# Quality Analysis of Lift Ticket Prices in the United States Using Logistic Regression

**Jared Murphy**

**Abstract**

This paper investigates the possibility of a relationship between Lift Ticket Prices and quality of resorts in the United States of America. The study incorporates information from a number of past research papers analyzing the price of lift tickets and the individual characteristics of the ski area. In recent years, the price of lift tickets has increased far greater than the rate of inflation. With over 350 companies operating in the industry in the United States, they combine for annual revenue greater than $2 billion. Consumers who enjoy the sport have seen a sharp increase in prices throughout the past decades. In 39 years, the price of a lift ticket has appreciated 546% and this study investigates the relationship between quality factors of ski resorts and their price in a logistic regression with a goal of understanding which factors are most significant and to give consumers a guide to which ski resorts are overpriced, underpriced, and priced fairly.

JEL Classification: F21, F23, C33

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[a] Department of Economics, Bryant University, 1150 Douglas Pike, Smithfield, RI02917. Phone: (774) 218-2520. Email: jmurphy18@bryant.edu

## 1.0 INTRODUCTION

The first ski lift was installed in 1936, and at the time there was no such thing as ski resorts, just small-scale hills operating with little to no infrastructure. Throughout the 50s and 60s, the competition in ski resorts became very intense, as new resorts were popping up throughout the country after World War II was complete. As time went on, many ski resorts began to adapt to offer more ski availability, with the introduction of snow making machines, which came in the early 1970s. Massive amounts of energy and capital are needed to keep ski resorts running, so resorts need to be strategic when it comes to setting prices for their operations. The United States ski industry contains more than 350 companies and combines for annual revenue greater than $2 billion dollars annually, but climate change may take a massive toll on this number in future years.

In 2019, a total of 9.2 million Americans reported that they were active skiers or snowboarders. In 1996, about 7 million Americans stated they were skiers and 1.4 million claimed they were snowboarders, and today that number sits at 7 million and 2.2 million respectively. At resorts like Vail and Breckenridge, consumers have to pay a steep price of around $200 per day just to hit the slopes, but why exactly have prices skyrocketed in previous years?

This study aims to enhance understanding of why ski lift ticket prices are so expensive and does so through a logistic regression. By using the results of the regression, the goal is to understand which independent variables are significant when it comes to setting the price of these lift tickets. Lift ticket prices can range from anywhere between $30 to $250, so this study collected many United States ski resorts to get a model that will be representative of all these different areas.

After the regression results are obtained, this study will then look to assign a value to each ski resort with the data calculated, with the main purpose to assess which ski resorts are overpriced, under-priced, and priced fairly. This information can be used by potential consumers to validate that they are paying a fair price for the product they are receiving.

Like skiing, gear and accessories are very expensive when it comes to sports like skateboarding, surfing, biking, and climbing, but these sports do not face such intense variable costs that skiers are experiencing when they try to use their respective gear. The average price for skis and snowboards has stayed relatively fixed with inflation over the

past twenty years, but ski lift tickets have seen intense increases in price with little to no information why.

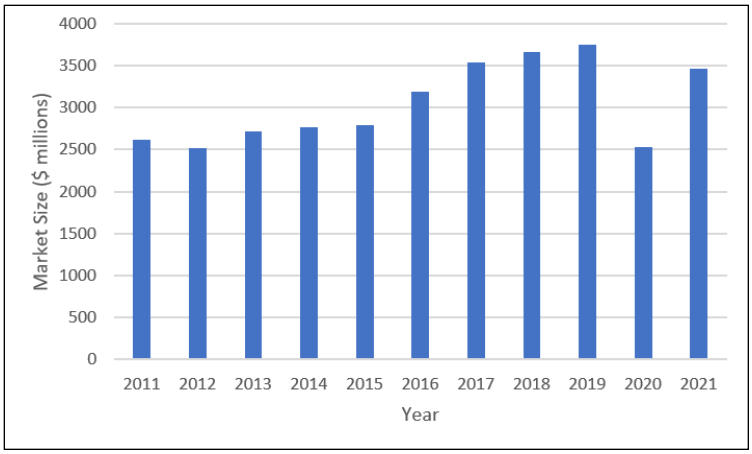
This paper was guided by three research objectives that differ from other studies: First it investigates the relationship between quality factors and price in a logarithmic regression; Second, it incorporates information contained in a previous study that investigated a hedonic pricing model in Norway and France and applies the information to United States ski resorts; Last, it analyzes the potential impact of climate change on the changing prices of ski lift tickets in the United States. There is very little empirical work in the literature concentrating on the pricing of lift tickets in the United States, and none that use a logarithmic regression to investigate elasticity. This paper successfully fills this void.

