Innovative pricing approaches in the alpine skiing industry

Iveta Malasevska
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UNIVERSITY
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Iveta Malasesvka
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Abstract

The tourism industry is one of the fastest growing business sectors in the world. Over recent years, mountain tourism has become a more and more important part of this growth. This PhD thesis focuses on the alpine skiing industry, which is one of the categories of mountain sport tourism with the strongest financial influence in the mountain regions. Alpine skiing is an extremely competitive industry that has experienced stagnation trend in recent years. Therefore, it is important to examine factors that may have positive effects on the performance of ski resorts.

Innovation is fundamental in order to realize the potential of the alpine skiing sector and to ensure sustainable business growth. For many ski resorts, innovation is a necessary condition for survival in a fiercely competitive environment. In other words, the competitiveness of ski resorts depends on their ability to innovate.

The overall purpose of this PhD thesis is twofold. First, the thesis aims to increase knowledge about factors that affect alpine skiing demand and the price for alpine ski passes. Second, it aims to provide new knowledge about how the alpine skiing industry can use innovative pricing approaches to achieve competitive advantage. This is one of the first studies to contribute to the research-based knowledge on innovative pricing approaches in the alpine skiing industry.

In general, the demand for alpine skiing exhibits strong variation. Hence, during periods with low demand, there is unused capacity. This thesis argues that one way to exploit unused capacity in the low-demand periods is to use innovative pricing strategies. Specifically, the findings of the appended research articles suggest that ski resorts can increase profitability and deal with fluctuations in demand by implementing the following pricing approaches: (1) variable pricing based on seasonality and (2) a dynamic pricing approach based on different weather scenarios.

In addition, this thesis provides empirical evidence on the price–quality relationship at ski resorts and discusses practical implications for ski resorts' managers. Possible directions for future research on innovative pricing approaches in the alpine skiing industry are also included for interested readers.

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Lillehammer, October 2017

Iveta Malasevska

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I.   Malasevska, I., Haugom, E. & Lien, G. (2017). Modelling and forecasting alpine skier visits. *Tourism Economics, 23*(3), 669–679.
Link to article/DOI: https://doi.org/10.5367/te.2015.0524

II. Malasevska, I. (2017). Explaining variation in alpine skiing frequency. *Scandinavian Journal of Hospitality and Tourism*, 1–11.
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III. Malasevska, I. (2017). A hedonic price analysis of ski lift tickets in Norway. *Scandinavian Journal of Hospitality and Tourism*, 1–17.
Link to article: http://dx.doi.org/10.1080/15022250.2017.1322531

IV. Malasevska, I. & Haugom, E. (2018). Optimal prices for alpine ski passes. *Tourism management, 64*, 291–302.

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V.   Malasevska, I., Haugom, E. & Lien, G. (2017). Optimal weather discounts for alpine ski passes. *Journal of Outdoor Recreation and Tourism*. Link to article/DOI: https://doi.org/10.1016/j.jort.2017.09.002

Appendix

Questionnaire used for the survey (empirical base for Articles II, IV and V).

1. Introduction

1.1. Background

The tourism industry is one of the fastest growing business sectors in the world. The Norwegian government has chosen to give high priority to the tourism industry as one of the business sectors that will contribute to Norway's future economic success (Regjeringen, 2012). Lately, mountain tourism has become economically important at the regional and national levels as well as at the local community level (Gilaberte-Búrdalo, López-Martín, Pino-Otín & López-Moreno, 2014). This PhD thesis focuses on the alpine skiing industry, which is the category of mountain sports tourism (Gibson, 1998) that has the largest economic influence in the mountain regions (Gilaberte-Búrdalo et al., 2014).

Alpine skiing is a highly competitive industry. Worldwide, there are about 2,000 ski resorts, with more than four ski-lifts in 67 countries that offer equipped outdoor ski areas covered with snow (Vanat, 2017). In Norway, skiing is the most popular winter season attraction for domestic and foreign visitors with more than 200 ski resorts. Norwegian ski resorts vary in size, ranging from a few very large ski resorts, which are popular with domestic and international tourists, to small resorts with limited capacity and ski runs. Moreover, Norwegian ski resorts differ widely in their geographic and supply-side characteristics. According to the Norwegian Alpine Resorts Association, Eastern Norway offers the highest density of ski resorts, accounting for 53 % Norway's ski resorts with the remaining proportions located in Western Norway (21 %), Northern Norway (11 %), Southern Norway (7 %) and Central Norway (8 %) (see Figure 1). There are also three high-altitude ski resorts that offer summer skiing.

Figure 1. Ski resorts in Norway.

The demand for alpine skiing is influenced by different factors, including the physical characteristics of the ski resorts and their prices, as well as by an individual's skiing budget, skiing ability and leisure time (see, e.g., Malasevska, 2017; Morey, 1981; Vanat, 2016). Recently, research on the ski industry has focused on the problems that the industry could experience as a result of reductions in the availability of natural snow and seasonal contractions (Gilaberte-Búrdalo et al., 2014). An international research team led by the Western Norway Research Institute (with members from Norway, Austria and Canada) has estimated that the number of ski days with natural snow cover will

decrease significantly over the next 13 years (Kleiven, 2017a). Today, almost all Norwegian resorts have a skiing season that lasts more than 100 days. However, according to the Western Norway Research Institute, every fifth Norwegian ski resort will fall below this level by 2030, and the percentage of ski resorts that will be open for Christmas holidays will fall from 77 % to 58 %. Although many resorts will lose natural snow skiing days, technological developments in snow-making could enable them to extend their skiing season by producing artificial snow in warmer temperatures. However, according to Robert Steiger, a researcher at the University of Innsbruck, some resorts will have to close because they do not have the financial capacity required to make adequate investments in artificial snow technologies (Kleiven, 2017b). There is no doubt that climate change makes it more expensive to operate ski resorts. Moreover, in recent years, many ski resorts, even the major destinations, have been experiencing stagnation (Vanat, 2017). Therefore, it is time, as Steiger (2012) has pointed out, to widen the scope of research and consider new ways to positively affect the ski resorts and increase demand for alpine skiing, rather than to concentrate on the effects of climate change. Further, as Vanat (2017) has stressed, based on international data for the winter season of 2016/2017, the skiing industry must find new ways to improve customers' experiences.

Innovativeness is a fundamental factor that could help ski resorts to enter new markets, expand their existing market share and retain, or even increase their competitiveness. For many ski resorts, especially the smaller ones, innovation is often a necessary condition for survival in a fiercely competitive environment; their competitiveness depends on their ability to innovate and develop better outputs that fulfil the demand requirements of potential customers (Sundbo, Orfila-Sintes & Sørensen, 2007). In general, innovations are needed to realize the tourism potential and ensure sustainable growth and wealth (Nieves, Quintana & Osorio, 2014). In recent years, much attention

has been devoted to the innovation process in service firms. These processes involve different actors, have different trajectories (Sundbo, 2011) and lead to various types of innovations (Orfila-Sintes & Mattsson, 2009). However, one of the key elements influencing the profitability and competitiveness of companies is the price (Hinterhuber & Liozu, 2013). This is because, first, price is one of the strongest marketing tools that can have a significant impact on customers' buying behaviours (Ceylana, Koseb & Aydin, 2014), and second, it is the only element of the marketing mix that produces revenues for the company; all the others are related to expenses. Nagle and Holden (1995) have pointed out that:

> If effective product development, promotion and distribution sow the seeds of business success, effective pricing is the harvest. Although effective pricing can never compensate for poor execution of the first three elements, ineffective pricing can surely prevent those efforts from resulting in financial success. (p.1)

Nevertheless, there has been very little research that directly addresses the process by which companies set or change prices (Rao, Bergen & Davis, 2000), perhaps because researchers assume that the processes by which prices are set or changed are relatively simple and, therefore, do not require strategic attention. Ingenbleek, Debruyne, Frambach and Verhallen (2003) have emphasized that pricing research in marketing tends to focus on normative strategies, the consumer's price and value perceptions; some studies have concentrated on the practices through which organizations arrive at price settings. In general, researchers and innovation economists mainly discuss pricing in the context of introducing new products or services, but not as a part of the innovation itself (Jonason, 2001).

In the ski industry, the price of a ski-lift ticket can be seen as the aggregate of all external and internal characteristics of the offered experience and services (Alessandrini, 2013). The physical characteristics of a ski resort influence both the experience provided to skiers and the price charged. Moreover, the price is an essential element that customers compare when choosing among different ski resorts and it is one of the key attributes used to promote a ski resort. Ski resorts face a very variable demand and sales of ski-lift tickets usually provide a major part of their revenue (Bartlett, Gratton & Rolf, 2006; Thompson, 2012).

Most Norwegian ski resorts charge a constant price for one-day ski passes over the entire winter season and provide group pricing, offering different prices to children, adults and senior citizens. Only a few charge different prices based on demand variations (e.g., during low season or weekdays versus weekends). Data on the characteristics of Norwegian ski resorts and their offered prices, as well as anecdotal evidence, suggest that pricing in the Norwegian ski resorts is largerly based on the competitors' prices. The popularity of competitor-based pricing is supported by Pellinen (2003) who has studied pricing practices in tourism enterprises located in Finnish Lapland. His results showed that ski-lift pass prices are influenced by the pricing decisions of other ski resorts, especially the leading ones. Competition as well as cost-based pricing approaches have gained popularity because of their simplicity and ease of use. However, these methods have a serious weakness in that they ignore the willingness-to-pay (WTP) and price elasticity (Hinterhuber & Liozu, 2012).

In today's constantly changing and open markets, the simple traditional pricing approaches, such as cost- and competition-based pricing are no longer sufficient to ensure a profitable business. Strategic pricing has become essential for success in the alpine skiing business. The need for an effective pricing policy is reinforced by the fact that the ski resorts face problems such as perishability and capacity constraints (Desiraju

& Shugan, 1999). Worldwide, some ski resorts have adopted variable pricing to maximize revenue (e.g., Wachusett Mountain Area in Massachusetts, Alta in Utah, Mammoth Mountain Ski Area in California and Mont Tremblant in Quebec) (Deprez, 2015). The introduction of variable pricing has been considered to have strong benefits: the Chief Marketing Officer of Mammoth Mountain Ski Area has noted that advance sales increased by 15 % as result of variable pricing and, at Homewood Mountain Resort, the shift to variable prices led to a better worker allocation and reduced crowding on slopes (Deprez, 2015). Some ski resorts (e.g., Pizol and Valais in Switzerland) have begun to implement dynamic pricing, offering reductions on one-day lift passes if the weather is bad. Ski resorts are being forced to break the old rules and create new pricing models to ensure profitability in today's highly competitive and changing markets. Thus, the adoption of a new pricing approach can be regarded as an act of innovation. Innovation in pricing introduces new approaches to pricing strategies, to pricing tactics, and the organisation of pricing, simultaneously increasing customer satisfaction and company profits (Hinterhuber & Liozu, 2014). The companies that implement innovative pricing activities often outperform their competitors because success is based not only on product or service innovation, but also on innovative approaches to pricing. Companies that strongly emphasize product or service innovation without a similar emphasis on pricing innovation can lose valuable opportunities for value capture. Therefore, innovative pricing is crucial for competitiveness and sustainability. Further, stable development and increasing numbers of visitors are important not only for the ski resorts themselves, but also for everyone impacted by the ski industry, from accommodation providers and tour operators, to equipment and clothing manufacturers, to ski town businesses and tourism transportation providers. Despite this, there has been little interest in, or focus on, how new ways of pricing existing services can be used to increase competitiveness within the alpine skiing industry.

1.2. Research purpose and questions

Given the context discussed above, the overall purpose of the thesis is twofold. First, it aims to increase the existing knowledge regarding factors that affect alpine skiing demand and the price of alpine ski passes. Second, it aims to make contribution to knowledge regarding how the alpine skiing industry can use innovative approaches to pricing to create competitive advantages.

To achieve these goals, the study examines the following research questions:

(1) What are the factors that affect demand for alpine skiing?

(2) What are the factors that influence the price of ski passes?

(3) What is the relationship between alpine skiing demand and the price of a ski pass?

(4) What is the optimal price for ski-lift tickets?

(5) Do ski resorts have the potential to increase their competitiveness by adopting a more innovative pricing approaches?

(6) What kind of innovating pricing approach is appropriate for alpine ski resorts?

The overall aim of the thesis and the research questions are explored through five articles, which are appended to the thesis. Article I formally examines what drives variations in skier attendance. Article II explores how variations in alpine skiing frequency can be explained. In Article III, the factors that affect one-day ski-lift ticket prices in Norway are examined. Article IV investigates the relationship between price and quantity demanded of alpine ski passes and determines the effect of variable pricing on ski resorts' revenues. Further, the various price–response functions are subsequently used to calculate optimal one-day ski-lift ticket prices. In Article V, the relationship between discount levels (and hence price) for various unpleasant weather scenarios and

quantity demanded of alpine ski passes. In total, six different scenarios are analysed: (1) very cold temperature of below −15°C; (2) a blizzard (strong wind and heavy snow); (3) very strong wind (> 12 m/s); (4) rain falling; (5) conditions resulting in less than 50% of slopes being open; and (6) conditions resulting in 50% to 75% of slopes being open. These estimated relationships are then used to calculate optimal weather discounts for ski lift ticket prices for each examined scenario.

Although innovative pricing is well established as a concept and has been successfully applied within many areas of the tourism and hospitality industry over recent decades, the application of innovative pricing approaches in ski resorts has not been well examined. Therefore, based on the five articles mentioned above, this thesis contributes to consumer behaviour theory and provides initial academic evidence of the effect of a more dynamic pricing approach on ski resorts' financial performance. Practitioners in the alpine skiing industry can use the insights and analytical framework presented in this study to develop new pricing tactics and implement them in their daily operations.

2. Theoretical framework

This chapter provides the theoretical framework of the thesis. In Section 2.1, the pricing concept and pricing theory in economics are discussed. The estimation processes for the price–response and demand functions are presented in Section 2.2. The basis of the price optimization is briefly introduced in Section 2.3, and the economics of price differentiation are discussed in Section 2.4. An overview of traditional pricing approaches is provided in Section 2.5, followed by discussions of innovative pricing in Section 2.6 and pricing in relation to the traditional innovation framework in Section 2.7. The chapter ends with a discussion, in Section 2.8, of the adoption of innovative pricing approaches within the tourism and hospitality industry.

2.1. Price theory in economics

In economics, a market is defined as a collection of buyers and sellers who interact, resulting in the possibility for exchange. The central idea in a market economy is competition and the idealization of perfect competition underlines much of traditional economic theory (Makowski & Ostroy, 2001). Perfect competition is a theoretical market structure that is primarily used as a benchmark against which other market structures are compared. A market structure is perfectly competitive if the following criteria are met: (1) there is homogeneity of products; (2) there is perfect knowledge about product quality, price and costs; (3) there are numerous firms, each having an insubstantial share of the market; (4) no single buyer or seller is large enough to influence the market price; and (5) the industry is characterized by freedom of entry and exit. In a perfectly competitive market, prices are determined by the interaction of demand and supply. Accordingly, in the absence of artificial restrictions, prices tend toward equilibrium. In such a situation, the firm is a price taker that must accept the market price. In a perfectly competitive market, there is no pricing decision, and the

price–response function faced by an individual firm is a vertical line at the market price (Phillips, 2005). If the firm prices above the market price, its demand drops to zero. If the firm prices below the market price, the demand would be equal to the entire market and it would be unable to satisfy the market demand (left panel of Figure 2). However, in the real world, most firms do not operate in perfectly competitive markets. They face finite customer responses to price changes and therefore have the opportunity to make active pricing decisions. Accordingly, the price–response functions that most firms face have some degree of smooth price response (right panel of Figure 2). In the real world, the firm does not have to take price as given; if it lowers price, the demand increases, and vice versa.
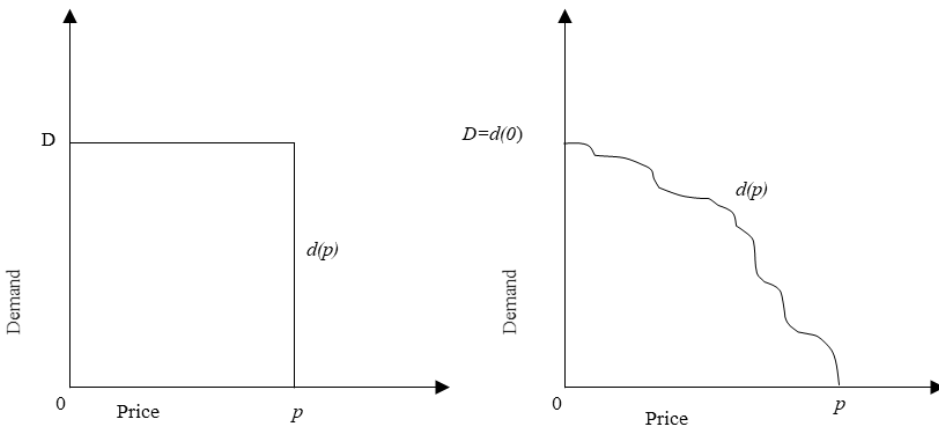
Figure 2. Price–response functions.

