

# Does Night Skiing Save Ski Areas? A Survival Analysis

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## Abstract:

This paper conducts a survival analysis on New England ski areas to examine the factors that cause a ski area to exit the industry. The main variable of interest in this case was whether or not the mountain conducted night time operations. Very specific criteria was used for the areas included in the study. This paper also suggests improvements that could be made to future studies on the subject.

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## **1.0 INTRODUCTION**

The author of this paper spent their entire life in the ski industry and has worked in the industry for the past 8 years. The ski industry is a global industry existing in many countries including the United States, European Union and Asian countries as well. Although the industry is a global one there has not been much economic analysis conducted on the industry with one economist conducting the majority of work on the industry.

Every year many ski areas close down especially independently owned ski areas instead of the ski areas owned by conglomerates. Other research has been done on the weather's impact on a ski areas ability to stay open. With new technology that has been created areas are able to offset a lot of the weather's impact on natural snow. This study instead looks at the characteristics of ski areas and how those impact the ability of a ski area to stay open.

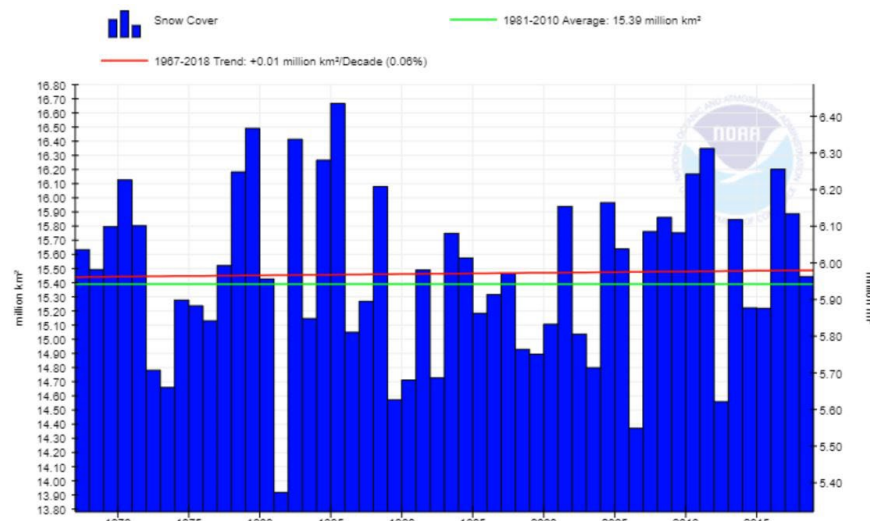
This paper looked at individual features of mountains such as the size and number of lifts, the vertical drop of a mountain as well as their physical locations were analysed along with night operations capabilities to determine the impact that those had on a mountains decision to stay open.

This paper differs from the few papers that exist on the topic in many ways. Rather than only looking at environmental factors in the decision for an area to stay open it looks at the physical characteristics of a ski area. This paper also expands on a topic with relatively little literature on the subject. The variable of interest in this study is also one feature of ski areas that often does not exist outside of the region studied. Finally this paper offers guidance for future research on the subject.

## 2.0 TREND (OF THE GIVEN TOPIC)

Figure 1 shows the trend of snow coverage on the Eastern Seaboard of the United States. Although coverage can vary widely from year to year the general trend is that it has remained constant over time. For this reason and the presence of existing literature on the topic of snowfall and ski area closures it was decided not to include snowfall data in this study.

**Figure 1: Snow Coverage on the Eastern States**



Source: Rutgers University Global Snow Laboratory (GSL)

Source: NOAA Snowfall Index

Figure 2 shows the trend of ski area closures starting from the 1970s. A quick glance shows that starting from that time the trend has continued for ski areas to close down despite many advances in the technology to offset weather conditions and other technological improvements to mountains. This paper wanted to analyze the other features of mountains that allow them to remain open despite the broader industry trend of closing down.