The rest of the paper is organized as follows: Section 2 gives a brief literature review. Section 3 outlines the empirical model. Data and estimation methodology are discussed in section 4. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

## 2.0 TREND

Figure 1 shows the market size of ski and snowboard resorts in the Untied Stated since 2011. In 2011, the market size of Ski and Snowboard Resorts in the United States was around $2.5 billion, and that number dramatically rose 48% in 2019 with a market size of 3.7 billion. As expected, the industry was hit hard by the pandemic and this can be seen in the market size decline in 2020. The market size of ski and snowboard resorts has increased faster than other businesses in the entertainment and recreation sector. Although the industry was impacted by the pandemic, analysts and experts predict the market to bounce back to pre-pandemic levels with an estimated increase in market size of 37.1% this upcoming year. Factors that impact the industry growth include increasing disposable income per capita and low growth risk. Another reason that ski and snowboard resorts may continue to grow is because people are having more leisure time available, and when leisure time increases, resort attendance increases and so does resort revenues.

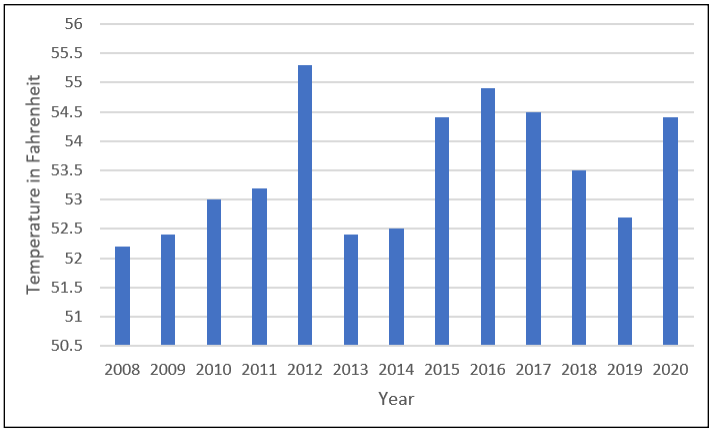
**Figure 1: Ski & Snowboard Resorts in the US**




Source: IBISWorld

Figure 2 shows the rising United States average temperature in the last 12 years and is clear evidence that climate change is a rising issue on our planet. In just 12 years, the average temperature rose 2 degrees and this rise in temperature is due to the rise in carbon dioxide emissions in the United States. Changing weather patterns have also been correlated to rising average temperatures, and extreme weather in the United States has led to an increase in hurricanes and extreme heat waves. For ski resorts to maximize earning potential, these resorts must stay on top of the warming trend and figure out ways to mitigate the problem before they are no longer able to stay in operation.

**Figure 2: U.S Average Annual Temperature 2008-2020**

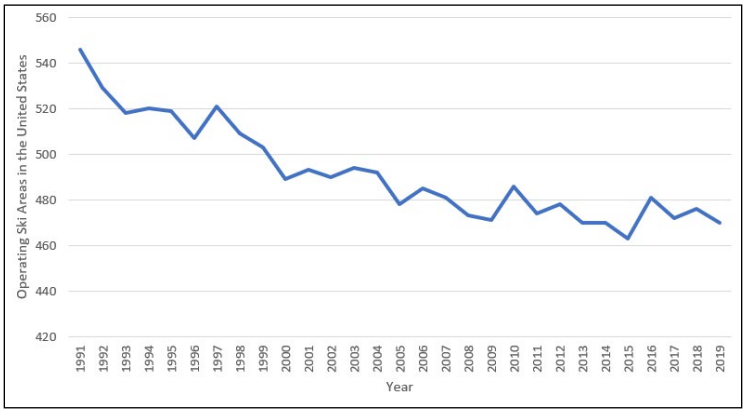



**Source: Statista**

Figure 3 is a chart that outlines the total number of ski areas in operation in the United States from 1991. A major trend that is hitting this industry is that many ski areas are closing operation, and this may be a result of increasing competition, climate change and evidence that smaller ski operations have a much more difficult time operating with

limited resources. There is small fluctuations throughout the time period due to cycles of closing and re-opening of smaller ski resorts and since 1991, there has been a decline of 14% in the total number of operating ski resorts.