A perfectly competitive market (left panel) and a typical price–response curve (right panel). Source: Phillips (2005, p. 40).

In reality, firms try to make their products and services different from those of their competitors. They develop and implement different strategies and set the price for the services they sell to increase their market share. In addition, many firms may be able to determine whether some customers have a greater WTP for services than others do.

From a managerial point of view, an efficient price is the price that is very close to the maximum that customers are prepared to pay.

According to Weber (2012, p. 281) "price theory is concerned with explaining economic activity in terms of the creation and transfer of value, which includes the trade of goods and services between different economic agents". The fundamental issue in price theory is to understand how consumers allocate incomes to the purchase of different goods and services. For most companies, better management of pricing is the fastest and most efficient way to maximize profitability.

In the standard theory of consumer behaviour, customers make purchasing decisions by comparing market baskets or bundles of commodities, and the essence of a rational behaviour is contained in the following three assumptions:

(1) *Each consumer has an ordered set of preferences.* Preferences are assumed to be complete. This means that consumers can compare and rank all possible baskets of goods and services.

(2) *Preferences are transitive.* Transitivity means that preferences are consistent in the sense that if a consumer prefers basket A to basket B and basket B to basket C, then the consumer also prefers basket A to basket C.

(3) The c*onsumer always prefers more of any good to less.* Goods are assumed to be desirable. Consequently, the consumer always prefers to have more of each good.

Consumer behaviour theory assumes that consumers act rationally to maximize their utility (Pindyck & Rubinfeld, 2009). Utility may change owing to a number of circumstances, which, directly or indirectly, are related to the product or service of interest. For example, the utility that a customer experiences from a trip to a ski resort could depend on internal characteristics that are fully controlled by ski resorts, such as

lift speed and capacity, snow-making possibilities, the development of ski runs and so on. It is likely, however, that the utility that the customer experiences from a day at a ski resort is also affected by external factors that cannot be directly controlled by the ski resort, such as weather conditions. The utility maximization model is represented by a budget constraint and indifference curve. An indifference curve aims to display all the various combinations of consumption for specific quantities of one or more goods (the market basket) that will give an individual the same level of satisfaction (utility). Therefore, the consumer will be indifferent to the various combinations along the indifference curve. A consumer's budget line indicates all combinations of goods that can be purchased given the consumer's income and the prices of the goods (left panel of Figure 3). If the price of one good (i.e., a ski pass) changes (with income unchanged), the new budget line is obtained by rotating the original budget line outward or inward, pivoting from the intercept (right panel of Figure 3).
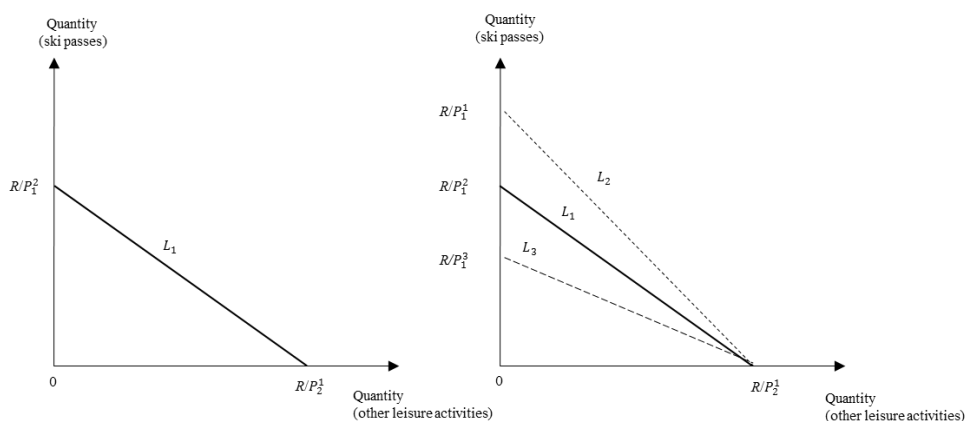
Figure 3. A budget line.

The left panel illustrates the combination of ski passes and other leisure activities that can be purchased given the consumer's income and the price of these leisure activities. The right panel depicts the effects

of a change in the price of a ski pass on the budget line. When the price of the ski pass decreases, the budget line rotates outward from budget line L_1 to L_2. When the price of the ski pass increases, the budget line rotates inward from budget line L_1 to L_3.

A consumer maximizes satisfaction by choosing the market basket at the point where the budget line and indifference curve are tangent, and no higher level of satisfaction (utility) can be attained. Accordingly, the theory then suggests that, in response to a change in the ski-lift ticket price, the consumer will choose a new preferred market basket in consideration of these changes. That is, the marginal rate of substitution between skiing and consuming all other goods will change, as illustrated in the left panel of Figure 4 below. Consequently, an indifference curve can be used to analyse reactions to changes in either relative prices or opportunities. This theoretical concept implies that the price–response function for a ski resort is directly linked to the consumption choices that customers of that ski resort make when faced with budget constraints. Figure 4 shows the consumption choices that will be made by the population of resort customers when allocating their fixed budgets between quantity demanded for ski passes and quantity demanded for other leisure activities for a given scenario.
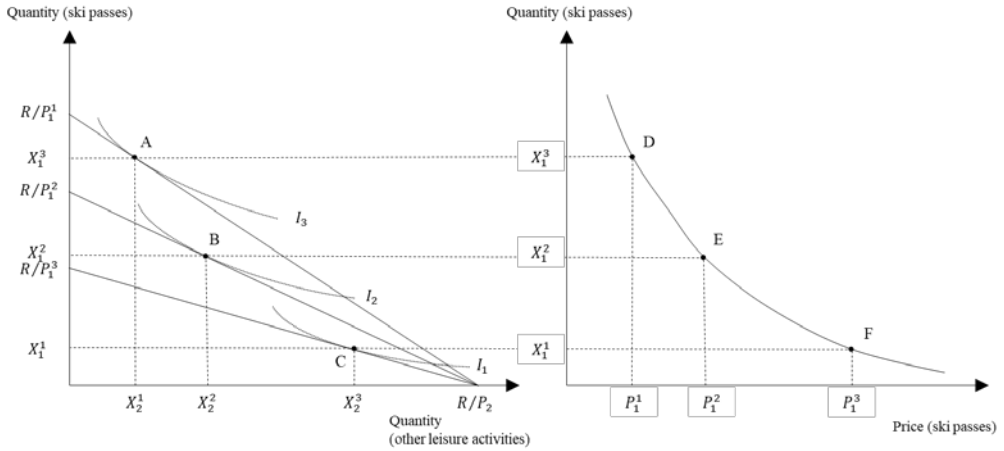
Figure 4. The customer's consumption choices between expenses on ski passes and expenses on other leisure activities for a given scenario.

The left panel illustrates the cases that maximize utility for various prices of a ski pass (point A corresponds to P_1^1, point B to P_1^2 and point C to P_1^3). The right panel shows the price–response function for a particular ski resort, which relates the price of the ski pass to the quantity demanded (points D, E and F, which correspond to points A, B and C, respectively).

2.2. Estimation of the price–response and demand functions

Generally, there are two approaches to the estimation of the demand function. The first approach is associated with the collection of information on the buying behaviour of consumers by conducting surveys or employing expert analysis. The second method is based on the historical data.

It is important to distinguish between the market demand function and the price–response function. The market demand function describes how the entire market responds to changing prices, whereas a price–response function specifies demand for the product of a single seller as a function of the price offered by that seller (Bodea & Ferguson, 2014). The distinction is critical because different firms competing in the

same market face different price–response functions as a result of various factors, including the effectiveness of their marketing campaigns, product differences, perceived customer differences in quality and location (Bodea & Ferguson, 2014; Phillips, 2005).

2.2.1. Estimation based on willingness–to–pay

The price–response function specifies the change in demand for a specific product or service for a given price change. Hence, there is an assumption about customer behaviour underlying the price–response function. Specifically, the price–response function can be directly linked to an assumption regarding the consumers' WTP. It is useful to understand the relationship between the two factors to evaluate whether the price–response function is based on assumptions appropriate for the specific application (Phillips, 2005).

WTP is usually referred to as the maximum price that a customer is willing to pay for a product or service. In the case of alpine skiing, a customer with a WTP of 400 Norwegian kroner (NOK) for a ski pass would visit the ski resort if the price for the ski pass is less than or equal to NOK 400, but not if it is NOK 401 or more. In this case, $d(NOK\ 400)$ equals the number of customers whose maximum WTP is at least NOK 400.

If we define $w(x)$ as the WTP distribution across the population, the fraction of the population with a WTP between p_1 and p_2 is then given by:

$$\int_{p_1}^{p_2} w(x)dx. \tag{1}$$

For example, if p_1 is NOK 200 and p_2 is NOK 250, and the expression inside equation (1) is 0.2, this means that 20% of the population has a maximum WTP of between NOK 200 and NOK 250. Moreover, if D is the maximum demand (the demand when

the price is zero), the demand function can be derived directly from the WTP distribution (Phillips, 2005), as follows:

$$d(p) = D \int_{p_1}^{p_2} w(x)dx. \tag{2}$$

A number of methods with different conceptual foundations and methodological implications are used to estimate WTP. These methods can be divided into the following categories: market data, experiments and direct surveys and indirect surveys (see Figure 5) (Breidert, Hahsler & Reutterer, 2006).
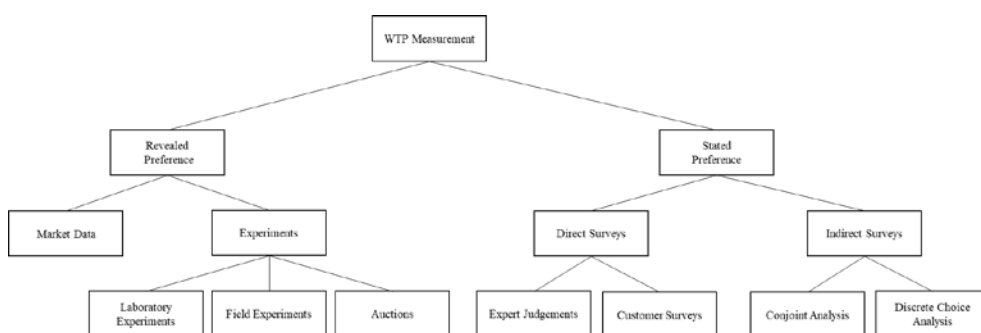
Figure 5. Classification framework for methods to measure WTP.

Source: Breidert et al. (2006, p. 10).

All methods have advantages and disadvantages when it comes to obtaining accurate, reliable data on price and demand in a time- and cost-efficient manner. The direct survey approach, termed the contingent valuation method (CVM), is one of the most commonly used methods to measure consumer WTP (Drayer & Shapiro, 2011; Reynisdottir, Song & Agrusa, 2008; Wicker & Hallmann, 2013). The CVM requires respondents to state their WTP directly (open-ended contingent valuation) or to make single or repeated choices of whether they would buy a good at a given price (closed-

ended contingent valuation) (Wertenbroch & Skiera, 2002). Steiner and Hendus (2012) confirmed that direct survey approaches are predominantly used from the practitioners' perspective.

2.2.2. Estimation of a demand function based on historical data

Typically, demand forecasting is based on past data (Bodea & Ferguson, 2014), which are often available within the company. Unlike survey methods, methods based on historical data are cost effective and reliable, as the element of subjectivity is minimal.

Regression approaches

Regression analysis is a common research tool for demand modelling and forecasting (Song & Li, 2008). There are both *univariate* and *causal* models (Witt & Witt, 1995) for determining and forecasting demand. *Univariate* models are primarily used for the purpose of forecasting and are based on the assumption that forecasts can be made without including other factors that influence the level of a variable (Rossello, 2012). The only information that such models require is the past values of the variable to be forecasted. Within the regression analysis context, a univariate model can be represented by the following autoregressive model:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \cdots + \beta_n Y_{t-n} + \varepsilon_t, \qquad (3)$$

where the observations of demand Y_t refer to the time period t (years, months, etc.) and that the explanatory variables are the lags of the same dependent variable.

The *causal* multiple regression approach to forecasting demand involves the use of regression analysis to estimate the quantitative relationship between demand and its determinants (Witt & Witt, 1995). A general form of a simple multiple regression is expressed by following equation:

$$Y_i = \beta_0 + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \cdots + \beta_n X_{n,i} + \varepsilon_i, \qquad (4)$$

where Y_i is the variable to be forecast and $X_{1,i}, \ldots X_{n,i}$ are the n predictor variables. The future values of demand are obtained by using forecasts of the demand determinants in conjunction with the estimated relationship (see, for example, Makridakis, Wheelwright & Hyndman, 2008; Witt & Witt, 1995).

However, Peterson, Stynes and Arnold (1985) emphasize that demand models based only on cross-sectional data are not stable over time, and thus, models estimated using time-series (or combined cross-section and time-series) data are considered to be more accurate (Bodea & Ferguson, 2014; Witt & Witt, 1995).

Hedonic approach

In economics, hedonic price analysis is used to estimate economic values for attributes or product characteristics that directly affect the price for products and services in the marketplace (Papatheodorou, Lei & Apostolakis, 2012). In general, the hedonic pricing method is based on the characteristic theory of value provided by Lancaster (1966) and Rosen (1974). It can also be used to estimate the implicit price for each characteristic of a ski resort (Andersson, Shyr & Fu, 2010). Originally, Rosen (1974, p. 34) defined hedonic prices as "…the implicit prices of attributes [that] are revealed to the economic agent from observed prices of differentiated products and the specific amount of characteristics associated with them".

In the case of ski resorts, this method can reveal which ski resort characteristics are important for customers and to what extent (Falk, 2008). In addition, it is expected that positive attributes as evaluated by the consumers will raise the overall price and have a positive effect on individual utility levels, whereas negative attributes will decrease the overall price and have a negative effect on utility levels (Thrane, 2005). Use of regression techniques makes the process of estimation of the implicit price for each attribute easier (Papatheodorou et al., 2012), as the parameter of the hedonic price function reveals the

marginal value that consumers place on each of the individual product or service attributes (Rigall-I-Torrent & Fluvià, 2011).

The formal hedonic price function of Rosen (1974) assumes that utility maximizing consumers and profit maximizing sellers interact in a quality-differentiated market and that market equilibrium is achieved when they arrive at mutually acceptable prices for goods and services of a given quality. As the overall price of the ski-lift ticket is assumed to be a function of the ski resort's quality characteristics (z), the hedonic price function can be defined as follows:

$$p_i = f(z_i) \qquad\qquad (5)$$

The partial derivative of p_i with respect to the characteristics $\delta p_i / \delta z_i$ refers to the marginal implicit price that represents the consumer's WTP for the ski resort's characteristics.

