A two-period pricing model for perishable items

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Abstract: This paper presents a two-period pricing model for perishable items via an advance selling strategy deployed within electronic businesses. This model is proposed by classifying consumers based on their shopping habits: strategic consumers and conventional consumers. The model was developed both with and without a consumer order cancellation variable. Numerical computation and sensitivity analysis were conducted to test and justify the theoretical model. The results demonstrate that the ratio of potential consumers in an advance selling period to that in regular selling period is the main factor affecting pricing decisions. Consumers’ perception of price fairness and order cancellation have effect on sellers’ total revenue. The best revenue and price is obtained by adjusting the length of the advance selling period.

Keywords: revenue maximisation; pricing model; perishable items; advance selling strategy; electronic commerce.

1 Introduction

Vegetables, fruits, milk, and flowers are typical perishable items that easily deteriorate over time. Clothes, electronic products, and information may not physically deteriorate quickly, but the value of these products often decays quickly. Due to the rapid development of technological innovation, many durable products have a much shorter life-time cycle (for example, home appliances). All these products belong to the broader category of perishable items. Weatherford and Bodily (1992) defined perishable items as those products with a short selling period and low salvage because of their inherent characteristics. They deteriorate and decay quickly and easily. The limited shelf life of perishable items suggests retailers sell them as soon as possible, since their availability and salability are both inherently limited. With the development of logistics and e-commerce, however, management of perishable items has improved significantly.

Advance selling is one such technique that has emerged from improved sales management. Advance selling is a strategy for selling a product or service before they are ready for sale. It has been widely used for air tickets and in the real estate industry. Before new products come to the market, advance selling is an effective way for sellers to determine market demand. It is also an effective way of marketing and advertising. From the feedback of advance selling, manufacturers can predict the prospects of a new product.
and adjust operation plans for production and purchase. Advance selling can be regarded as a form of demand accumulation that reduces the uncertainty of demand. Advance selling offers incentives to consumers as well, allowing them to purchase a product at a lower price, or to receive the product before the general public. More and more people are willing to buy the products they desire through advance selling arrangements. In e-commerce environments, it is easy and convenient for a consumer to place or cancel an order. Information between sellers and buyers is much more transparent and symmetrical. When people buy things over the internet, it is convenient for them to compare prices among different channels and sellers. When considering whether to buy something in advance selling scenario, consumers anticipate future prices and make informed decisions.

The key question is how to make a price decision for perishable products within an advance selling strategy, including the best price for each sales stage. Answering this question will help vendors increase revenue and also promote the application of an advance selling strategy. In this paper, the authors developed a two-stage pricing model of perishable items with the strategy of advance selling. In this model, the authors considered scenarios in which orders were and were not cancelled.

The article is organised as follows: first, literature on the pricing of perishable items and advance selling strategies are reviewed. After defining salient terms, the equations of a basic two-stage pricing model are developed in a general form. Numerical experiments are conducted in the software MATLAB to test the effectiveness of the model. The authors then discuss the result with sensitivity analysis. The model that includes order cancellation is put forward to better model real sales contexts, and the solution of the model is given by an example. Finally, a summary and discussion of potential future work is provided.

2 Review of previous work

For determining the price of perishable items, existing research focused primarily on dynamic pricing models (Chatwin, 2000; Chew et al., 2014; Wang et al., 2015; Abad, 2001). That is to determine different prices for perishable items according to various factors of different selling periods, for example, market demand, competition, sales volume, etc. The prices can differ on the basis of time or region. Time different price refers to selling the product at different prices as time passes. For example, electronic products are usually sold at a higher price when it first comes into the market, and the price goes down quickly after a certain period of time. While the price of air ticket has an opposite trend, the earlier you book, the cheaper the price is. Regional different price means having different prices in different sales regions. For example, the selling prices of iPhone vary in mainland China, Hong Kong, the USA and other regions.