**Figure 3: Operating Ski Areas in the United States 1991-2019**




Source: National Ski Areas Association

## 3.0 LITERATURE REVIEW

France is one of the most highly attracted ski destinations worldwide and sees an average of about 10 million visitors arrive annually to ski the slopes of the Alps and other beautiful ski terrain. Previous research by Wolff (2014) found that lift ticket prices in France are correlated to the attributes of ski resorts. These attributes include number of trails, number of operating lifts and other factors like snowfall levels and snowmaking ability. The author defined an efficient resort as one where the ticket price is the cheapest for a given quality and found resorts in the Northern Alps are more inefficient because of the presence of large, connected ski areas offering more runs for a small surcharge. Although characteristics of French ski areas are much different than that of the United States, the same processes can be applied to United States resorts to understand the factors that are most influential in determining the prices. Another similar article by Fonner and Berrens (2014) found that similar factors impact United States prices but found that large crowds and overcrowding have a strong negative impact on the price of ski areas.

Malasevska (2018) did a similar pricing analysis of ski tickets in Norway and found similar factors that determine the price. The results of this study indicate that vertical drop, share of intermediate slopes, and price of nearest large ski resort positively affect prices. A significant factor that was found to negatively impact price was whether or not the resort

could hold a capacity of 3000 persons per hour. This study was able to determine whether or not ski resorts were overpriced or underpriced, and this data can be used my managers to increase profitability.

Ski resorts throughout the United States experience a wide variety of altitudes and a previous study done by Kuscer and Dwyer (2018) analyzed whether altitude and size of the mountain matters. The goal was to analyze the sustainability of resorts and to determine which types of ski resorts are able to manage sustainability more effectively. Results state that larger ski resorts and ski resorts at higher altitudes are more effectively able to implement sustainability management practices and as a result enjoy higher quality environments.

In the past couple decades, the United States has seen an increase in the prices of lift tickets that has been more significant than the rising costs of other recreational activities. In Colorado, ski resorts spend significant time trying to settle on a price that will attract the maximum amount of business, but a major trend has been evident in recent years. Marketing News (2007) emphasized that ski resorts have been in contention with each other to gain as much market share as they can but stated that a trend has been seen is that these ski resorts are raising prices rather than cutting them to attract more business. By raising their prices, these resorts think that they will have a more prestigious image, stating that many people thing “most expensive equals best.”

Although the previous study stated that prices are increasing to set prestigious images, Deprez (2015) conducted a study and found that the presence of a new online website may allow consumers a more attractive price for tickets. Liftopia, a San Francisco company specializing in online lift tickets, has a vision to adapt the skiing industry to be more like industries like hotels and airlines. Instead of paying the same price regardless of when you bought the ticket, Liftopia offers discounted prices depending on when the ticket was purchased so customers who commit earlier are rewarded with cheaper prices. Although the ski resorts are getting less per ticket, this process acts as a hedge against the weather for the resorts, as they are able to get revenue months ahead regardless of the weather on the ticket’ date. Liftopia users paid an average 32% less than nonusers for tickets 15 days in advance and the site has a major presence as it is affiliated with over 250 United States and Canada ski areas.

Climate Change is a rising issue that is negatively impacting many industries around the world, including the ski industry. The ski industry is an industry that relies heavily on local weather characteristics like snowfall and temperature levels, and the changing climates have created a severe issue for operators to stay open. Previous research done by Beaudin and Huang (2013) suggest that there has been significant decline in the number of operational ski areas due to many changing patterns in the climate. Research from the thirty-year period between 1970 and 2000 shows that New England has seen an increase in the average annual temperature, average winter temperature, and the number of days with snow on the ground has declined significantly.

The author's highlight other factors that are contributing to the closing of these ski areas, but their results suggest weather conditions have a significant impact both directly and indirectly. Direct impacts include the changes in snowfall and temperature, while climate change has indirectly caused the closing of these areas through its influence on investment activities. As these operating areas are experiencing the changing climates, their decisions regarding the purchase of snow making machines or upgrading resorts has been impacted since these investments may not be worth the risk they pose. The ski market is essentially being diluted, as the big resorts with a lot of money are able to weather the storm with the availability of more resources, while the smaller and medium sized resorts are in danger of their survival.