Usually, the hedonic price model is estimated by means of an ordinary least squares regression (OLS) or a related technique. The econometric techniques offer different specifications, such as linear, semi-logarithmic, double log, quadratic and Box-Cox linear and quadratic functional forms. Despite the fact that early researchers (e.g., Cropper, Deck & McConnell, 1988; Halstead, Bouvier & Hansen, 1997; Rasmussen & Zuehlke, 1990) have experimented with several functional forms to find the most suitable, the literature does not suggest a specific functional form for hedonic price analysis. However, double-log, semi-log and linear are the dominant functional forms in hedonic research (Triplett, 2004).

2.3. Price optimization

Price and revenue optimization has its roots in management science and operation research. Recently, there has been growing interest in this field. Phillips (2003) considered that pricing and revenue optimization represents the next important success story for management science in business after financial engineering and supply chain management. He suggested defining pricing and revenue optimization as the formulation and solution of tactical pricing decisions using constrained optimization. The point of departure for pricing and revenue optimization is the economics of customer price response and market segmentation. Based on these foundations a number of tactical pricing decisions, each of which is applicable in a specific situation or industry, are developed. Phillips (2005) pointed out that the scope of price and revenue optimization is to provide the right product to the right customer at the right price at the right time through the right channel.

In general, the purpose of the optimization problem is to maximize total contribution, that is total revenue minus total incremental costs from sales (Phillips, 2005):

$$m(p) = (p - c)d(p), \tag{6}$$

where $m(p)$ is the total contribution and c is incremental costs. The basic price optimization problem can be defined as follows:

$$\max_{p}(p - c)d(p). \tag{7}$$

The price that maximizes the total contribution can be found by taking the derivative of the total contribution function and setting it to zero. Figure 6 illustrates an example of the total contribution as a function of price. In this example, the total contribution function is hill-shaped, with a single peak that shows the maximum total contribution that the ski resort can realize in the specified time period. In this case, p^* is the price that will maximize the total contribution of the ski resort.
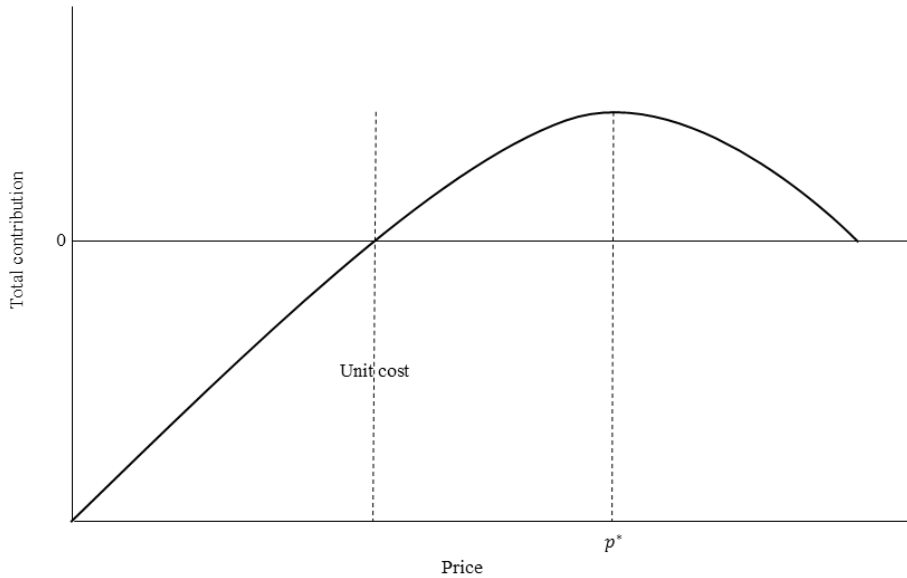
Figure 6. Total contribution as a function of price.

In addition, the important condition for achieving optimal prices is that the total contribution is maximized in the basic price optimization problem at the price at which marginal revenue (the amount of additional revenue the seller could achieve from a small increase in price) equals marginal costs (the amount of additional cost the seller would incur from a small increase in price) (Phillips, 2005). If marginal revenue is greater than marginal cost, then the total contribution can be increased by increasing the price. In turn, if marginal revenue is lower than marginal cost, then the total contribution can be increased by decreasing the price (Figure 7).
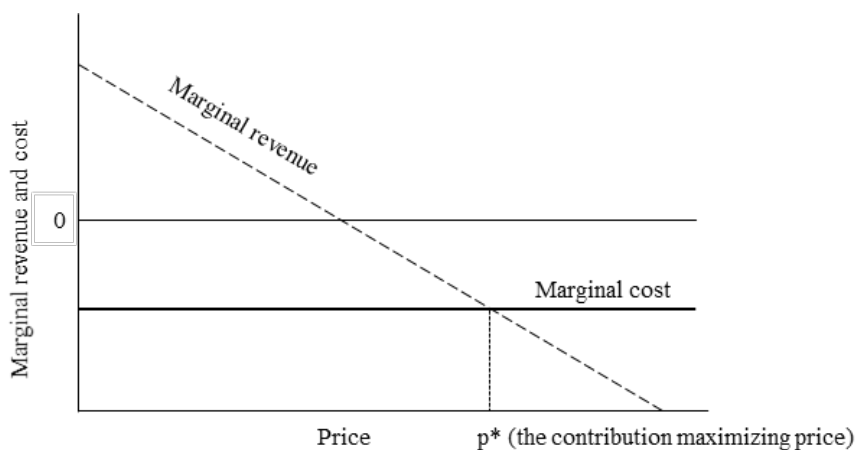
Figure 7. Marginal revenue and marginal cost.

2.4. The economics of price differentiation

Price differentiation (also referred to as price discrimination and dynamic pricing) is a fundamental economic principle. Its underlying principle is that profits can be maximized by charging different prices to different customers for exactly or nearly the same good or service, instead of selling to all consumers at a uniform price (Phillips, 2005; Swann, 2009). Price differentiation is a powerful way for firms to increase their profitability and competitive position, and it adds a new level of complexity to pricing. Stern (1989) suggested that price differentiation can increase revenue without sacrificing demand, alter consumer buying behaviour to the business advantage, create a desired response in the competitive environment and increase profitability and long-term business value. The fundamental challenge of price differentiation is finding the way to divide the market into different segments, such that higher prices can be charged to the segments with a high WTP and lower prices to the segments with a low WTP. A variety of price differentiation techniques exist, depending on the characteristics of a market, the competitive environment and the character of the goods or services being sold. According to Phillips (2005), the most common and effective approaches are group

pricing, channel pricing, regional pricing, couponing and self-selection, product versioning and time-based differentiation (for detailed explanation of these approaches, see Phillips, 2005, pp. 78–85).

Figure 8 illustrates the total potential opportunity for profit improvement from price differentiation.

With a single price, the ski resort will charge P_2 per ski pass and realize a total profit that is indicated in the area of region A in Figure 8. However, there are customers who are willing to pay more than P_2, indicating that there is an opportunity to improve profitability. Furthermore, some customers are willing to pay more than the production costs (P_1), but less than the actual sales price (P_2). Under a single price system, each of these customers represents potentially profitable sales that are lost because the price is too high. If the ski resort charges each customer who is willing to pay more than P_2 per ski pass his/her exact WTP, it would achieve the additional revenue shown in region B in Figure 8. Additionally, there is an opportunity to sell ski passes to customers who are willing to pay more than P_1, but less than P_2. This potential profit is shown as region C in Figure 8. The sum of the three regions is the total profit that the ski resort would realize if it were able to charge every potential customer a price that is exactly equal to his/her WTP.
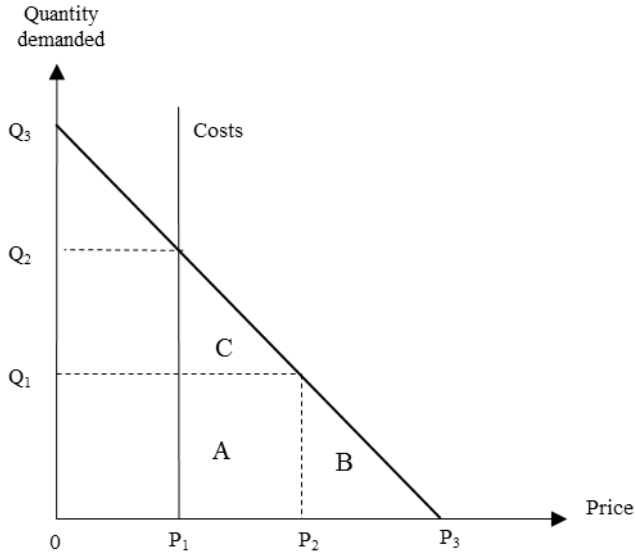
Figure 8. Contribution opportunity from price differentiation.

In the case of the ski resort, we can assume that customers could be divided into two segments. One segment consists of all customers with a high WTP; in the example, this is WTP of more than P_2. The other segment consists of all the customers with a low WTP, namely P_2 or less. The price–response curves for both of these segments are depicted in Figure 9.
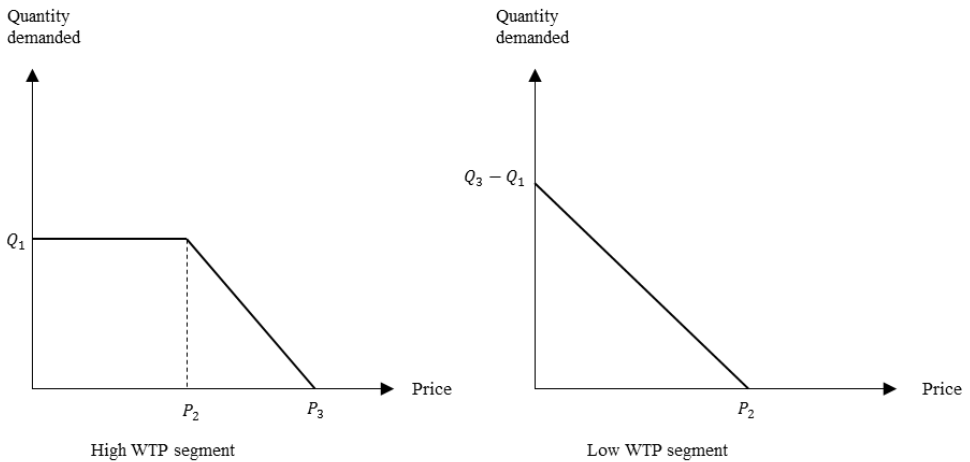
Figure 9. Price–response curves for two customer segments.

The sum of these two curves depicted in Figure 9 is the price–response curve in Figure 10. These two segments taken together make up the same total market that the ski resort faced before, except now, it can offer different prices to each of the two segments to increase revenue and total profit.
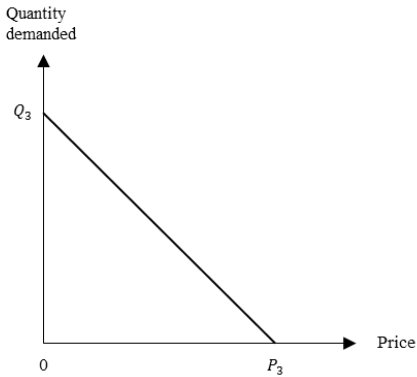
Figure 10. Price–response curve for ski passes.

The pricing differentiation is equally applicable to a number of service industries, as long as they are characterized by the necessary market conditions, defined as: (1) varying but predictable demand, (2) relatively fixed capacity in the short run, (3) low costs of marginal sales, and (4) limited or no storage possibilities (Berman, 2005; Hinterhuber & Liozu, 2014; Phillips, 2005).

However, according to Phillips (2005), the effectiveness of price differentiation can be limited by the following factors:

(1) *Imperfect segmentation.* The key factor for successful price differentiation is a customer population that is diverse at some level, but to determine the precise willingness–to–pay is almost impossible.

(2) *Cannibalization.* In the case of differential pricing, customers in high–price segments could want to find ways to pay the lower price.

(3) *Arbitrage.* Differentiated prices create a strong motivation for third–party arbitrageurs to find a possibility to buy the product at the low price and resell below the market price to high-price segment customers, while keeping the difference for themselves.

2.4.1. Price differentiation and consumer welfare

The key concept in measuring the effect of pricing approaches on consumer welfare is consumer surplus. Consumer surplus is defined as the difference between the total amount that consumers are willing and able to pay for a good or service (indicated by the demand curve) and the total amount that they actually pay (i.e., the market price). The surplus associated with a customer who does not purchase is zero. The total consumer surplus in the market is the sum of the individual surpluses. According to most theories of social welfare, it is assumed that one pricing approach is better than another for consumers as a whole if it results in a greater total consumer surplus (Phillips, 2005).

At first, it may appear that price differentiation only benefits sellers. If perfect differentiation were possible, a seller would charge a price to each customer exactly equal to his/her WTP, resulting in a total consumer surplus of zero. Accordingly, the seller would have taken the entire potential consumer surplus in the market as profit. However, in reality, price differentiation can make consumers better off. Figure 11 illustrates the potential opportunity for profit and consumer surplus from price differentiation. In this example, a market is divided into two segments and seller provides two-price policy. Price P_2 is charged to a segment with a high WTP, whereas

P_1 to a segment with a lower WTP. With a single price (shown by the left panel in Figure 11), a seller will charge P_2 per ski pass and realize a total profit that is indicated in the area of region A, whereas the customer surplus is shown in region C. In the case of price differentiation (shown by the right panel in Figure 11), the total consumer surplus is the surplus under the single price, denoted by region C, plus a new surplus, shown by C1. The seller's profit is shown by the sum of regions A and A1. A comparison of the left and right panel in Figure 11 shows that price differentiation has resulted in both more profit for the seller and a higher total consumer surplus for the buyers than did the single price policy. Accordingly, it is evident that price differentiation can be a win–win for buyers and sellers alike.
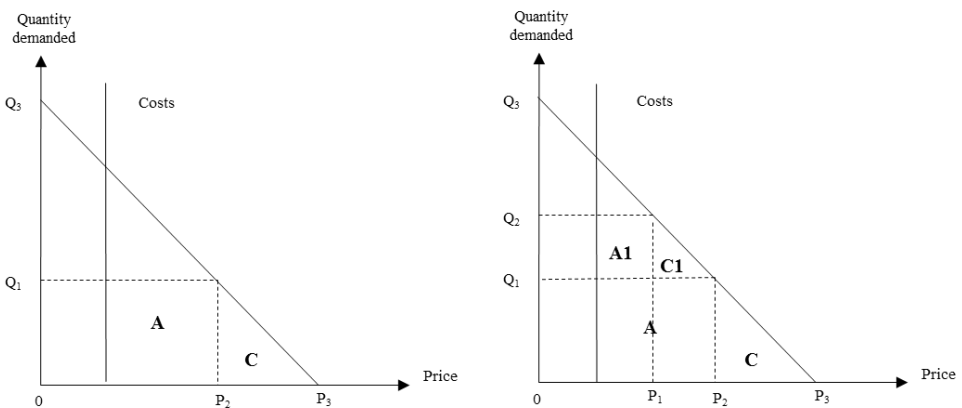
Figure 11. Profit and consumer surplus.

The left panel shows the single price approach and the right panel shows the differentiated two-price approach.

However, if a price differentiation approach increases profits for a seller but does not result in additional production (capacity is constrained), it will reduce total consumer surplus (Phillips, 2005). In other words, if a ski resort is already selling out at a single

price and it implements a price differentiation strategy that increases revenues, it will have done so by making customers, on average, worse off. It is not the case that price differentiation always either increases or decreases total consumer surplus. However, it is important to understand that even if the total consumer surplus is reduced, this does not mean that no customers are better off when price differentiation is applied.

