (1.35) when compared to others we tried. Using this model provided us with our recommended AdultWeekend ticket price of $95.87.

4.11.2 Random forest regression model performance

```
rf_neg_mae = cross_validate(rf_grid_cv.best_estimator_, X_train, y_train,
                            scoring='neg_mean_absolute_error', cv=5, n_jobs=-1)
```

```
rf_mae_mean = np.mean(-1 * rf_neg_mae['test_score'])
rf_mae_std = np.std(-1 * rf_neg_mae['test_score'])
rf_mae_mean, rf_mae_std
```

```
(9.644639167595688, 1.3528565172191818)
```

```
mean_absolute_error(y_test, rf_grid_cv.best_estimator_.predict(X_test))
```

```
9.537730050637332
```

5.7 Calculate Expected Big Mountain Ticket Price From The Model

```
X_bm = ski_data.loc[ski_data.Name == "Big Mountain Resort", model.X_columns]
y_bm = ski_data.loc[ski_data.Name == "Big Mountain Resort", 'AdultWeekend']
```

```
bm_pred = model.predict(X_bm).item()
```

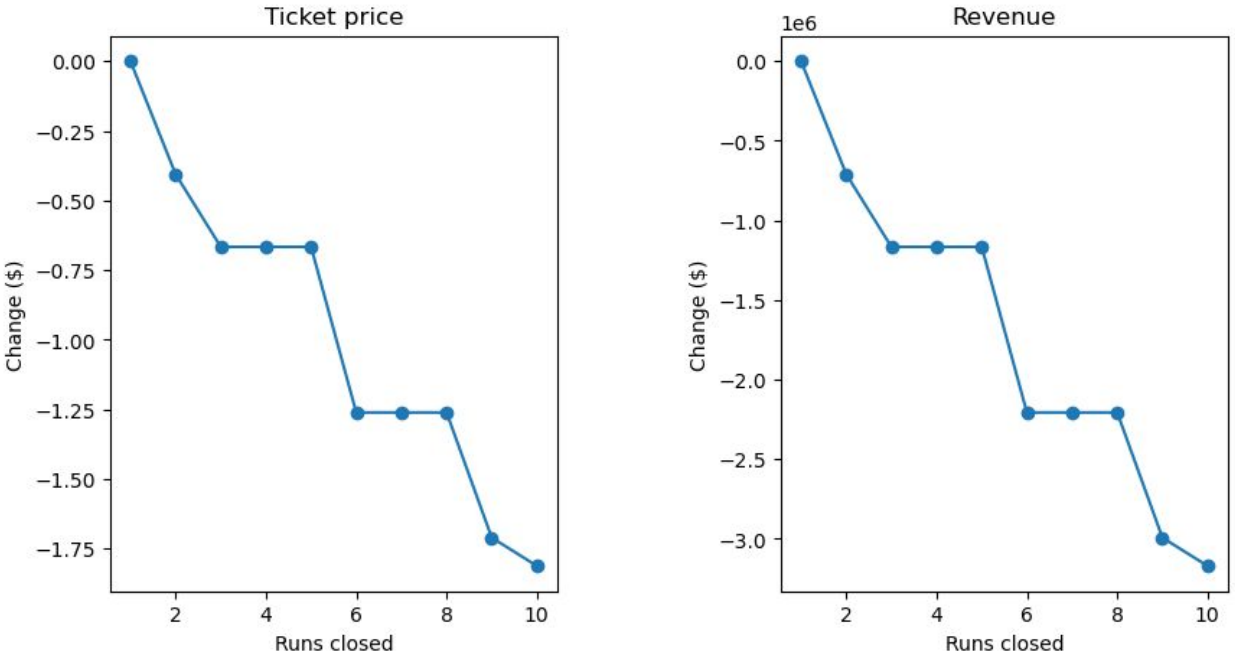
```
y_bm = y_bm.values.item()
```

```
print(f'Big Mountain Resort modelled price is ${bm_pred:.2f}, actual price is ${y_bm:.2f}.')
print(f'Even with the expected mean absolute error of ${mae_mean:.2f}, this suggests there is room for an increase.')
```

```
Big Mountain Resort modelled price is $95.87, actual price is $81.00.
Even with the expected mean absolute error of $10.39, this suggests there is room for an increase.
```

Scenario Testing

Testing the effect of feature changes on Ticket Prices and Revenue:
We also tested various scenarios of Big Mountain Resort having different numbers of key features to evaluate the impact such changes would have on BMR's value proposition and justify any ticket price changes. For example, closures of some runs would minimally impact the need to decrease ticket pricing, based on our model.



How ticket prices can expect to change, based on the number of runs at BMR (or increased # of closures); there is no drop-off closing 3-5 or 6-8 runs, once 3 or 6 runs have already been closed for example

Summary & Conclusion

Data Limitations:

We were provided with this dataset of US Ski Resorts, and we are unclear whether more information exists outside of this database. We discovered our model would perform better with more data and such information could be useful to improving our model. In addition, information on number of visitors, lift usage, and other factors could also help us build a better model. It would also be interesting to learn about the operating costs (and depreciation) aspects of the various facilities to include in our pricing mode.

Additionally, information can be shared on our scenario studies for future updates to Big Mountain Resort features. If this subject is a matter of interest, I would request additional information on the cost of setting up, operating, and taking down certain features, to better understand the extent of cost reduction/expenditure, and whether management had a target ticket price and/or operating budget to hit. In the future, some kind of dashboard using a new model can be created to help the operations and finance teams plan for future improvements/changes to the resort.

Summary:

Assuming BMR makes no changes to its facilities, we would recommend increasing tickets from their current $81 to something closer to $95.87. Because this would be an 18% increase, we'd recommend implementing an incremental rollout of pricing increases to visitors; in a way we could possibly test and re-evaluate again as the process unfolds.

Assuming pricing increases are implemented, it would be good to understand and evaluate the difference in ticket sales YoY to grade our recommendations. If any new data can be identified or researched we can further refine and improve our model. In the future for management planning we can develop a dashboard allowing users to input different values of a resort to calculate pricing, and perhaps estimate sales/revenue (if that data is included).