## Figure 2: Ski Area Closures in New England

*L. Beaudin, J.-C. Huang / Ecological Economics 106 (2014) 56–68*

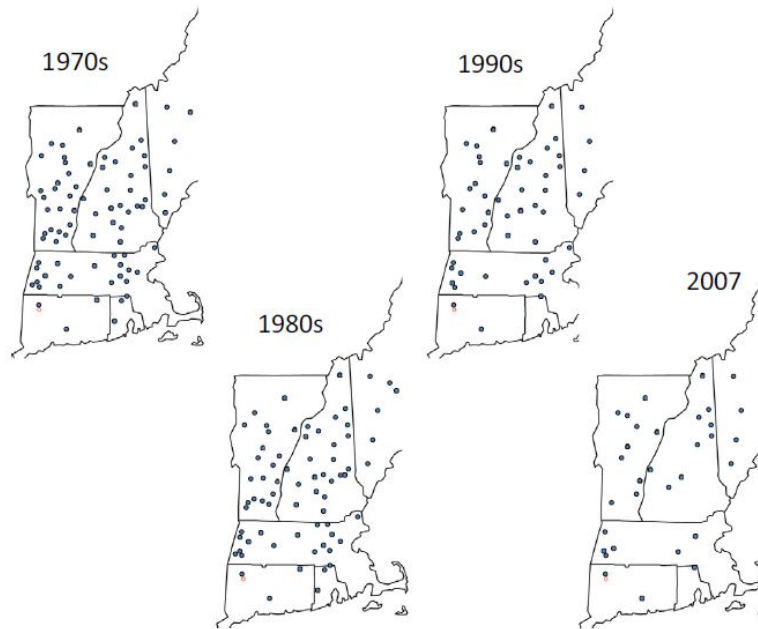


Fig. 1. Mapping of ski areas in New England over four decades.

Source: Beaudin 2014

Despite the relatively low change in snowfall trends and increases in technology, ski areas all over New England continue to close down. This paper wanted to analyse whether other factors and characteristics of ski areas had a larger effect on whether they remained open or not.

### 3.0 LITERATURE REVIEW

There is relatively little economic literature on ski areas and most of it was created by one researcher. In order to supplement the economic literature the author's experience in the industry as well as interviews with members of the ski area industry were also used.

Beaudin and Huang (2014) analyzed New England Ski Areas and found that weather conditions as well as investment in new technology such as snow making significantly improves a ski area's probability of surviving to the next year of operation. They also analyzed the distance that any mountain was from Boston to see if it impacted their survival chances. The distance variable is important many mountains operate as resorts so the state that they are located in may be a more useful variable. Snowmaking

has also been increasingly important to mountains, because it can help offset years of poor weather. The snowmaking technology is becoming increasingly more efficient.

Interviewing many instructors from Yawgoo Valley ski area produced theories on why that particular mountain is able to remain open when the other 5 ski areas in Rhode Island have closed over the years. Most of the theories come back to the location of the mountain, the school groups and that they are open during off peak hours for night operations.

Another interview with Richard Edwards the vice-president and co-owner of Catamount Ski Area has produced the following insight into the importance of night operations. Richard had this to say on night operations “Night operations for ski resorts has been economically beneficial as a result of attracting an audience who are not able to participate daytime or weekends. This demographic has a much lower entry price which is very attractive to school groups, church groups, recreation department groups and the like. The ski resorts provide lift tickets, rental equipment and lessons for these groups at a time of day where there is excess capacity to service the demand.” In this way the area is able to operate across multiple price points for consumers and expand the time that they are able to operate and attract business when normally they would not be able to attract customers.

Falk in 2009 found that out of all the major ski area conglomerates only one them operated more efficiently than independent ski areas. This find was surprising because it shows that the skiing industry does not necessarily benefit from economies of scale and the greater access to resources that a ski area conglomerate can provide. The increase in ski area conglomerates could be part of the reason for the declining number of ski areas, but it could also save many ski areas that would have closed.

In 2011 he found that weather only has a significant impact on local visits not visits from large distances. This makes sense especially with people’s likelihood to follow the sunk cost fallacy. If someone is driving a large distance they are less likely to cancel the trip to the ski area due to the fact that they most likely paid for the trip in advance rather than the day of.

In 2013 Falk also discovered that early season snowfall has a large effect on ticket sales, but not later in the season. The increase in snowfalls early in the season especially

around the holiday period makes logical sense that it would impact ticket sales. After the first few months of operation business does tend to slow down even with late season snowfalls. All of this makes logical sense to any person who has been involved in the industry.

After reviewing the available literature and conducting interviews with industry insiders the data collection process began.

## 4.0 DATA AND EMPIRICAL METHODOLOGY

### 4.1 Data

The study uses cross sectional data on New England Ski Areas that were open between 1970 and the present. Data were obtained from the New England Lost Ski Areas Project website. If the ski was still open than the data were obtained from the ski areas individual website. Summary statistics for the data are provided in Table 1.

**Table 1 Summary Statistics**

Variable	Observation	Mean	Std. Dev.	Min	Max
Open	50	0.72	0.4535574	0	1
Night skiing	50	0.48	0.504672	0	1
Snowmaking	50	0.76	0.4314191	0	1
Off Season	50	0.5	0.5050763	0	1
Trails	50	35.52	38.08542	1	155
Vertical	50	1003.74	776.9469	100	3050
Lifts	50	6.72	5.5322421	1	21
State	50	-	-	0	1

### 4.2 Empirical Model

Following Beaudin and Huang (2014) this paper modified their model and created a new one.