2.4.2. Price differentiation and customer acceptance

Customers often react to prices in ways that do not accord with the classical economic model of rational decision-making. There are different factors that can influence consumer behaviour that cannot be easily included in the WTP model (Phillips, 2005). Examples include: (1) the price presentation and package; (2) the customers' perceptions of the profit that the seller will realize; (3) a price comparison with past and anticipated future prices; and (4) the prices that the customer perceives as being charged to other customers. Researchers have continually investigated the ways in which buying and selling in real world differs from the idealized models used by economists. Accordingly, this section discusses the implications of such findings for price optimization.

Motivated by observing customer decision-choices that were puzzling under expected utility theory, economists have been developing alternative theories for human decision-making under uncertainty (Zheng & Özer, 2012). The most important breakthrough in this field is prospect theory introduced by Daniel Kahneman and Amos Tversky (Kahneman & Tversky, 1979). The basic idea of prospect theory is that individuals evaluate perceived outcomes from purchase decisions in terms of gains and losses, relative to a reference point, rather than based on the absolute outcome itself. This can lead to outcomes that are inconsistent with rationality as understood by economists. Although much of prospect theory relates to the way that people evaluate uncertainty, which is not directly relevant to price optimization, the principle of asymmetrical gains

and losses is relevant (Phillips, 2005). Prospect theory argues that gains and losses are valued differently; customers tend to experience losses much more intensely than they value gains. Accordingly, the ideas of reference-dependent utilities and loss aversion in prospect theory have led to the phenomenon of the "framing effect"; that is, different presentations of the same choice problem may yield different or even reversed preferences (Zheng & Özer, 2012).

A key implication of prospect theory is that individual preferences are reference dependent. Winer (1986) introduced the idea that many customers make purchase decisions with a reference price in mind that they consider fair. Hence, if the actual price is higher than the reference price, it is less likely that customer will make a purchase. The reference prices are formed by different psychologic mechanisms and influenced by a customer's past buying history (Phillips, 2005). If a customer becomes used to seeing an item at a low price, he or she will expect the price to be low in the future and will be less likely to purchase if the price increases. This can be challenging for the seller, as decreasing the price now may be optimal solution to maximize short-run contributions, but this may have future consequences if it lowers the reference prices of potential future customers.

Although in the last decade, economists have given a great deal of attention to the issue of perceived fairness and how it influences customer behaviour, many aspects of pricing acceptance are not fully understood. Phillips (2005) suggested that there are at least two ways in which customers evaluate the fairness of a price, being in terms of: (1) the profit earned by the seller, and (2) the prices other buyers are paying.

The perception that a price is unfair results not only from a perceived higher price but also from consumers' understanding of why the higher price was set (Xia, Monroe & Cox, 2004). The seller's cost plays an important role in buyers' assessments of price

fairness. A principle of price fairness referred to as *dual entitlement*, formalized by Kahneman, Knetsch and Thaler (1986) proposed that it is perceived as fair for sellers to pursue a pricing rule of raising prices when their costs increase. Under this approach, consumers evaluate prices with the belief that, although a firm is entitled to a profit, the consumer is also entitled to a fair price. When buyers believe that a seller has increased prices to take advantage of an increase in demand or scarcity of supply, without a corresponding increase in costs, they will perceive the new higher prices as unfair (Frey & Pommerehne, 1993; Kahneman et al., 1986; Urbany, Madden & Dickson, 1989). By contrast, an unavoidable increase in a company's costs may make a price increase acceptable (Kahneman et al., 1986). In addition, price differentiation can be an extremely sensitive issue, as interpersonal comparison can turn a satisfied customer into an unsatisfied one, for reasons totally unrelated to the product or customer service. In other words, the customer might be satisfied with his/her purchase until he/she finds out that someone paid less. Accordingly, if the concepts of dual entitlement and interpersonal comparison hold true, most pricing strategies behind price differentiation would be considered as unfair (Kimes & Wirtz, 2003). However, there are several other key elements influencing the acceptability of pricing optimization (Bodea & Ferguson, 2012; Phillips, 2005). First, product-rather than customer-based pricing differentiation is much more likely to be willingly accepted (Hanks, Cross & Noland, 2002; Kimes & Wirtz, 2003). Second, customers claim to prefer pricing schemes that are open. Third, prospect theory predicts that discounts are more acceptable than surcharges (Choi, Jeong & Mattila, 2015). Fourth, a reward for loyalty or volume purchases is much more likely to be acceptable than any kind of penalty. Fifth, price differentiation is more acceptable if the reasons for the varying price levels are easy to understand (Kimes & Wirtz, 2003; Lynn, 1990). Sixth, customers are much more likely to accept a discount if it is potentially available to them (e.g., early-booking discounts) than if it is not under

any circumstances (Kimes, 1994). Seventh, customers prefer traditional ways of doing business and tend to distrust innovations; therefore, the least disruptive way to introduce pricing optimization is within the context of an existing tactical pricing practice (e.g., markdowns, promotion pricing and customized pricing) (Phillips, 2005).

It is important to be sensitive to customers' price perceptions; however, it is equally important not to allow expected customer reactions to prevent the possibility of pricing innovation. It must be kept in mind that much of research on price perception, prospect theory and fairness has been based on surveys that do not necessarily reflect how people will react in real life. Moreover, customer complaints and even negative press do not necessarily mean that a new pricing approach is a failure (Phillips, 2005).

2.5. Traditional pricing approaches

Different industries use different approaches to pricing. Oxenfeldt (1983) defined pricing methods as explicit steps or procedures by which companies arrive at pricing decisions. Pricing and revenue optimization incorporates costs, demand and the competitive environment to determine the prices that maximize expected revenues. However, commonly used pricing approaches across companies, industries and countries are cost-, competition- and customer value-based pricing (Avlonitis & Indounas, 2005; Hinterhuber & Liozu, 2012; Mohammed, 2005; Phillips, 2005; Raju & Zhang, 2010). These pricing approaches tend to weight one of these three mentioned aspects more than the others. In particular, the first two approaches, the cost- and competition-based approaches, are the most commonly used (Avlonitis & Indounas, 2005; Mohammed, 2005; Phillips, 2005; Raju & Zhang, 2010).

Cost-based pricing is the oldest and most popular pricing method (Phillips, 2005). This method has a compelling simplicity–pricing decision is influenced by accounting data, with the objective of achieving a required return on capital. Some typical examples of

cost-based pricing methods are cost-plus pricing, target return pricing and break-even pricing (for a detailed description of these approaches, see Avlonitis & Indounas, 2005). However, despite its popularity, this method has fundamental problems. First, in most industries, it is impossible to determine a unit cost before its price, as unit costs change with price (Nagle, Hogan & Zale, 2016). In addition, this is an entirely inward-focused pricing approach that is divorced from market factors, as prices are calculated without taking either competitive situation or what customers might be willing to pay for a particular service or product into account (Phillips, 2005). Therefore, because of these drawback, experts tend to be sceptical or even harshly critical of cost-based pricing approaches (Lilien, Kotler & Moorthy, 1992; Nagle et al., 2016; Simon & Robert, 1996).

Competition-based pricing uses data on competitive price levels. However, it can mean different things in different contexts. For instance, it can mean pricing similarly to one's competitors or according to the market's average price, pricing above, or below competitors or pricing according to the clear market leader's price (Avlonitis & Indounas, 2005). Although this method does consider the competitive situation, in contrast to cost-based pricing, it does not consider the demand function.

Customer value-based pricing, also called *value-based pricing*, in contrast to the above two methods, is based on a deep understanding of the customers' perception of value, customer needs, price elasticity and customers' WTP. Phillips (2005) noted that value-based pricing is sometimes a synonym for personalized or one-on-one pricing, under which each customer is charged a different price based on the customer's value for the product or service being sold. Usually, methodologies such as customer surveys, focus groups and conjoint analysis are used to determine value-based prices. An advantage of this method is that it considers customer perspectives. However, a significant disadvantage is the data requirements, as data on customer preferences, WTP, price

elasticity and size of the different market segments are difficult to obtain and interpret. Despite these shortcomings, many pricing scholars have increasingly considered the value-based pricing approach to be superior to all other pricing strategies (see e.g., Baker, 2009; Cannon & Morgan, 1990; Hinterhuber, 2004; Hoseason, 2005; Ingenbleek et al., 2003). However, in the tourism industry, cost- and competition-based approaches remain the most commonly used methods (Middleton, 1994; Pellinen, 2003; Yolal, Emeksiz & Cetinel, 2009).

2.6. Innovative pricing

In today's open and dynamic business environment, the simple, traditional cost- or competition-based methods may no longer be sufficient to sustain a profitable business. Hinterhuber and Liozu (2014) pointed out that companies that implement innovative pricing methods significantly outperform their competitors. However, although virtually all companies pay some attention to product or service innovation, only 5 % focus on pricing innovation and introduce new-to-the-industry pricing approaches (Hinterhuber & Liozu, 2014). Despite the fact that impressive advances in information technology and emerging evidence on the dynamics of consumer behaviour considerably expand the possibilities of pricing methods (Hinterhuber & Liozu, 2014), academic research into innovative pricing remains scarce. The pioneering research in this field is the study by Hewitt and Patterson (1961). In 1968, a book entitled *Creative pricing*, containing papers by scholars and pricing practitioners on creative pricing approaches, was published (Marting, 1968). Its editor, Elizabeth Marting, commented that: "It is the thesis of this book that with sound planning, flexible techniques, and adequate support, pricing can be made to have a positive, productive impact on company profit; in short, that it can be creative" (Marting, 1968, p.5). Later, Nagle (1983) pointed out that pricing is a creative process, stating that

"…effective pricing is a creative awareness of who buyers are, why they buy, and how they make their purchase decisions. The recognition that buyers differ in these dimensions is as important for effective pricing as it is for effective promotion, distribution, or product development" (p.19).

More recently Hinterhuber and Liozu (2013, p. 4) defined innovation in pricing as a process which "regards instances in which companies innovate their pricing strategies, tactics, or organization, or where companies use an understanding of consumer psychology to change customer perceptions of value and price". Moreover, based on interviews with 50 executives and an analysis of the pricing practices of 70 companies worldwide, Hinterhuber and Liozu (2014) presented a framework consisting of more than 20 possible avenues for innovation in pricing and offered basic ideas, relevant to any companies, on how to increase both profits and customer satisfaction (see Table 1).

Table 1. A road map for innovation in pricing.
Source: Hinterhuber and Liozu (2014, p. 415).

Element	No innovation in pricing				Road map for innovation in pricing			
STRATEGY	Cost or competition-based pricing	Good-better-best market segmentation	Needs-based market segmentation	Pay-for-performance pricing	Pricing to drive market expansion	New metrics	Zero as a special price	Participative pricing
TACTICS	Discounting	Revenue management	Contingent pricing	Bundling	Individualized pricing	Flat fees	Creative discounting	Psychological pricing
ORGANIZA-TION	No pricing team	Dedicated pricing function	Centralization of the	CEOs as pricing	Confidence	Company-wide pricing	Change management	Pricing experiments:

pricing function	champions	capabilities	pricing as learning

This road map shows that when management decides to implement innovative pricing methods, it leads to new approaches to pricing strategies, tactics and organization. Generally, according to Hinterhuber and Liozu (2014), the objective of such changes is to increase customer satisfaction and company profit conjointly. In addition, Liozu (2015) suggested that competition, costs and price sensitivity within a market affect the parameters within which companies set prices. However, superior pricing is almost always based on the development of skills in price setting and price realization (Liozu & Hinterhuber, 2012). Without managerial engagement, companies typically base price setting on cost information and yield too much pricing authority to the sales force (Liozu, 2015).

2.7. Innovative pricing in the traditional innovation framework

There are many definitions of innovation, but all emphasize the development and implementation of something new or the improvement of previous solutions, at least for those involved in or affected by the innovation process (De Jong & Vermeulen, 2003; Rønningen & Lien, 2014). Sørensen, Sundbo and Mattsson (2013) emphasized that innovation only occurs if changes are deliberately and systematically repeated with many users and implemented as economically more significant changes. In addition, Toivonen and Tuominen (2009), building on Schumpeter (1912/2002, 1934) suggested that there are three criteria based on which innovations, and processes leading to them, can be separated from other changes and activities in organizations. First, innovation is something that is carried into practice (Schumpeter, 1934, p. 88). This means that an idea without an application or the acceptance of the markets is not yet an

innovation. Second, innovation is something that provides benefits to its developer (Schumpeter, 1912/2002, p. 111). Competitiveness, profitability and the added value that innovations can provide to customers are the central factors that motivate their pursuit. Third, innovation is something that is reproducible, i.e., it has more than one specific application (Schumpeter, 1934, p. 88).

Many theories of innovation start from the views first formulated by Schumpeter who distinguished between the following five different types of innovation: new products, new methods of production, new sources of supply, the exploitation of new markets and new ways to organize business (Schumpeter, 1934). The OECD Oslo Manual (2005), the primary international basis of guidelines for defining and assessing innovation activities, defines innovation as the implementation of a new or significantly improved product (good or service) or process, a new marketing method or a new organizational method in business practices, workplace organization or external relations. Consequently, inspired by Schumpeter's (1934) classic work in this area, the following four innovation types have been identified: product innovation, process innovation, marketing innovation and organizational innovation. Product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses (OECD, 2005). Product innovation in services can include significant improvements in how they are provided, the addition of new functions or characteristics to existing services or the introduction of entirely new services. Process innovation is the implementation of a new or significantly improved production or delivery method (OECD, 2005). Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing (OECD, 2005). Finally, organizational innovation is the implementation of new organizational

methods in the firm's business practices, workplace organization or external relations (OECD, 2005).

Innovative pricing can be seen as an innovation from different angles. In economics, most of the focus has been on the product and process innovation (Fagerberg, 2004). If we consider innovative pricing as a new or significantly improved method for service delivery to increase profitability and value creation, then, according to OECD Oslo Manual (2005), it can be a type of process innovation. By contrast, Swann (2009) classified innovative pricing as one of the different types of product innovation. He stressed that innovative pricing is an innovation in terms of what the customer faces in the marketplace, not an innovation in the way something is produced. Therefore, it is closer to product/service than to process innovation (Swann, 2009). Again, if we look at innovative pricing as a new or changed sales method to increase profitability and value creation, then it can be considered a marketing innovation, which involves the implementation of new marketing methods, which can include changes in service promotion and placement and in methods for pricing services.

2.8. Innovative pricing approaches in the tourism and hospitality industry

Tourism is strongly interrelated with other economic and social fields. Hjalager (2015) systematically collated 100 innovations that have transformed the tourism industry through the years. This study indicated that innovation in tourism did not originate within tourism itself, but was the effect of something that happened elsewhere that affected tourism to a significant extent.

The point of departure for innovation in pricing in the tourism industry can be seen in the airline deregulation that occurred in the late 1970s. The airline industry in the

United States was heavily regulated up to 1979. In 1978, Congress passed the Airline Deregulation Act, which led to the restructuring of the airline business and was a significant factor in the emergence of low-cost airlines (Hjalager, 2015) and subsequent fierce airline competition (Legohérel, Poutier & Fyall, 2013). One of the first new airlines that arouse after deregulation was the low-fare airline People Express (Phillips, 2005), which offered fares up to 70 % lower than the major airlines and, as a result, filled its planes with passengers from untapped market segments: price-sensitive students and middle-class leisure travellers. In 1985, Robert Crandall, the CEO of American Airlines, announced that American Airlines would compete using carefully considered price variations, which were better adapted to the customer segments, sales time periods and product types (Phillips, 2005). They offered *early bird* low fares to passengers who booked at least 21 days in advance of flight departure (McGill & Van Ryzin, 1999), while restricting the number of discount seats sold to save seats for full-fare passengers, who would be booking within the last two weeks prior to departure (Phillips, 2005). American Airlines' pricing approach could be seen as the emergence of revenue management using innovation in pricing tactics. The impact of American Airlines' action was dramatic. This pricing innovation offered the airline the potential to increase revenue from seats that would otherwise fly empty (McGill & Van Ryzin, 1999). Following this success, revenue management has been adopted by other major airlines in the United States, as well as those in Europe and Asia.

