Business, Management and Economics Research
ISSN(e): 2412-1770, ISSN(p): 2413-855X
Vol. 3, No. 10, pp: 185-187, 2017
URL: http://arpgweb.com/?ic=journal&journal=8&info=aims

Probabilistic Selling Strategy with Customer Return Policy

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Abstract: Probabilistic selling is a marketing strategy that multi-item vendors provide to consumers, presenting discounted options through acceptance of uncertain risks with random selections from sets of multiple distinct items. However, past studies of this strategy assume a no return policy since returned items shift part of the mentioned uncertain risk to the retailer. Because returns are a common business practice and an important coordination tool in supply chains, this research identifies the impacts of a return policy on the efficacy of probabilistic selling models.

Keywords: Probabilistic selling; Customer return policy; Marketing strategy.

1. Introduction

Electronic commerce (E-Commerce) provides the probabilistic selling model with the market conditions. With this probabilistic selling model, vendors can apply the price-discrimination strategy and take advantage of the consumer uncertainty to achieve market segmentation, profit increase and yield adjustment. Recently, the probabilistic selling strategy has attracted many vendors and has been applied quite successfully. One notable example, Priceline, offers hotel rooms to consumers and permits price selection based on visit duration, destination and approximate quality ratings for lodging. However, disclosure of detailed information is withheld until full payment is received and customer return (CR) is not allowed for these deals. Since then, many Internet retailers refine probabilistic selling models to sell their merchandise. For example, Swimoutlet, BustedTees and Bulsoso employ this model to sell their clothes on the Internet. Kayak and Jetblue offer secret carriers. GetaRoom, LateRooms, Wotif、Hotel Direct, Quickbooks and Booklt provide premium services with minimal cost. On the other hand, much research in this market domain is highly focused on this new business model. Additional perspectives from service providers, brokers and consumers (Chernev, 2003; Fay, 2004; Fay and Xie, 2008; Fay, 2008; Fay and Xie, 2010; Hann and Terwiesch, 2003; Spann and Tellis, 2006) yield insightful analyses on this new business model.

Despite all these favors from the academic and business communities, the policy of no returns is the assumption as well as implementation for both the academic and business, but this may affect consumers' willingness to buy products or services, thus decreasing vendors' profits. In fact, the CR policy enables consumers to easily purchase desired products and services, but retailers must pay for the cost at the risk of producing low quality product, or they must take the responsibility for any low quality products or services.

In the past, little research was conducted on the probabilistic selling model for CR. However, the CR model permits consumers to buy products or services without worry over quality defects. On the other hand, it is also the responsibility for the vendors to guarantee the quality of their products or services with satisfied requirements. In this study, the impact of the CR policy on the probabilistic selling strategy is discussed. Our results show that if vendors do not set the cost of restocking differentially, the consumers' willingness to buy the probabilistic selling products remains unaffected. In other words, the lower the consumers' unsatisfactory cost, the higher the restocking fee, thus yielding a higher benefit for vendors.

The latter sections detail a theoretical model (section II) and describe what situation vendors would gain benefits from employing CR service for consumers (section III). Section IV discusses conclusions and future study.

2. Theoretical Model

2.1. Study Scopes and Assumptions

(1) Market:

In this study, the marketing strategy for a single vendor is considered. If the Hotelling model (Matsumura and Matsushima, 2009; Xu *et al.*, 2016) is employed, products are discriminated based on the preferences of customers. Any consumers liking or disliking the products are on both sides of an assumed

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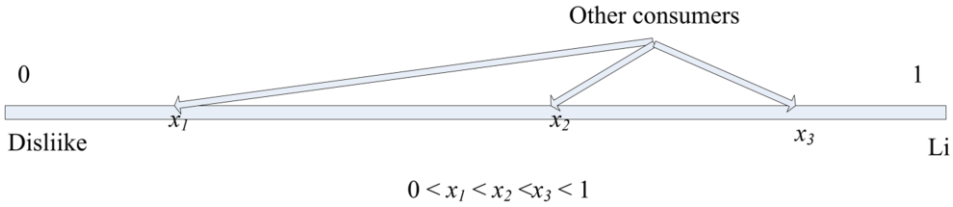
preference line located at 1 and 0 coordinates respectively; the preference of other consumers are distributed evenly over the line between the two points. The consumers' preference line is illustrated in Figure 1.

Figure-1. Consumers' preference Hotelling line.



(2) Vendors Behaviors:

This article assumes that the manufacturer produces two products *j*, *j=1,2* with the same properties and the two products are sold in the market with the form of component product. Furthermore, our article also assumes that their yields could meet the market demands. Let the probability of probabilistic selling component product 1 be ω and the unit production costs for the two component products be the same i.e. $c_1 = c_2 = c$ in this study where c_1, c_2 and c denote the unit production costs of component product 1, component product 2 and the two component products, respectively. To improve the service quality toward the customers, the vendors would like to provide the CR service. However, if the consumers want to return the product *k*, *k=j,p*, they must pay for the restocking fee *fk* as well as return all the other products in this order to the vendor. With the condition of not providing the CR service for the consumers, the retailer sets the prices of component products and probabilistic selling products to be p_{cj}^{nr} and p_p^{nr}, respectively. Once they decide to provide the CR service, the prices and probabilities of these two products are set to p_{cj}^{or} and p_p^{or}, respectively. The key point is that once CR is provided, the risk to buy unsatisfactory products or services mainly shifts back to the vendors and it clearly offsets the effect of taking advantage of consumers' uncertainty to buy probabilistically selling products or services. This is an important issue considering vendors could gain maximum profits by providing CR service for consumers.