## 4.0 DATA AND EMPIRICAL METHODOLOGY

### 4.1 Data

The study uses cross sectional data from 2021. Data was obtained from OnTheSnow, which is a database providing snow reports, deals, and reviews from over 2000 ski resorts worldwide. In this study, lift ticket price is the dependent variable of interest and the independent variables include number of operating ski lifts, altitude levels, total skiable acres, trail difficulty, snowmaking ability and average annual snowfall levels. Summary statistics for the data are provided in Table 1.

**Table 1 Summary Statistics**

| Variable | Observation | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Price | 60 | 101.5 | 51.56 | 30 | 229 |
| SkiLifts | 60 | 11.15 | 7.94 | 1 | 44 |
| AltT | 60 | 5196.717 | 3757.808 | 440 | 13011 |
| PerBeg | 60 | .244 | .104 | .04 | .5 |
| PerInt | 60 | .398 | .105 | .19 | .67 |
| PerAdv | 60 | .2635 | .091 | .1 | .48 |
| SnowMake | 60 | 245.0333 | 207.121 | 0 | 660 |
| SnowInch | 60 | 130 | 99.057 | 0 | 451 |

### 4.2 Empirical Model

Following Wolff's study representative of French ski lift ticket prices, a model was generated to be representative of resorts in the United States.

The model could be written as follow:

$$lnPLT = \beta 0 + \beta 1 lnSkiLifts + \beta 2 lnAltT + \beta 3 lnSkiAcres + \beta 4 lnSnowMake + \beta 5 lnSnowInch + \beta 6 PerBeg + \beta 7 PerInt + \beta 8 PerAdv + u$$

*lnPLT* is the dependent variable of interest in this study and is defined as the price of a lift ticket in dollars. Independent variables consist of eight variables obtained from OnTheSnow. Appendix A and B provide data source, acronyms, descriptions, expected signs, and justifications for using the variables. First, SkiLifts represents the total number of operating ski lifts at each designated ski area. AltT is a proxy for altitude at the summit of the ski area , which data was obtained from OnTheSnow's ski resort database. SkiAcres is a variable that is described as the total number of skiable grounds in acres and SnowMake is also measured in acres and is representative of the total snow making capacity of each resort. SnowInch is a variable included to represent the climate of each region and is described as the average annual snowfall levels of each ski resort. PerBeg, PerInt and PerAdv are variables that measure the difficulty levels of the trails at each ski resort.

## 5.0 EMPIRICAL RESULTS

The empirical estimation results are presented in Table 2. The empirical estimation shows the positive relationship between ski resort characteristics and the price of a lift ticket. In this study, there was 54 total ski resorts in the dataset and this empirical

model generated an R-squared value of .9013. This reveals that 90% of the data in this study is representative of the logistic regression model. At 45 degrees of freedom, five of the eight explanatory variables generated statistical significance. The three variables that were not statistically significant include total skiable acres, percent beginner trails and percent intermediate trails.

**Table 2: Regression Results**

| Variable | Coefficient | Standard Error | T-Value |
|---|---|---|---|
| SkiLifts | 0.447 | 0.073 | 6.13 |
| AltT | 0.271 | 0.067 | 4.05 |
| SkiAcres | -0.081 | 0.053 | -1.51 |
| SnowMake | 0.116 | 0.032 | 3.61 |
| SnowInch | 0.097 | 0.041 | 2.39 |
| PerBeg | 0.808 | 0.409 | 1.97 |
| PerInt | 0.312 | 0.309 | 1.01 |
| PerAdv | 0.747 | 0.356 | 2.08 |
| Constant | 0.213 | 0.516 | 0.41 |
| | 99.9% Significance | | |
| | 95% Significance | | |

*Note: Green denotes significance at the 5%, while blue denotes significance at the 1%.*

Economists use confidence intervals to measure uncertainty in sample variables and they are conducted using statistical methods like t-tests. At 45 degrees of freedom, five of the eight independent variables generated t-values that concludes they are statistically significant at the 95% level. The variables with the highest statistical significance include number of total operating ski lifts, altitude at the summit of the mountain and snowmaking ability. The results of this model are consistent with past research, as Wolff's model representative of French ski resorts also found strong statistical significance in the variables number of operating ski lifts and snowmaking ability. Kuscer and Dwyer's past research found that altitude is a strong factor that impacts price of lift tickets, and the results of this study are consistent as altitude at the summit registered a very high t-value.