Revenue management can be defined as "the application of information systems and pricing strategies to allocate the right capacity to the right customer at the right price at the right time" (Kimes & Wirtz, 2003). Nowadays, revenue management has spread well beyond the passenger airlines to become a common business practice in a wide range of service industries. Moreover, the rapid evolution of information technologies and the corresponding growth of the Internet and e-commerce has led to more

sophisticated revenue management capabilities (Bitran & Caldentey, 2003). Today revenue management and related information technologies have become crucial factors of business success for airlines, hotels, restaurants, car rental companies, cruise lines, golf courses, sports clubs, telephone operators, conference centres, equipment rental companies and other industries (Chiang, Chen & Xu, 2006). As a result of the rapid spread of revenue management practices among different service industries, there was a notable increase in theoretical research into revenue management fundamentals and its application in different industries. Many scholars have reviewed the theory and practice of revenue management to advocate the development and understanding of revenue management (see e.g., Berman, 2005; Bitran & Caldentey, 2003; Brotherton & Mooney, 1992; Chiang et al., 2006; McGill & Van Ryzin, 1999). Most of this research has been conducted within traditional revenue management industries, such as the hotel and the rental car industries (e.g., Denizci Guillet & Mohammed, 2015). From a historical perspective, the pioneering studies of revenue management are those by Rothstein (1971, 1974) and Littlewood (1972) on airline and hotel overbooking. General revenue management principles are easily applicable to different industries. However, each industry has specific characteristics that affect the practical application of revenue management in its individual companies. Thus, there are far fewer revenue management studies examining the application of revenue management to the non-traditional sectors of the tourism and hospitality industry than to the traditional fields. Nevertheless, a number of studies have covered the non-traditional industries, including *restaurants* (e.g., Heo, Lee, Mattila & Hu, 2013; Kimes, 2005; Kimes & Wirtz, 2016)*, attractions* (e.g., Heo & Lee, 2009; Hoseason, 2006), *national parks* (e.g., Schwartz, Stewart & Backlund, 2012), *cruise and ferry lines* (e.g., Hoseason, 2000; Sun, Gauri & Webster, 2011), *casinos* (e.g., Chen, Tsai & McCain, 2012; Hendler & Hendler, 2004), *saunas* (e.g., Yeoman, Drudy, Robertson & McMahon-Beattie, 2004), *resorts* (e.g.,

Pinchuk, 2006), *golf* (e.g., Licata & Tiger, 2010), *sporting events* (e.g., Balseiro, Gallego, Gocmen & Phillips, 2011; Barlow, 2000) and *conferences* (e.g., Hartley & Rand, 2000). Innovative pricing approaches in the ski resort industry have received little academic attention. There is only one study by Perdue (2002) that examined revenue management from the perspective of alpine ski resorts. Moreover, Denizci Guillet and Mohammed (2015) pointed out that additional research efforts are needed to enrich practitioners' understanding in the industries that have received little attention. This thesis directly contributes to this research field by focusing on opportunities for the application of innovative pricing in the alpine skiing industry.

3. Research design and methodology

In this chapter, the methodological choices and design of this thesis are discussed. The chapter starts with the methodological foundations, followed by a discussion of the trustworthiness of the research based on its reliability and validity. Then, the research design of each article included in this thesis is presented, with a focus on the data sample and analysis.

3.1. Methodological foundations

Research is one of many different ways of knowing and has been described as a systematic investigation or inquiry designed to collect, analyse, interpret and use data to understand, explain, predict or control a phenomenon (Mackenzie & Knipe, 2006; Mertens, 2014). Mertens (2014, p. 2) pointed out that "the exact nature of the definition of research is influenced by the researcher's theoretical framework and by the importance that the researcher places on distinguishing research from other activities or different types of research from each other". The theoretical framework is sometimes referred to as the paradigm (Mertens, 2014) that influences the way knowledge is studied and interpreted (Mackenzie & Knipe, 2006). A number of theoretical paradigms are discussed in the literature, including positivist (and post-positivist), constructivist, interpretivist, transformative, emancipatory, critical, pragmatist and deconstructivist (see e.g., Delanty & Strydom, 2003; Mertens, 2014). The philosophical assumptions, design and methods all contribute to a research approach that can be quantitative, qualitative or mixed (Creswell, 2013). Certain types of social research problems call for specific approaches. Quantitative research is focused on deduction, confirmation, theory and/or hypothesis testing, explanation, prediction, standardized data collection and statistical analysis (Johnson & Onwuegbuzie, 2004). It is commonly stated that the positivist research paradigm underpins quantitative methodology

(Firestone, 1987; Johnson & Onwuegbuzie, 2004; Krauss, 2005; Lincoln, Lynham & Guba, 2011; Mackenzie & Knipe, 2006).

The positivist paradigm which has been central to consumer behaviour research, was established on the basis of assumptions that consumers are largely rational, stable and knowable entities (Pachauri, 2001). The positivists tend to assume that one truth or reality exists (McGregor & Murnane, 2010), that the causes of behaviour can be predicted and that they are controlled by forces that are not controlled by consumers themselves (Anderson, 1983). The positivist paradigm has been criticized for treating consumers as passive objects and ignoring the complexity of consumer experience. In response to this criticism, a range of alternative philosophies have emerged, and a term that better represents today's practicing quantitative researchers is post-positivism (also referred as non-positivism) (see e.g., McGregor & Murnane, 2010; Pachauri, 2001; Phillips & Burbules, 2000; Yu, 2003). In response to criticisms of positivism, interpretive and postmodern perspectives have emerged. From an interpretivist point of view, "actions like buying are not simply matters of rational calculation with consumers computing up the pros and cons of objective facts, but rather are matters involving felt expectations as to how the consumption episode will be personally experienced" (O'Shaughnessy & Holbrook, 1988, p. 206).

The postmodern perspective goes further in its rejection of all rational attempts to understand consumer experience (Pachauri, 2001). It emphasises the creativity, autonomy and power of consumers to define and change themselves and the world in which they live through different patterns of consumption and lifestyles (Brown, 1995). However, as Pachauri (2001) stressed, these perspectives have been criticized because they tend to be discussed at an abstract level and remain divorced from key marketing concepts and the practical issues of concern to marketers.

The overall purpose of this thesis is twofold: to identify factors that influence the demand and prices for alpine skiing passes, and to calculate optimal ski pass prices for various scenarios to find possibilities for implementing new, innovative and dynamic pricing approaches in the alpine skiing industry. Accordingly, based on the previously defined research questions, this study has adopted a quantitative approach to the research process. Furthermore, the appropriate philosophical position for the current research is post-positivism.

This thesis consists of five empirical articles, which are based on different research methods and data. The papers are linked to the research questions of the thesis, which have shaped the research process and choices of research design and methods. As the articles are based on studies that differ in terms of design and data, the research strategy is structured through the presentation of each paper. An overview of all the appended articles is provided in Table 2, followed by a more detailed description of the data and research design applied in each article.

Table 2. Overview of the research designs applied in the empirical articles appended to this thesis.

Article	Purpose of the study	Applied approach and method	Empirical data base
I	Formally examine what drives variations in skier attendance at the ski resort.	Quantitative, OLS regression with time series data.	Daily visitor data for seven winter seasons in the period 2007/2008–2013/2014 from a Norwegian ski resort in the inland region of Norway.
II	Examine how consumers' social and personal factors influence overall skiing frequency and the	Quantitative, OLS and quantile regression.	259 existing domestic skiers at three ski resorts in the Lillehammer area in the inland region of Norway

Article	Purpose of the study	Applied approach and method	Empirical data base
	frequency of repeated visits to a specific ski resort by existing domestic skiers in a typical winter season.		who are not seasonal ticket holders. The data were collected at the end of the 2015/2016 season.
III	Examine what affects one-day ski-lift ticket prices.	Quantitative, Hedonic price model estimated by OLS.	The prices and quality characteristics of 83 Norwegian ski resorts in the winter season 2014/15
IV	Examine the relationship between price and quantity demand of alpine ski passes; Determine the effect of variable pricing on the ski resort's revenues and demand; Calculate the optimal price for one-day ski-lift ticket.	Quantitative, Price and revenue optimization analysis.	265 existing skiers at three ski resorts in the Lillehammer area in the inland region of Norway who are not seasonal ticket holders. The data were collected at the end of the 2015/2016 season.
V	Examine the relationship between discount levels for various unpleasant weather scenarios and the quantity demand of alpine ski passes	Quantitative, Price and revenue optimization analysis.	398 existing skiers at three ski resorts in the Lillehammer area in the inland region of Norway who are not seasonal ticket holders. The data were collected at the end of the 2015/2016 season.

3.2. The reliability and validity of the research findings

Validity and reliability need to be addressed to ensure the quality of research (Hussain, Elyas & Nasseef, 2013) because they demonstrate and communicate the rigour of the research process and the 'trustworthiness' of the research findings (Roberts, Priest & Traynor, 2006). The trustworthiness of research depends on a number of research

features, such as the initial research question, how data are collected, including when and from whom, how data are analysed and what conclusions are drawn (Roberts et al., 2006). These research features alone are not sufficient to produce trustworthy results (Murphy & Dingwall, 2003), because concepts of reliability and validity could be influenced by participants' concerns to protect their interests or be subject to participants' hidden aims (Hussain et al., 2013). Validity within empirical economics is generally concerned with whether a particular method of research and the subsequent observations provide an adequate reflection of the truth (Roe & Just, 2009). Reliability is a basis for validity, as it determines whether the results of research are repeatable and consistent (Bryman & Bell, 2011). In other words, validity is concerned with whether the right concept has been measured, whereas reliability is concerned with the stability and consistency of measurement. Reliability describes to what degree a particular test, procedure or tool, such as a questionnaire, will produce similar results in different circumstances, assuming nothing else has changed (Roberts et al., 2006). In quantitative research, internal and external validity are used to evaluate the overall trustworthiness of the research (Malhotra & Briks, 2007; Moutinho & Hutcheson, 2011). Internal validity relates to the quality of the research design, such that the results obtained can be attributed to the manipulation of the independent variable (Moutinho & Hutcheson, 2011). Thus, it measures the authenticity of the cause-and-effect relationship. External validity also relates to the quality of the research design, but such that the results can be generalized from the original sample and extended to the population from which the sample originated (Moutinho & Hutcheson, 2011). In quantitative research, there are different statistical techniques and methods to determine whether the validity and reliability criteria have been met. The tests performed in this thesis are described in the following section for each appended article, respectively.

3.3. Research design in the appended papers

Article I: *Modelling and forecasting alpine skier visits.*

Tourism demand can be measured in a variety of ways. Kim (1988) (cited in Song & Li, 2008) categorized the measurement of travel and tourism demand into the following four criteria: (1) a doer criterion, including the number of tourist arrivals, the number of tourist visits and the visit rate; (2) a pecuniary criterion, including the level of tourist expenditure (receipts) and the share of expenditure (receipts) in income; (3) a time-consumed criterion, including tourist days or nights; and (4) a distance traveller criterion, for instance, the distance travelled in miles or kilometres.

In this article, a doer criterion for tourism demand measurement was used. The data set consists of the number of daily visitors at a specific ski resort in the inland region of Norway, which has approximately 30,000 skier visits per season. The sample represents only approximately 1% of the Norwegian ski market, which consists of about 3.1 million skier visits (Alpinanleggenes Landsforening, 2016). However, it is sufficient to provide useful information about the skiing population as long as the sample is representable. In Norway, there are more than 200 small and large ski resorts. Most resorts are small, similar to the ski resort used for this article. Therefore, the results of this study can be generalized to other Norwegian ski resorts and possibly to ski resorts with similar characteristics elsewhere. The characteristics of the ski resort studied are presented in Table 3.

Table 3. The characteristics of the ski resort.

The characteristics	
Total ski-lift capacity (persons per hour)	3 200
Total length of ski slopes (km)	7

Number of ski slopes	7
Number of ski lifts	3
Base altitude of ski resort (m)	700
The distance between the top and base of a ski resort, measured straight down (m)	250

Daily visitor data were obtained for seven winter seasons in the period from 2007/2008 to 2013/2014. Daily visits were measured at the ski resort with the assistance of an access control and visitor management system that counted the number of unique ski-lift users. Some previous studies (Falk, 2010; Surugiu, Dincă & Micu, 2010; Töglhofer, Eigner & Prettenthaler, 2011) used overnight stays as the dependent variable, whereas others used ski-lift ticket sales or the number of visits (Hamilton, Brown & Keim, 2007; Holmgren & McCracken, 2014; Shih, Nicholls & Holecek, 2008). However, overnight stays is a less reliable outcome variable than ski-lift ticket sale data or the number of visits because when tourists arrive at the ski area, they have the opportunity to replace skiing with other activities.

Weather observation data were collected from the weather stations nearest to ski resort location. All weather variables were available at a daily frequency. The interaction between temperature and wind, known as the wind-chill index, was used as one explanatory variable. This variable represents the temperature felt on the exposed human body. To test the hypothesis that both very warm and very cold temperatures have a negative impact on the number of visits, a quadratic term for wind chill has been included in the model to allow for a non-linear response in skiers' visits as the wind chill increases.

In addition, several categorical variables were included to control for several other factors: weekdays, holidays and specific arrangements at the ski resort (for more details, see appended Article I).

The goal of this study was to propose a model to explain variation in the number of visits. Therefore, in the empirical analysis, a time series regression with exogenous variables was applied. In the general case, the model can be specified as:

$$TS_t = \alpha + \beta X + \varepsilon_t, \tag{8}$$

where TS_t denotes a time series of ticket sales in a given category, X is a vector of independent variables and ε_t is the error term. In this case, the impact of known market measures and weather-related variables on the total number of visitors was examined.

A time series is stationary if the distribution of its value remains the same as time progresses, which would imply, in this case, that the probability of TS falling within a particular interval is the same now as at any time in the past or the future. For a stationary series, the estimated parameters do not change over time or follow any trend. The use of non-stationary data can lead to spurious regressions, and subsequently, invalid asymptotic analyses (e.g., t tests). To test for stationarity, the Augmented Dickey–Fuller test (Dickey & Fuller, 1979) was used.

To account for the time series properties of the data, lagged values of daily visits were included in the final model. Moreover, this ensures that the model is correctly specified in terms of fulfilling the underlying assumptions regarding the absence of autocorrelation in the residuals. To test for serial correlation, both a graphical approach (an autocorrelation function plot of the residuals) and the Durbin–Watson test were used. The value of the Durbin–Watson test was two, indicating that the assumption of independent errors has almost certainly been met (Durbin & Watson, 1951). To test that a given number of lags (1, 2 …) is simultaneously equal to zero, the Q-statistic,

developed by Box and Pierce (1970), was used. In addition, the Breusch–Pagan test was applied to determine whether there were problems of heteroscedasticity (Breusch & Pagan, 1979), and Huber–White's sandwich estimator of the variance was used to correct for heteroscedasticity. The independent variables were examined for multicollinearity by estimating the variance inflation factor (VIF). The VIF values for our model indicated that there is no multicollinearity in the data applied in this study.

The relationship between the independent variables and the number of daily visitors was estimated by OLS regression with time series data. In addition, a median regression was applied that yielded almost the same coefficients as did the reported OLS model. Thus, the results appear robust.

Article II: *Explaining variation in alpine skiing frequency*

This study used data from a survey conducted at three ski resorts in the Lillehammer area in the inland region of Norway. The characteristics of all three ski resorts are presented in Table 4.

Table 4. The characteristics of all three ski resorts.