The model could be written as follow:

$$\text{Open} = \beta_0 + \beta_{\text{night}} + \beta_{\text{snowmaking}} + \beta_{\text{investment}} + \beta_{\text{offseason}} + \beta_{\text{trails}} + \beta_{\text{vertical}} + \beta_{\text{lifts}} + \beta_{\text{state}} + E$$

(1)

Open is whether a mountain remains open and is the dependent variable in this study. It is a dummy variable with either a 1 for if the mountain is still open or a 0 if it has shut down any time since 1970.

Independent variables in this study consist of dummy variables for whether the mountain has night skiing or not, whether it has snowmaking capabilities, whether it invested in the area, and whether it participated in off season revenue generating activities. The number of trails a mountain has, its vertical drop in feet and the number lifts a trail had were also included. Due to some high correlations this equation did not produce significant results and a new equation was created as follows:

$$\text{Open} = \beta_0 + \beta_1 \text{night} + \beta_2 \text{snowmaking} + \beta_3 \ln(\text{trails}) + \beta_4 \ln(\text{lifts}) + E$$

## 5.0 EMPIRICAL RESULTS

The regression results from the second regression appear in the table below. This second regression had a much lower r-squared than the first one, but it did produce more significant variables.

**Table 2: Regression results for the night skiing study**

OPEN	I	II
CONSTANT	0.7205378	-0.1209043 (89.155)
Night Skiing	0.0830911	0.3259087* (0.1145444)
Snowmaking	-0.183743	0.0994872
Investment	0.7630147	
Off Season	-0.1408683	
Trails	0.0031054	
Vertical	-0.0000006	
Lifts	-0.0022935	
Vermont	-0.5953313	
New Hampshire	-0.03289704	
Connecticut	-0.03337211	
Massachusetts	-0.2795043	
Maine	-0.279048	
Rhode Island	-0.26874	
LogTrails		0.1994601* (0.07147456)
LogLifts		0.0133155
R <sup>2</sup>	0.6963	0.4704
F-statistics	0	0
Number of obs.	50	50

Note: \*\*\*, \*\*, and \* denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

In the second regression equation both the night skiing and log of trails variables were significant at the 10% level. With an adjusted r-squared of 0.4704 a decent amount of the variation was explained by the model. The state variable did have all negative



coefficients which is most likely due to every state in the study having ski areas that have closed down. In the second study the constant was also a negative indicating that the trend for ski areas closing is likely to continue.

Interpreting these results it is clear that night skiing can have a statistically significant impact on whether or not a mountain remains open. It can also be seen that the number trails had a similar significant effect. The state location data did not provide any insights similar to the data about offseason activities in order to generate revenue.

## **5.0 CONCLUSION**

The ski industry is a complex business that more research needs to be conducted on. Further research should include variables such as the population of the surrounding area within driving distance, whether the ski area is also a resort and the general public's knowledge of the area. Behavioral economic analysis should also be included regarding lift ticket sales during seasons that have above average snowfall versus seasons that have below average snowfall and the extremes of those factors. In order to conduct a more thorough analysis more data from nonpublic sources needs to be analyzed. Individual ski areas that remain open and the former employees or people that have access to closed ski areas data should also be included. Due to the fact that every state had a negative impact on whether a ski area remained open or not distance from the nearest major city or multiple major cities should also be analyzed. If the pricing of lift tickets is available over a period of time that data would help improve the study. Lastly if the ski areas are owned by conglomerates or independently owned would make a dummy variable that could also impact the study.

## Appendix A: Variable Description and Data Source

Acronym	Description	Data source
Open	Whether a ski area remains open today	New England Lost Ski Areas Project or ski area website
Night Skiing	Whether an area conducts night operations	New England Lost Ski Areas Project or Ski Area website
Snow Making	Whether an area has or had snowmaking capabilities	New England Lost Ski Areas Project or Ski Area website
Investment	Whether a mountain conducted investment activity	New England Lost Ski Areas Project or Ski Area website
Off Season	Whether an area does or did conduct off season operations	New England Lost Ski Areas Project or Ski Area website
Trails	Number of Trails	New England Lost Ski Areas Project or Ski Area website
Lifts	Number of Lifts	New England Lost Ski Areas Project or Ski Area website
Vertical	Vertical Drop In Feet	New England Lost Ski Areas Project or Ski Area website
State	The state an area is or was located in	New England Lost Ski Areas Project or Ski Area website

### Appendix B- Variables and Expected Signs

Acronym	Variable Description	What it captures	Expected sign
Night Skiing	Whether a mountain has night operations	Whether a mountain has night operations	+
Snowmaking	Whether a mountain has snowmaking	Whether a mountain has snowmaking	+
LnTrails	Log of the number of trails	Size of the mountain	+
LnLifts	Natural log of the number of lifts	Size of the mountain	+

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