(3) Consumer Behaviors:

As stated before and Figure 1, the preferences of consumers are distributed evenly over the Hotelling line and assume that customer *i* located at x_i on the line and the value of the product *j* is estimated to be v_{ij} by consumer *i*, where the value gap with that of the ideal product is assumed to be *t* in unit production cost, *0<t<1*. As a result, the estimated value evaluated by consumer *i* toward the product *j* can be given by

$$\begin{cases} v_{i1} = 1 - tx_i \\ v_{i2} = 1 - t(1 - x_i) \end{cases} \quad \text{where } x_i \sim U(0,1]$$

The value for the consumer could also be estimated by $\omega v_{i1} + (1-\omega)v_{i2}$.

2.2. Model

If we assume θ_k denotes the probability of product *k* to be returned by consumers, $x_{min}^{nr}(x_{max}^{nr})$ and $x_{min}^{or}(x_{max}^{or})$ denote the minimum (maximum) of the consumers' willingness to buy product 1 and 2 when the CR service is provided and not provided, respectively. Moreover, $D_k^{nr}(P_{cj}^{nr}, P_p^{nr}, \omega)$ and $D_k^{or}(P_{cj}^{or}, P_p^{or}, \omega)$ denote the market demands with the return and non-return services provided, respectively. Hence, the profit of the retailer can be given by

$$\begin{cases} \textit{Not allowing customer return} \\ \pi^{nr} = \sum_{j=1}^{2}(P_{cj}^{nr} - c)D_{cj}^{nr} + (P_p^{nr} - c)D_p^{nr} \\ \textit{Allowing customer return} \\ \pi^{or} = \sum_{j=1}^{2}\left[(f_{cj} - c)\theta_{cj} + (P_{cj}^{or} - c)(1 - \theta_{cj})\right]D_{cj}^{or} \\ \quad + \left[(f_p - c)\theta_p + (P_p^{or} - c)(1 - \theta_p)\right]D_p^{or} \end{cases} \tag{1}$$

3. The Optimal Strategy

When we consider the scenario of not providing CR service with the fixed x_{min}^{nr} and x_{max}^{nr} condition, the optimal product price and market demand could be obtained by means of the consumers' surplus equation. Therefore, the maximal profit for the vendor could also be given by (Fay and Xie, 2008)

$$\pi^{nr} = 1 - c - \frac{t(5\omega - 1)}{8\omega} \tag{2}$$

If the vendor provides the CR service and the restocking fee of the two products are the same, i.e. $f_1 = f_2 = f$,, the retailer could set the product price again so that the maximal consumers' surplus could be achieved with the given x_{min}^{or} and x_{max}^{or} conditions. By the first order derivatives, the following equations can be inferred.

$$p_{c1}^{or} = (1 - \omega)t(1 - 2x_{min}^{or}) + p_p^{or} \tag{3}$$

$$p_{c2}^{or} = 1 - t(1 - x_{max}^{or}) \tag{4}$$

$$p_p^{or} = 1 - \omega t x_{max}^{or} - (1 - \omega)t(1 - x_{max}^{or}) \tag{5}$$

By means of the maximizing (1), the following formulas could be obtained.

$x_{min}^{or^*} = 1/4$ (6)

$x_{max}^{or^*} = (1+\omega)/4\omega$ (7)

$\pi^{or^*} = 1 - c - \theta(1-f) + \frac{1}{8\omega}(1-\theta)t(1-\omega)$ (8)

Above all and comparing (2) and (8), the following Lemmas and Theorem can be concluded.

Lemma 1: With the symmetrical consumers' preferences, it cannot prove that it is useful for the consumers to raise their willingness to buy probabilistic selling products when the CR service is provided with the condition that all component products are with the same restocking fee.

Lemma 2 : If $> 1 - \frac{t}{8\omega}(5\omega - 1)$,, it is helpful for the marketing of the probabilistic selling products when the CR service is provided.

Theorem: If consumers are not sensitive to the quality and the preference among all products or services differs with minor, it encourages the vendors to provide CR service for their customers and vice versa.

Proof: By using above Lemma1 and 2, we arrive at the main results.

4. Conclusion and Future Works

The probabilistic selling theory is a marketing model of selling products by means of introducing a type of buyer uncertainty. Recent theories have verified its effect, and it has been adopted by businesses as a tool for price-discrimination and competitiveness, proving effective in many practical applications. Since risk will transfer back from consumers to vendors, vendors are reluctant to provide CR service. In past research, there are few materials discussing this issue. Conflict arises over whether retail profits will be affected by decreased consumer purchase due to lack of CR service.

The scenario retailers achieve maximum profit with provided CR service is discussed. Our results indicate that if cost for products and services is the same, and vendors do not set the differential restocking fee for those products or services with the same nature, consumers' willingness to buy products will not increase even with CR service. Furthermore, the restocking fee $f = 1 - \frac{t}{8\omega}(5\omega - 1)$ determines the threshold for retailers' profits. Only by setting the restock fee higher than this threshold will the retailers be willing to provide the CR service. Regarding consumers' preferences, the lower the cost for consumers' dissatisfaction to the quality of the products or services, the more likely vendors provide CR service for their customers.

In summary, our research assumption is confined to the scope of simple and practical applications. Dramatic market changes in the recent years present additional issues for discussion such as preference distributions of common consumers', asymmetrical consumers and cost structure for various products when the obstacle of CR is considered. In addition, the effect of group buying is an ideal topic for further study.

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