	Ski Resort 1	Ski Resort 2	Ski Resort 3
Total ski-lift capacity (persons per hour)	21 060	3 200	10 000
Total length of ski slopes (km)	44	7	21
Number of ski slopes	32	7	21
Number of ski-lifts	18	3	9
Base altitude of ski resort (m)	195	700	800
The distance between the top and base of a ski resort, measured straight down (m)	835	250	350

All three ski resorts are located within 40 km travel distance of the city centre of Lillehammer. Data collection was performed at the end of the 2015/16 season by six bachelor students from the economics and business administration faculty at the Inland Norway University of Applied Sciences. To avoid sample selection bias (Heckman, 1979), the interviews were carried out on various weekdays (in the period from March 14 to March 20 and on April 9 and 10) at different times during the day. The same interview questionnaire was used for the Articles IV and V, but the key variables of interest differ between the articles. As the main objective of the Articles IV and V was to examine price–response functions for day passes, the skiers at the various resorts were first asked if they possessed season tickets. Those who answered "no" to this question were then asked to participate in a survey (the questionnaire is attached in Appendix). In total, 259 observations were used in this analysis (for detailed sample characteristics, see appended Article II).

Two separate models were distinguished. The first focuses on overall visit frequency to the three ski resorts in a typical winter season, whereas the second focuses on visit frequency to a specific ski resort in a typical winter season. In general, the models can be specified as follows:

$$\ln Y_i = \propto + \beta X_i + \varepsilon_i, \qquad (9)$$

where Y is the overall visit frequency or the visit frequency to a specific ski resort, the Xs are the independent variables, i represents the observation number and ε is the error term.

To examine how different social and personal factors affect a customer's willingness to participate in alpine skiing, OLS regression analysis was used. The log-linear model was chosen based on the Akaike information criterion (AIC) and the Bayesian information criterion (BIC). The underlining assumptions of the linear regression model, including linearity, independence of errors, homoscedasticity, normality and collinearity, were

examined. Linearity, homoscedasticity and normality were checked by visual inspection. To detect multicollinearity, VIF was used.

However, the OLS regression only enabled average visit frequency across skiers to be estimated (Koenker & Hallock, 2001). The distribution of the dependent variables, overall visit frequency and visit frequency to a particular ski resort, were somewhat right-skewed, and the determinants of visit frequency were expected to differ between skiers with higher and lower visit frequency. Therefore, to achieve a more detailed understanding of the relationship between the selected variables and alpine skiing frequency, a quantile regression (Koenker & Bassett, 1978) was applied. The quantile regression enabled the estimation of conditional quantile functions, where each function characterized the behaviour of a specific point in the conditional distribution and allowed for distinctions among skiers with low, moderate and high visit frequencies (see Koenker & Hallock, 2001).

Given the relatively small sample size of 259 observations, only the results for the 25th, 50th, and 75th quantiles were reported to examine selected explanatory variables across the entire conditional visit frequency distribution. Standard errors were obtained using the bootstrap method (Buchinsky, 1995) with 1,000 repetitions.

Article III: *A hedonic price analysis of ski-lift tickets in Norway*

The analysis in Article III was based on geographic information, supply-related characteristics and climatic data of Norwegian ski resorts. The data were collected from

the websites of each ski resort, and from the comparative ski lift operator websites[1], as well as through email questionnaires addressed to ski resort representatives. The web mapping service *Google Maps* was used to calculate travel distance between a given and other ski resorts. The same service was used to calculate the travel distance from a resort to urban areas and to the international airport. However, not all ski resorts provide publicly available information on ski pass prices and skiing services. As a result, the sample for analysis was restricted to 83 ski resorts representing approximately 43% of all ski resorts in Norway. Most (56%) of the ski resorts studied were located in Eastern Norway, with 25% in Western Norway, 7% in Southern Norway, 6% in Central Norway and 6% in Northern Norway. The data set included all of the largest ski resorts, which have more than 100,000 skier visits per year based on figures from the Norwegian Alpine Resorts Association (Alpinanleggenes Landsforening, 2016), but excluded glacier ski resorts that are open only in summer. The collected data relates to skiing during the 2014/2015 winter season.

A ski pass is a complex good, the value of which is determined by a number of characteristics. The literature suggests that if any of the price determinants is missing from the hedonic price model, the estimation could be biased (Bao, 2014). The reason is that the bias caused by omitted variables is an aggregation of the bias caused by each individual omitted variable (Clarke, 2005). Although the inclusion of all relevant, correlated variables is impossible, it is suggested that the inclusion of as many variables as possible will reduce the bias. However, including more variables in a regression, even relevant ones, does not necessarily mean that the regression results will be more accurate (Clarke, 2005; Griliches, 1977). If information on one important variable is unavailable

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[1] http://www.skiinfo.no, http://www.alpinanleggene.no, http://www.skiresort.info, http://ski-resorts.wanderbat.com, http://www.alpepass.no, http://www.visitnorway.no, http://www.skiheis.as

in the data set, the regression estimator of the coefficient of the included variables may still be unbiased as long as the omitted variable is not significantly correlated with the included ones (Bao, 2014).

In this study, different variables were chosen and tested based on not only data availability and statistical tests, but also the theory and earlier studies. The characteristics of a ski resort included in the final model were as follows: percentage of intermediate ski slopes, percentages of chair lifts and gondolas to total number of ski-lifts, the total length of ski slopes, the vertical drop, base altitude of a ski resort, the last five years' average amount of snowfall in a season, the number of terrain parks, travel distance to the nearest ski resort in Norway, travel distance to the nearest large Swedish ski resort, travel distance to the nearest international airport, travel distance to the nearest large urban area in Denmark or Sweden, the price at the nearest ski resort in Norway, a dummy variable indicating whether there are two or more ski resorts within a 50 km radius, a dummy variable indicating that the ski resort is located in western Norway and a dummy variable indicating small lift capacity.

Several additional variables were tested, including population in the municipality and in the county, travel time to the nearest large urban area in Norway, Sweden or Denmark, travel time to the nearest large ski resort in Sweden, the number of private cabins in the municipality where the ski resort is located and the number of hotel beds in the county where the ski resort is located. None of these variables had a significant effect on lift ticket price and, therefore, were not included in the final model. In some previous studies, a variable for vertical transport meters per hour (the number of persons who can be transported uphill at a speed of 1,000 vertical meters per hour) was used. Unfortunately, no such information was available for all ski resorts included in this analysis. Therefore, this commonly used variable was not included in the final model. However, data were collected on the total lift capacity for each ski resort, and a dummy

variable was added to identify ski resorts with a total lift capacity below 3,000 skiers per hour.

A hedonic price model was used to examine how the abovementioned factors affect the price of ski passes. The hedonic price model was specified as follows:

$$\ln P_i = \alpha + \beta \ln X_i + \varepsilon_i, \qquad\qquad (10)$$

where ln is the natural logarithm, P is the price for a one-day adult lift ticket, i indicates the ski resort, X_i is a vector of characteristics and ε_i is an error term.

The double-log model was chosen on the basis of AIC and BIC. To apply the model and establish validity, several critical assumptions, including linearity, independence of errors, homoscedasticity, normality and collinearity, were examined. Linearity, homoscedasticity and normality were checked by visual inspection. To detect multicollinearity, VIF was examined. A VIF greater than 10 was used as a threshold to identify problematic relationships between variables. For the present model, the VIF values were all well below 10. Additionally, a median regression model was examined that gave almost the same coefficients as the reported OLS model. Hence, the results from the OLS model appear robust.

Article IV: *Optimal prices for alpine ski passes*

The data for this study were obtained at the same three ski resorts used for Article II (see Table 4) and using the same questionnaire. The CVM, which is one of the most commonly used direct methods to measure WTP (Drayer & Shapiro, 2011; Reynisdottir et al., 2008; Steiner & Hendus, 2012; Wicker & Hallmann, 2013), was used to examine customers' WTP. In this method, respondents are asked to state their WTP directly (open-ended contingent valuation) or to make single or repeated choices of whether they would buy a good at a given price (closed-ended contingent valuation)

(Wertenbroch & Skiera, 2002). Breidert et al. (2006) mentioned the following drawbacks of the direct approach: (1) an unnatural focus on price and too little focus on other attributes of the product; (2) customers may not have an incentive to reveal their true WTP; (3) a statement of maximum WTP cannot necessarily be translated into buying intention; (4) directly asking for WTP for complex and unfamiliar products is a challenging task for respondents; and (5) misjudgement of price can occur, especially if it is not a high frequency purchase. These drawbacks have led some researchers to conclude that the direct method of asking customers' WTP for different products may not be reliable. However, a more recent study by Miller, Hofstetter, Krohmer and Zhang (2011) presented contrary results. The authors evaluated four different methods for measuring consumers' WTP by estimating price–response functions based on the WTP data obtained from various methods using a logit model. The performance of each method was assessed by comparing the results to real (actual) purchase data. The conclusion was that the hypothetical methods (such as the direct approach) could forecast demand reasonably well and lead to correct pricing decisions, even though hypothetical bias was generated. They found that the direct approach could be largely biased in terms of the intercept, but not as much in terms of the slope, indicating that this method may still provide good estimates of optimal price and quantity.

As the study underlying Article IV was partly explorative, some pre-testing of the questionnaire was performed. This was carried out in two rounds. First, students and employees at the Inland Norway University of Applied Sciences answered the questionnaire and provided their detailed feedback. Based on this pre-testing, the categories measuring the relationship between price and visit frequency (demand) were reduced in number. The revised version was then used for a pilot study at one of the ski resorts. The feedback from 30 respondents who participated in the pilot was that the specific question measuring price sensitivity could be simplified further. Therefore, the

number of price alternatives was reduced again, and relative numbers were replaced with absolute numbers. Instead of asking the respondents about their total skiing frequency for an entire season, we asked how many *more* or *fewer* visits they would have made to the specific resort under various price changes. The feedback was that this adjustment made the questionnaire easier to understand and, hence, that the risk of response errors was reduced.

The total number of observations used in the analyses was 265 (for detailed sample characteristics, see appended Article IV).

The assumptions about the distribution of the consumers' WTP were made to choose the right functional form of price–response function. The linear price–response function is commonly used in practice because of its ease of estimation. A linear price–response function corresponds to a uniformly distributed WTP, where consumers are evenly distributed across the entire range of possible prices (Phillips, 2005). However, this is not a very realistic representation of the global price response, as the linear price–response function assumes that the change in demand (in units) is the same for a unit change in price for all price levels. The logit price–response function assumes that the WTP distribution follows a bell-shaped curve known as the logistic distribution. This is a reasonable WTP assumption that groups the largest percentage of consumers around a mean value, assuming very small probabilities at the low- and high-end extremes (Bodea & Ferguson, 2014). The highest point of the logistic WTP distribution occurs at the approximate "market price" (Phillips, 2005), which is also the point at which the slope of the price response is steepest. In real-world situations, price–response curves have a reverse S-shape, as customers are most price sensitive when the price is close to the market price (Phillips, 2005). Accordingly, when the price is very low, demand is high, but demand changes very slowly according to price changes. In the area of the market price, demand is very sensitive to price changes, with the result that small

changes in price can lead to substantial changes in demand. At high prices, demand is low and changes slowly if the price rises.

The linear price–response function is specified as follows:**Feil! Bokmerke er ikke definert.**

$$d(p) = D + m \cdot p, \qquad\qquad (11)$$

where D is the maximum demand (demand at zero price), m is the slope (i.e., how much demand falls for a one-unit increase in price) and p is the price. The function is very simple to implement in practice as it only involves fitting a linear regression line using OLS.

The logit price–response function is given by:

$$d(p) = \frac{C \cdot e^{a+b \cdot p}}{1 + e^{a+b \cdot p}}. \qquad\qquad (12)$$

In this case, C, a, and b are parameters to be estimated, with the restrictions that $C > 0$ and $b < 0$. According to Phillips (2005), a can be either greater than or less than zero, but in most applications this parameter will be greater than zero. Phillips (2005) also stated that parameter C can be understood as the size of the overall market and that b specifies price sensitivity. Larger values of b mean greater price sensitivity, and vice versa. The logit price–response model was estimated using non-linear regression. In this case, the parameters were estimated by minimizing the sum of the squared residuals.

Subsequently, various price–response functions were used to calculate optimal prices for each subset of skiers according to their differing characteristics. To find the price that maximizes the total contribution margin, the corresponding optimization problems were solved. The corresponding optimization problem can be defined as:

$$\max_p cm = (p - c)d(p) \qquad\qquad (13)$$
$$s.t. \qquad\qquad\qquad .$$
$$d(p) \leq capacity$$

That is, the contribution margin is maximized by changing the price, subject to the capacity constraints at the resort. Based on calculations and following the suggestions of Phillips (2005), the assumption was made that the incremental costs per additional customer in the ski resort are effectively zero. Accordingly, the total contribution for the ski resort could be maximized by maximizing revenue (Phillips, 2005). In this case, the objective function was:

$$\max_p R(p) = d(p)p. \qquad\qquad (14)$$

Article V: *Optimal weather discounts for alpine ski passes*

The data for this study were obtained at the same three ski resorts in Lillehammer (see Table 4 above) and using the same questionnaire as that in Articles II and IV, but the key variables of interest were different. The CVM was used to examine customer WTP for different weather-related scenarios. The total number of observations used in this study was 398 (for detailed sample characteristics, see the appended Article V).

The price–response functions were estimated based on the information obtained about skiing frequency at various discount levels. Only the logit price–response function was chosen for estimation in this study, following the suggestions of Phillips (2005) and Bodea and Ferguson (2014), and taking previous research (e.g., Huang, Leng & Parlar, 2013; Sudhir, 2001) and the findings of Article IV into account.

Demand was assumed to be independent for each scenario and the optimal discount price for each weather related scenario was found by solving the following independent optimization problem:

$$\max_{p} R(p) = d(p)p. \qquad\qquad (15)$$

In Articles IV and V, the optimal prices and discounts were calculated, using a relatively small sample size. Therefore, it is important not to be overconfident about these prices; the results must be seen as preliminary evidence of possibilities for ski resorts that choose to use a more dynamic pricing approach.

4. Research findings

In this chapter, I provide a summary of the most important findings in each of the five appended articles, followed by a presentation of the links between the research questions and articles.

4.1 Article I

Malasevska, I., Haugom, E. & Lien, G. (2017). Modelling and forecasting alpine skier visits. *Tourism Economics, 23*(3), 669–679.

The purpose of this study was to understand the causes of variations in skier visits for a Norwegian alpine ski resort. A model was proposed that incorporated wind chill as a weather characteristic and several market measures, including day of the week, holidays and promotional activities.

One of the findings was that there is strong intra-week and intra-season seasonality (Figure 12), which is consistent with previous research findings (e.g., Shih et al., 2008). Skiers mostly visit the ski resorts on Fridays, Saturdays and Sundays, while the weekdays (Monday to Thursday) are generally characterized by low attendance.
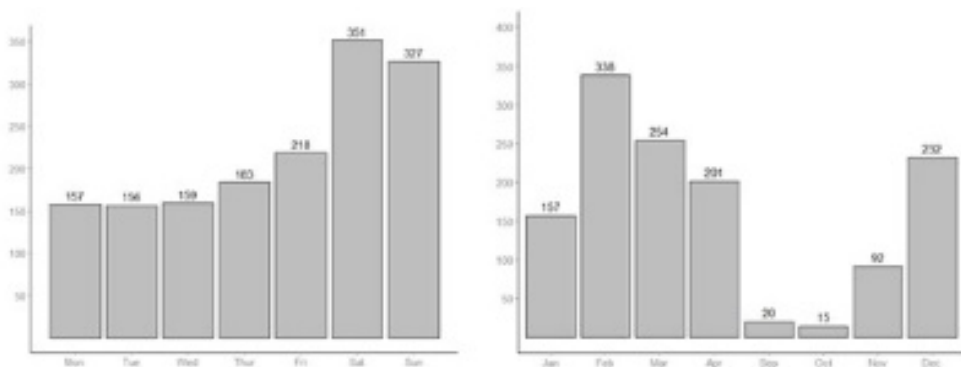
Figure 12. Average numbers of visitors.

Left panel – visitors by day of the week; right panel –average daily numbers each month.