What was interesting about the results of this study was the significance between share of advanced trails and price. In Malasevska's past research, the author found that share of intermediate trails was statistically significant with price and share of advanced

trails was not as significant in their model. When the regression was ran, share of expert trails was omitted.

In order to gain a better understanding of the regression results, a quick description of the statistically significant coefficients will be provided next. When the number of operational ski lifts increases by 10%, the price of a lift ticket increases by 4.47%, holding all other factors constant. When the altitude at the summit of the mountain increases by 10%, the price of a ski lift ticket increases by .271%, holding all other factors constant. When snowmaking ability increases by 1%, the price of a lift ticket at that ski resort increases by 1.16%, holding all other factors constant. When the level of snowfall increases by 10%, the ski resort lift ticket price increases by 0.97%, holding all other factors constant. When the percentage of advanced trails increases by 10%, the price of a lift ticket increases by 0.74%, holding all other factors constant.

Another model was generated quickly to understand which ski resorts are overpriced, underpriced, and priced fairly. Previous research claimed that larger ski resorts tend to upcharge to get a more prestigious image, which is consistent with the results of this study. Of the 54 resorts in this study, 44 of them were in the overpriced area and the most overpriced resort (Jackson Hole) is selling lift tickets for $95 more than their market value. The giant resorts on the west coast seem to have more overpriced tickets which makes sense because they are trying to look more prestigious and high-class. The top underpriced resorts in this model were all from New England and include resorts like Killington (VT), Okemo (VT) and Sugarloaf (ME).

## 5.0 CONCLUSION

When investigating United States ski resorts and their lift ticket prices, it is evident that number of operating ski lifts, altitude level at the summit of the ski area, snow making ability, total skiable acres and percent advanced trails are all very important characteristics that shift the prices of each ski resort. Ski resorts are trying to get a county club type look and rises in prices can be an effect of that trend. In order to gain a better understanding as to why lift ticket prices have appreciated so drastically, future research could gather time series data to understand how relationships have changed over time. In this study there was only 54 ski resorts included in the model due to availability of data, so further research could gather more data to make the model more representative of all

United States resorts. By using time series data, further research could gain a greater understanding as to how climate change is impacting the price of lift tickets and causing many ski areas to close.

Variables that could be included to potentially increase the relationship include length of ski season at each resort, a variable that is representative of the culture of the ski area, and further research could investigate the effects of Covid-19 on the industry and understand whether the pandemic caused an increase in ski lift ticket prices of if it caused the resorts to lower prices in order to generate revenue and cover pandemic-induced costs.

## Appendix A: Variable Description and Data Source

| Variable | Description | Source |
|---|---|---|
| PLT | Price of Lift Ticket | Resort Website |

| | | |
|---|---|---|
| SkiLifts | Number of total ski lifts at resort | OnTheSnow Database |
| AltB | Base level altitude | OnTheSnow Database |
| AltT | Top level altitude | OnTheSnow Database |
| NumTrails | Number of Total Trails | OnTheSnow Database |
| LongRun | Longest trail at mountain | OnTheSnow Database |
| PerBeg | Percent of Beginner Trails | OnTheSnow Database |
| PerInt | Percent of Intermediate Trails | OnTheSnow Database |
| PerAdv | Percent of Advanced Trails | OnTheSnow Database |
| PerExp | Percent of Expert Trails | OnTheSnow Database |
| SnowMake | Snowmaking ability in acres | OnTheSnow Database |
| SnowInch | Average annual amount of snow in inches | OnTheSnow Database |

## Appendix B- Variables and Expected Signs

| **Acronym** | **Variable Description** | **What It Captures** | **Expected Sign** |
|---|---|---|---|
| SkiLifts | Number of Total Operating Ski Lifts | Lift Capacity of Each Resort | Positive |
| AltT | Summit Level Altitude | Environmental Characteristics of Ski Area | Positive |
| SkiAcres | Total Area of Skiable Ground | Size of Ski Resort | Positive |
| SnowMake | Snowmaking Ability in Acres | Number of Snowmaking Machines | Positive |
| PerBeg | Percentage Trails Beginner Level | Trail Difficulty | Positive |
| PerInt | Percentage Trails Intermediate Level | Trail Difficulty | Positive |
| PerAdv | Percentage Trails Advanced Level | Trail Difficulty | Positive |

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