In addition, it was found that weather conditions, holidays and promotional activities significantly affected the number of daily visitors. The time series regression analysis revealed a non-linear relationship between the number of visitors and wind chill temperature. The results indicated that if the wind-chill temperature was below –9.5℃, then an increasing temperature had a positive effect on the number of daily visitors. Similarly, if the wind-chill temperature was above –9.5℃ a higher temperature led to a lower number of skier visits, on average. Accordingly, the optimal wind-chill temperature was determined to be –9.5℃, *ceteris paribus*. These effects are illustrated in Figure 13.
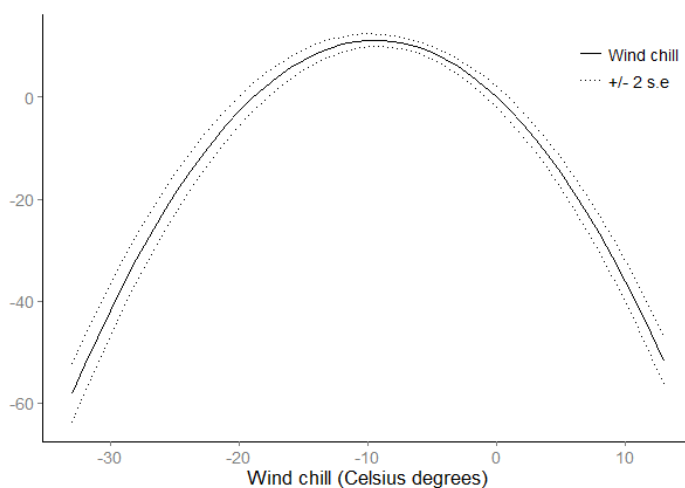
Figure 13. Total effect of wind chill on the number of visitors.

4.2. Article II

Malasevska, I. (2017). Explaining variation in alpine skiing frequency. *Scandinavian Journal of Hospitality and Tourism*, 1–11.

doi:http://dx.doi.org/10.1080/15022250.2017.1379435

The purpose of this study was to examine how social and personal factors influence overall skiing

frequency and the frequency of the repeated visits to a specific ski resort of existing domestic skiers in a typical winter season.

Skiing interest, household income, current occupation, family status and a type of accommodation when visiting the ski resort were examined as factors that could influence visit frequency.

The results indicated that overall visit frequency was significantly influenced by skiing interest and household income. In addition, in the case of a specific ski resort, the type of accommodation (at home or at own cabin/apartment) used when visiting the ski resort had a significant and positive effect on visit frequency.

A quantile regression was conducted to examine whether various social and personal factors had different effects on visit frequency in the lower and higher quantiles of the distribution compared with the estimates at the mean. It was found that the effect of the variables did not vary significantly between skiers with low and high visit frequencies.

4.3. Article III

Malasevska, I. (2017). A hedonic price analysis of ski lift tickets in Norway.
Scandinavian Journal of Hospitality and Tourism, 1–17.
doi:http://dx.doi.org/10.1080/15022250.2017.1322531

The purpose of this study was to understand how various characteristics caused variations in one-day ski-lift ticket prices. In addition, following the studies by Falk (2008) and Alessandrini (2013), the estimated coefficients of the regression model were

used to calculate the predicted prices, which were then compared with the observed ski-lift ticket prices to determine which ski resorts were under- or overpriced.

The results indicated that the vertical drop, the share of intermediate difficulty ski slopes, the number of snow parks, the travel distance to the nearest large ski resort in Sweden and the price at the nearest ski resort in Norway *positively* affected prices. By contrast, travel distance to the nearest ski resort in Norway and to the nearest large urban area in Denmark or Sweden, a total lift capacity of less than 3,000 persons per hour, a location in western Norway and a location close to more than two other ski resorts significantly and *negatively* affected prices.

It was found that only seven of the 83 ski resorts included in this analysis were priced according to their quality characteristics. These findings suggest that ski-lift ticket prices were influenced by the pricing decisions of other ski resorts, especially the leading ones. More specifically, 50% of the observed ski resorts had set their actual prices within the range of prices charged by the 15 largest ski resorts in Norway.

4.4. Article IV

Malasevska, I. & Haugom, E. (2018). Optimal prices for alpine ski passes. *Tourism management, 64*, 291–302.

In this study, the relationship between price and quantity demanded was examined, and the effect of variable pricing on ski resorts revenue was estimated.

The findings were consistent with previous research, which indicated that the logit price–response function fits the observed data for a wide range of markets and outperforms the linear price–response function.

In general, the empirical results revealed that ski resorts have very variable demand, with higher price sensitivity during midweek days (Monday to Thursday), which indicates

that ski resorts can increase their revenue by altering ski-lift ticket prices during the week.

In addition, the results from the customer subgroup analyses confirmed the findings of Schroeder and Louviere (1999) that visitors who have travelled a longer distance to the ski resort are willing to pay more for a ski-lift ticket. More precisely, for customers living within a 70 km radius of the ski resort, who are the most attractive to the one-day alpine skiing market, the results suggested a surprisingly low optimal price (approximately 50% lower than the actual price). Similarly, for locals who did not pay for accommodation, but stayed at their own home when visiting the ski resort, the optimal price indicated was very low. The highest optimal prices suggested were for private holiday homeowners. The findings on family status suggested that price differentiation based on the family status of customers was not very efficient.

4.5. Article V

Malasevska, I., Haugom, E. & Lien, G. (2017). Optimal weather discounts for alpine ski passes. *Journal of Outdoor Recreation and Tourism.*
doi:http://dx.doi.org/10.1016/j.jort.2017.09.002

The purpose of this study was to examine the relationship between discount levels for the alpine ski passes for various unpleasant weather-related skiing scenarios and quantity of ski passes demanded.

The findings pointed out that the relationship between the price and quantity demanded of ski passes differed under various weather related scenarios, indicating that price sensitivity varied with the various skiing conditions. The study calculated the optimal discount price for six different scenarios and found that the lowest optimal discount prices were for alpine skiing in blizzard, rain and in a situations in which less

than 50% of the slopes were open, compared with scenarios of very low air temperatures, very strong wind or situations in which only 50% to 75% of the slopes are open. Overall, the results suggested that discounted prices have different—but in all cases, positive— effects on quantity demanded and revenue for the ski resorts.

Additionally, weather data from the Norwegian Meteorological Institute for the winter seasons 2014/2015 and 2015/2016 were examined. These data showed that ski resorts in the particular area of study were affected by one of the bad weather-related scenarios included in this analysis for approximately 37% of their operating days per winter season. The fact that ski resorts are subject to poor weather conditions for more than one-third of the winter season reinforces the need for innovative mechanisms to enhance competitiveness and ensure profitability of the ski resorts.

4.6. An overview of the links between the appended articles

All of the articles presented above contribute to the overall purpose of this thesis and to one or more of the research questions posed. Table 5 illustrates how the articles are connected to the different research questions.

Table 5. The research questions of the thesis and the positioning of the articles.

	Research question	Article
RQ 1:	What are the factors that affect demand for alpine skiing?	I & II
RQ 2:	What are the factors that affect the price of ski passes?	III
RQ3	What is the relationship between alpine skiing demand and ski pass price?	IV
RQ 4:	What is the optimal price for ski-lift ticket?	IV & V
RQ 5:	Do ski resorts have the potential to increase their competitiveness by adopting a more innovative pricing approach?	IV & V

	Research question	Article
RQ 6:	What kind of innovating price approach is appropriate for alpine ski resorts	IV & V

5. Research contributions, implications and further research

This chapter summarizes and concludes the contributions of this thesis in Section 5.1. The practical and managerial implications for ski resorts follow in Section 5.2. Finally, in Section 5.3 some suggestions for further research are provided.

5.1. Theoretical contributions

As previously argued, additional research is needed to understand more thoroughly how ski resorts could improve their competitiveness and profitability in the context of today's changing and highly competitive alpine skiing market. Therefore, this PhD thesis has had a twofold overall purpose. First, it aimed to increase the knowledge of factors that affect alpine skiing demand and prices for alpine ski passes. Second, it aimed to examine the potential for innovative pricing approaches in the alpine skiing industry.

In this section, the contributions in this thesis are briefly summarized and discussed in three parts, based broadly on the research questions outlined above. The first part, Section 5.1.1, focuses on the factors influencing variation in alpine skiing demand and visit frequency (RQ1). The second part, Section 5.1.2, indicates factors influencing one-day ski-lift ticket prices (RQ2). The third part, Section 5.1.3, considers the price–demand relationships and how such information can be used to set optimal ski-lift ticket prices and what potential there is for innovative pricing approaches in the alpine skiing industry (RQ3, RQ4, RQ5, and RQ6).

5.1.1. Factors influencing variations in alpine skiing demand

There are only few studies focusing on Scandinavian countries in relation to the demand for alpine skiing, the most recent of which are by Tjørve, Lien and Flognfeldt (2015) and Falk and Hagsten (2016). This thesis has contributed to expanding the research within Scandinavian countries and to deepening and broadening the existing research

on alpine skiing demand from different theoretical perspectives. As previously mentioned, in Norway, most ski resorts are relatively small, similar to the ski resort analysed in Article I. Therefore, the results from this thesis can be generalized to other Norwegian ski resorts and possibly to ski resorts with similar characteristics elsewhere.

In addition, the thesis findings contribute to explanations of the factors influencing overall skiing frequency and the frequency of repeated visits to a specific ski resort of existing domestic skiers in Norway.

In contrast to previous studies, which have focused on the linear effect of air temperature on the number of ski resort visitors (e.g., Shih et al., 2008), this study estimates the non-linear relationship between alpine skiing demand and wind-chill (the apparent temperature felt on the exposed human body owing to the combination of temperature and wind speed). Surugiu et al. (2010) and Shih et al. (2008) claimed that there is a negative relationship between temperature and the number of visitors. However, the results of this study indicate that this relationship does not necessarily hold for all temperature levels. This finding of a non-linear relationship between temperature and number of visitors is an important contribution. Alpine skiing is an outdoor activity that is most enjoyable within specific ranges of temperature and other weather conditions; weather that is too cold or too warm is not desirable for alpine skiing. Shih et al. (2008) attempted to find specific temperature thresholds best suited for skiing, but did not find any significant effects. By contrast, this study was able to estimate that the 'optimal' wind-chill temperature for alpine skiing is approximately –9.5℃, *ceteris paribus*, based on examining the actual number of daily visitors at a specific ski resort.

This thesis provides support to the argument that the alpine skiing industry is appropriate for innovative pricing approaches because the industry exhibits strong variations in demand and unused capacity during low-demand periods. Moreover, this

study enhances the knowledge of the Norwegian alpine skiing market segmentation, based on consumers' behaviour, in a manner that integrates skiers' social and personal characteristics, as well as overall skiing demand patterns. The development of more efficient market segmentation is fundamental to the strategic development and implementation of more efficient pricing approaches.

5.1.2. Factors influencing ski lift ticket price

Ski resorts' quality characteristics have a significant impact on customers' WTP for alpine skiing (Falk, 2008). Previous research has examined how the internal and external characteristics of ski resorts affect the price for alpine ski passes, mainly focusing on major ski destinations (in terms of skier visits) in European alpine countries (e.g., Alessandrini, 2013; Borsky & Raschky, 2009; Falk, 2008, 2011; Pawlowski, 2011; Wolff, 2014) and the United States (e.g., Fonner & Berrens, 2014; Mulligan & Llinares, 2003). This thesis widens the sample to include a small country, Norway. This is an important contribution because the results from major ski destinations cannot be generalized to small destinations, where the ski market is generally fragmented, uncrowded and involves small companies operating the ski-lifts. Moreover, skiers have different preferences when choosing a ski destination (see, e.g., Carmichael, 1992; Konu, Laukkanen & Komppula, 2011; Richards, 1996). Therefore, one can expect that WTP will differ, based on the different quality characteristics of ski resorts, between skiers who choose large ski resorts in popular major destinations and those who prefer small, uncrowded ones.

In addition, this study extends previous work by estimating the effects of variables that have not been examined previously, such as travel distance to the nearest ski resort, travel distance to the nearest large ski resort in a neighbouring country, the one-day ski-lift

ticket price at the nearest ski resort, the number of ski resorts within a 50 km radius and the travel distance to the nearest large urban area in the neighbouring country.

Furthermore, the results of this study contribute to a better understanding of the price–quality relationship of Norwegian ski resorts. The findings suggest that the pricing approaches of ski resorts are inefficient to some degree because most are based on pricing decisions at other ski resorts (competition-based pricing). Ski resorts have different quality characteristics; therefore, such a pricing approach can lead to a situation where lower quality ski resorts are overpriced. The results of this thesis do not indicate that the larger ski resorts are more frequently underpriced than small resorts, or vice versa. However, in general, the results underline the fact that innovative pricing could be a valuable instrument to enable ski resorts to become more attractive to skiers, even when they do not possess the highest quality characteristics.

5.1.3. The price–demand relationship and the potential for innovative pricing approaches

There is a lack of extensive research on innovative pricing approaches within the alpine skiing industry. Mitchell (2013) emphasized that there is a need for more academic research in the area of pricing management to support the expansion of new pricing knowledge. This study responds to this call for additional pricing research. In addition, although there are several studies that have examined how different weather variables influence alpine skiing demand, no studies have attempted to quantify how much the value of alpine skiing is influenced by different weather conditions. The findings of Article V fill this research gap by estimating the relationship between quantity demanded and price for ski-lift tickets under specific weather scenarios and by calculating the optimal 'weather discounts'.

This thesis confirms that alpine skiing is an industry that has the characteristics necessary for innovative pricing, including a relatively fixed capacity, varying and predictable demand, price sensitivity that varies across time and/or market segments and low costs associated with marginal sales. In general, the findings of the appended research articles suggest that ski resorts can increase profitability by implementing the following pricing approaches: (1) variable pricing based on seasonality, and (2) a dynamic pricing approach based on different weather scenarios. Both approaches are available to all customers and would therefore be likely to be accepted as fair pricing strategies.

In general, this thesis suggests that ski resorts can innovate in terms of new pricing approaches. Although innovative pricing approaches have been used in other industries, their adoption by ski resorts can be seen as an innovation in itself. This is because innovative pricing influences the performance and market position of ski resorts and involves a new flow of knowledge and expertise, which are the traditionally defined requirements for innovation (Sundbo, 1997; Walker, 2004).

5.2. Practical implications

Innovative pricing is an effective way for firms to increase revenue and market share simultaneously, as it provides incentives for consumers to change their purchasing patterns and potentially buy more of a product, and it enables firms to sell to new customer segments. For managers, it is important to understand that the implementation of a powerful pricing capability is a complex task that calls for the following: (1) a clear understanding of customers' WTP and (2) the costs to serve these customers at the microsegment level. These two factors are affected by the various channels used, the geographic markets selected and the promotions or discounts in place (Cudahy & Coleman, 2007). Liozu (2015) emphasized that the development of pricing power is a learning behaviour and is usually based on skills in price setting and price

getting. Bodea and Ferguson (2012) developed the following process road map for developing and sustaining pricing capabilities (see Figure 14).
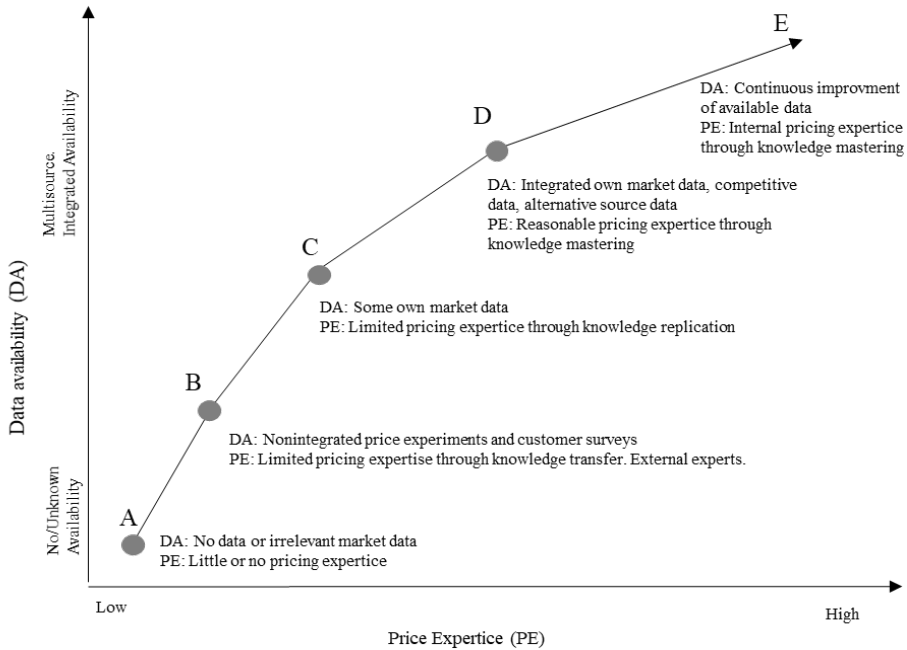
Figure 14. Developing pricing capabilities: process road map.

Source: Bodea and Ferguson (2012, p. 27).

Point A in Figure 14 indicates the initial stage of acquiring pricing capabilities. At this point, company has little or no pricing expertise and, often, no data are available. By contrast, point E indicates the situation, where the company has high-level pricing expertise and can use this extensive knowledge to operate successful pricing approaches. Point E is not the final goal because successful market-oriented companies have to continuously improve their pricing approaches and experiments, using continuous innovation, to grow their profitably, provide superior customer satisfaction and

outperform their competitors (Bodea & Ferguson, 2012; Hinterhuber & Liozu, 2012; Hinterhuber & Liozu, 2014). Bodea and Ferguson (2012) pointed out that, in some cases, companies at the initial stage (point A) already collect and posses the market data necessary for pricing analytics, but their lack of pricing expertise makes it difficult to transform this available information into applicable market decisions. This statement may be applied, to some extent, to a large proportion of the Norwegian ski resorts. Almost all Norwegian ski resorts use access and visitor management systems (e.g., SKIDATA), which provide a wide range of visitor data. However, according to findings of this thesis, their pricing nevertheless remains inefficient, presumably because of their lack of expertise in pricing analytics. This indicates unused potential benefits from the adoption of more efficient pricing. To be an innovative pricing leader in an industry, one must move beyond the traditional pricing practices of relying on cost numbers or competitor pricing decisions (Huxol, 2013; Liozu, 2015). By increasing their pricing expertise, ski resorts could use the demand data that are already available to implement more efficient pricing approaches. Recently, innovative pricing strategies have become easier to adopt because of the development of new technologies such as pricing optimization software and the availability of decision-support tools for analysing demand data (Elmaghraby & Keskinocak, 2003). The visitor management system SKIDATA, which is typically used by ski resorts, can provide the necessary data to make better decisions and support innovative pricing. Moreover, companies that invest in pricing optimization software typically improve their revenue within approximately two years (Liozu, 2015).

In general, the implementation of innovative pricing approaches requires that the appropriate steps be completed. First, the primary customer segments based on WTP should be identified. Identification of customer segments with varying WTP allows ski resorts to segment the market and thereby increase their profitability and

competitiveness. The next step is to estimate the optimal price for each segment, based on the price and demand relationship. Accordingly, the ski resort's management must develop core competencies in forecasting demand, understanding customer buying behaviour, and predicting competitive responses (Huxol, 2013). As a result of the perishable nature of ski resort services capacity, it is not recommended that innovative and dynamic pricing approaches are applied without first undertaking accurate demand forecasting (Witt & Witt, 1995). Innovative pricing provides buyers with incentives for altering their buying behaviour and gives ski resorts the chance to reach new customer segments. As the innovative capacity of the tourism industry is quite low in general (Rønningen, 2010), such pricing innovations are crucial for the sector to realize the potential of tourism growth.

Based on the findings of this study, managers of the ski resort should consider the following:

(1) variable pricing based on seasonality (intra-day, intra-week, intra-season);

(2) variable pricing based on the quality of the service offered (e.g., in terms of the proportion of slopes that are open);

(3) dynamic pricing directly based on weather forecasts;

(4) privileged ski pass prices for local residents;

(5) discounted one-day group tickets for families or groups of friends;

(6) discounted prices (e.g., during low season periods) to motivate price sensitive customers to visit ski resorts more frequently; and

(7) ensuring quality products and good service at the ski resort to prevent price inelastic customers from choosing other ski destinations.

It should be noted that, although setting the 'right' price can increase profitability more than almost any other business action, consumer behaviour with respect to different prices is still not well understood, especially in regard to the perceived fairness of variable and dynamic pricing (Lowe, Lowe & Lynch, 2013). Therefore, ski resort managers must be aware of possible challenges related to the implementation of innovative pricing practices.

First, therefore, great emphasis must be placed on how prices are presented, given that different customers have different perceptions of fair prices (Guadix, Cortés, Onieva & Muñuzuri, 2010; Nagle et al., 2016, p. 91; Phillips, 2005, p. 305). Choi et al. (2015) and Huefner and Largay (2008) found that prices promoted as discount prices were perceived as being fair, whereas premium prices were not. These findings are in line with prospect theory (Kahneman & Tversky, 1979), which predicts that the same price will be accepted more readily if it is the result of a discount rather than a surcharge. Such a reaction results from the customers' notion of fairness, usually based on a reference price (Huefner & Largay, 2008), which is the customer's expected price based on past experience or knowledge of market price (Schroeder & Louviere, 1999). As a reference point is likely to be related to the perceived product quality (Monroe & Chapman, 1987), one can assume that customers regard actual ski-lift ticket prices as overpriced if skiing conditions are bad (e.g., due to weather conditions). Oh (2003) stressed that, whereas underpricing does not have a significant effect on customers' quality perceptions, overpricing tends to lower quality perceptions. This leads in turn to a reduction in the customers' WTP or willingness to (re)purchase (Kalwani, Yim, Rinne & Sugita, 1990; Winer, 1986). Therefore, it is crucial for ski resorts to understand that different factors can reduce customer utility and WTP for skiing experiences.

Second, the main idea behind variable pricing is to offer a lower price to customers with low WTP and a higher price to customers with high WTP. However, in practice, perfect

customer segmentation is not always feasible. Moreover, product-based pricing differentiations are much more willingly accepted by customers than are customer-based differentiations (Phillips, 2005, p. 316). Product versioning means that the seller develops an 'inferior' and/or 'superior' variant of an existing product (Phillips, 2005). Whereas a superior product is intended to capture fewer price sensitive customers, the aim of the inferior product is to satisfy the most price sensitive customers. As alpine skiing demand is affected by weather conditions (see e.g., Falk, 2013; Hamilton et al., 2007; Malasevska, Haugom & Lien, 2016, 2017; Shih et al., 2008), it is likely that WTP will be reduced in response to the reduced quality of the skiing experience, assuming that the consumer's budget remains fixed. In other words, alpine skiing during unpleasant weather, or when only some ski slopes are open, can be viewed as an inferior product variant of standard skiing. Offering lower ticket prices (discounts) when scenarios that make skiing less enjoyable arise allows ski resorts to sell an inferior product cheaply to customers with lower WTP without cannibalizing sales of the standard product, and thus simultaneously increasing demand.

Third, as the results of this study suggest, when providing discounted prices for specific time periods, skiing conditions and customer segments, ski resorts must be aware of the risk that customers will perceive these discounted prices as reference prices for future purchases, thereby reducing their likelihood of purchasing higher priced products. One way to avoid such an issue is to provide discount prices only during a control period. For instance, a ski resort could announce lower midweek prices for specific weeks during the low season only and/or provide them only when consumers purchase their tickets well in advance of the specific skiing date.

Fourth, it should be noted that the possibility of increasing the quantity of ski passes demanded in times when demand is usually low is important not only for ski resorts, but also for nearby local businesses, since the demand for one product is always joint

with the demand for some other products (Friedman, 2008). For instance, in the ski resorts, the demand for ski-lift tickets is linked to the demand for ski equipment, accommodation, restaurants and so on. Therefore, the impact of new pricing tactics would not be restricted to the ski resort itself.

5.3. Future research

This thesis has examined the factors affecting alpine skiing demand and price for alpine ski lift tickets. The appended articles expand the existing research and knowledge on innovative pricing approaches suitable for the alpine skiing industry. However, there are still questions to be asked and answered.

Skiing is mostly based on the domestic markets with a limited share of international customers for most ski destination countries (Vanat, 2017). This is also the case for Norway, and the characteristics of the sample used in the present study reflects this. As a result, it is probable that the general findings of this thesis would apply to other domestic ski resorts and the wider international ski resort market. However, this remains to be formally confirmed by future research using data from more ski resorts around the world.

Some previous research has suggested that WTP for alpine skiing activities could differ substantially between domestic and international customers (Davis & Tisdell, 1998; Reynisdottir et al., 2008). The present study sample consisted mostly of Norwegian skiers, and thus another interesting direction for future research would be to examine the price and demand relationship between skiers of different nationalities.

It cannot be claimed that the findings of this study regarding the impact of weather variables on skiing conditions, and thus on customers' WTP, can be generalized to all other ski resorts, because customer preferences and ski resort characteristics can result

in the weather and snow conditions impacting differently on customers' WTP between resorts. Therefore, it is important to extend the current study to a larger number of resorts in different climate zones. Moreover, as this study is limited to the six specified weather scenarios, it would be useful to focus on other weather-related scenarios in future research.

In addition, the calculations of optimal discount levels were made without taking different periods during the winter season into account. Hence, the study could be extended to separately calculate the optimal discount prices during the high (Christmas, Easter and school winter holidays) and low seasons.

The data sample in this study consisted of skiers who were one-day ski pass holders. It would be interesting to investigate factors affecting the visiting patterns of season and multi-day ski pass holders. Further, it could be possible that the implementation of dynamic pricing based on weather conditions could have a negative impact on demand for season passes for subsequent winter seasons. Therefore, another useful direction for future research would be to examine how the implementation of innovative pricing affects the demand for season passes.

Finally, it is expected that the implementation of innovative pricing will help to deal with fluctuating demand for alpine skiing. Accordingly, another topic for future research would be an investigation of the effects of innovative pricing approaches on the overall skiing experience. For instance, could innovative pricing approaches result in crowded slopes and longer queues at ski-lifts? Other questions for the future could include whether innovative prices would be accepted as fair by skiers and what long-term effects they would have on alpine skiing demand.

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Appendix

Appendix

Questionnaire used for the survey (Empirical base for Articles II, IV and V)

CUSTOMER SURVEY ABOUT SKIERS' PREFERENCES AT [RESORT NAME] SKI RESORT

The aim of this research is to enhance our understanding of skiers' preferences when visiting a ski resort. We highly appreciate your response.

1. Gender?
   - ☐ Male
   - ☐ Female

2. Age?
   _____ years old

3. What is your place of residence?
   City/location: _____
   Country: _____

4. Where do you stay when visiting [resort name] today?
   - ☐ At home
   - ☐ My own cabin
   - ☐ Rented apartment / cabin
   - ☐ Hotel
   - ☐ Other: _____

5. In a typical season, approximately, how many days do you ski at a ski resort?
   _____ days

6. In a typical season, approximately, how many days do you ski at [resort name] ski resort?
   _____ days

7. What days of the week do you typically visit the ski resort? (Several options possible)
   - ☐ Monday
   - ☐ Tuesday
   - ☐ Wednesday
   - ☐ Thursday
   - ☐ Friday
   - ☐ Saturday
   - ☐ Sunday
   - ☐ I use the ski resort on all days of the week

8. Do you think you would increase your skiing frequency during the midweek period (Monday through Thursday) if the ONE-DAY ski pass price on those days was cheaper than for the weekend?
   - ☐ Yes
   - ☐ No

9. If you answered yes to the previous question, would the increased skiing frequency during the midweek period lead to reduced skiing frequency in the weekend?
   - ☐ Yes
   - ☐ No

10. Given the weather scenarios below, and that you are uncertain about going to the ski resort because of the weather, how much discount would be enough for you to still want to visit the ski resort?

Different scenarios		Percentage discount on ONE-DAY ski pass				
		0%	10%	30%	50%	70%
A	Very cold temperature: Below −15 °C	☐	☐	☐	☐	☐
B	A blizzard (a strong wind and heavy snow)	☐	☐	☐	☐	☐
C	A very strong wind (> 12 m/s)	☐	☐	☐	☐	☐
D	Rainfall	☐	☐	☐	☐	☐
E	Less than 50% of slopes are open	☐	☐	☐	☐	☐
F	50% to 75% of slopes are open	☐	☐	☐	☐	☐

11. Today the price of a ONE-DAY ski pass in [resort name] is NOK 405. In the following, we ask you to evaluate how you would use [resort name] ski resort for various weekdays if the price of a ONE-DAY ski pass were different than today.

Compared with today´s price, how many **EXTRA** days would you ski in [resort name] during a typical winter season, if the price of a ONE-DAY ski pass were as given in the table? Please complete all boxes, and write 0 if no change.		
Price	Midweek (Monday – Thursday) Total EXTRA days during season!	Friday – Sunday Total EXTRA days during season!
10% Discount		
30% Discount		
50% Discount		

Compared with today´s price, how many **FEWER** days would you ski in [resort name] during a typical winter season, if the price of a ONE-DAY ski pass were as given in the table? Please complete all boxes, and write 0 if no change.		
Price	Midweek (Monday – Thursday) Total FEWER days during season!	Friday – Sunday Total FEWER days during season!
10% Higher		
30% Higher		
50% Higher		

BACKGROUND

12. What is your current occupation?
    - ☐ Working full time
    - ☐ Working part time
    - ☐ Unemployed
    - ☐ Student
    - ☐ Other: _____

13. Family status?
    - ☐ Single
    - ☐ Single with children
    - ☐ Couple
    - ☐ Couple with children
    - ☐ Other: _____

14. If you are living in Norway, what is the approximate distance from your home to [resort name] Ski Resort?
    _____ km

15. What is your household's approximate NET income?
    - ☐ Below NOK 100 000
    - ☐ NOK 100 000 – NOK 300 000
    - ☐ NOK 300 001 – NOK 600 000
    - ☐ NOK 600 001 – NOK 900 000
    - ☐ NOK 900 001 – NOK 1 200 000
    - ☐ More than NOK 1 200 000
    - ☐ Prefer not to answer

16. How interested are you in skiing in general? *Please evaluate on a scale from 1 to 7, where 1 = not interested at all, and 7 = very interested.*

    1   2   3   4   5   6   7

THANK YOU!

Innovative pricing approaches in the alpine skiing industry

The tourism industry is one of the fastest growing business sectors in the world. Over recent years, mountain tourism has become a more and more important part of this growth. This PhD thesis focuses on the alpine skiing industry, which is one of the categories of mountain sport tourism with the strongest financial influence in the mountain regions. Alpine skiing is an extremely competitive industry that has experienced stagnation trend in recent years. Therefore, it is important to examine factors that may have positive effects on the performance of ski resorts.

Innovation is fundamental in order to realize the potential of the alpine skiing sector and to ensure sustainable business growth. For many ski resorts, innovation is a necessary condition for survival in a fiercely competitive environment. In other words, the competitiveness of ski resorts depends on their ability to innovate.

In general, the demand for alpine skiing exhibits strong variation. Hence, during periods with low demand, there is unused capacity. This thesis argues that one way to exploit unused capacity in the low-demand periods is to use innovative pricing strategies. Specifically, the findings of the appended research articles suggest that ski resorts can increase profitability and deal with fluctuations in demand by implementing the following pricing approaches: (1) variable pricing based on seasonality and (2) a dynamic pricing approach based on different weather scenarios.

In addition, this thesis provides empirical evidence on the price–quality relationship at ski resorts and discusses practical implications for ski resorts' managers. Possible directions for future research on innovative pricing approaches in the alpine skiing industry are also included for interested readers.

Iveta Malasevska was born in 1982 in Latvia.

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