In contrast to these cost-based approaches, Abad (2001) established an optimal price and optimal volume model from a revenue perspective. He also studied the optimisation problem of price changes with different decisions. Since then, related efforts studied this problem extended to consider the farther factors of production, service level, the cost of lost sales, product assortment, etc., which made the model more realistic (Cinzia, 2016; Önal et al., 2016). Pasternack (2008) studied the pricing and recovery policy of
perishables with a fully consideration of the nature of perishable items. Wang (2014) studied the dynamic pricing models of both perishable manufacturing products and perishable service under e-business environment.

Traditional research on advance selling has mainly focused on real estate and airline ticket sales. With the development of electronic commerce and technology, it has been applied to many other categories, especially products whose value decrease quickly over time. Literatures mainly addressed to study the attitude of consumer acceptance and scope of application of this sales mode. Wu (2011) studied the network advance selling network based on consumer behaviour. He analysed how an advance selling strategy affected consumers in their purchase decision-making. Literature (Wang, 2013; Li et al., 2016) applied advance selling in new products sales and presented a dynamic pricing model under the background of strategic consumer presence and competition. Yu et al. (2017) studied seller’s optimal price decision for new products considering valuation bias and strategic consumer reactions, where the sales cycle is divided into advance selling and subsequent spot period.

Pricing for perishables has been studied by many scholars and a relatively mature theory has developed. The pricing model has become more and more realistic, with consideration of constraints including risk, rational expectations, social welfare and so on. Although advance selling has been existed for a long time, but its application and research was quite limited. There are little achievements addressing pricing problem of perishables in advance selling strategy. Safari et al. (2015) developed a continuous time optimal control model for identifying pricing strategies for the web service classes based on maximum principle and proposed an algorithm to obtain the optimal pricing policy. From above literature review, we found that it is of great necessity to further carry out our research on pricing of perishable items with the consideration of an advance selling strategy. As the extensive application of advance selling in online market, it is of great importance for both theoretical and practical values. In this paper, we develop a pricing model for perishable items considering two sales stages, namely advance selling and regular selling period. In this research, we studied the problems with two situations-with and without consumer’s order cancellation taken into consideration.

3 Model description and assumptions

In an advance selling strategy, the sales cycle can be generally divided into two periods: advance selling period and regular selling period. To achieve a maximum profit, it is necessary to decide the price of each sales period for a seller. In the context of e-business, consumers can be categorised into two main groups by their shopping habits and behaviours: strategic consumers and conventional consumers. Strategic consumers are the ones who pay attention to the advance selling of commodity. They are usually well-informed and tend to compare the price in an advance selling period with the regular sale period. If they are satisfied with the price in an advance selling period, they will make a purchase in that period; if not, they tend to wait till regular selling period. On the contrast, conventional consumers only purchase in the regular selling period. Strategic consumers are sensitive to the difference of prices in an advance selling period and a regular selling period, which means the price variance affects their purchasing decision.
The demand function in this model is linear, and depends on price. We assume that demand is a linear function of price. Demand function for an advance selling period and regular selling are expressed respectively in the following equations.

\[ D_1(p) = a_1 - b_1 p_1 \]  
\[ D_2(p) = a_2 - b_2 p_2 - s(p_2 - p_1) \]

- \( a_1 \) presents the number of potential consumers in the advance selling period, which is predicted by previous data or fixed to a seller’s quota.
- \( b_1 \) represents the sensitivity coefficient of price in an advance selling period.
- \( p_1 \) is the price in an advance selling period.
- \( a_2 \) represents the number of potential consumers in a regular selling period.
- \( b_2 \) represents the sensitivity coefficient of price in a regular selling period.
- \( p_2 \) is the price in a regular selling period.
- \( s \) represents the level of sensitivity to price of strategy consumers, which is so-called sensitivity coefficient of price variance.

In an advance selling period, consumers cannot accurately perceive the value of products by themselves, so they may make the buying decision in regular selling period. Hence, consumer demand is more sensitive to the price in that period. Moreover, due to the characteristics of perishable items, it increases the demand sensitivity to price. We assume the price sensitivity coefficient follows the rule \( b_2 > b_1 \). Because the effect of price on demand is greater than the effect on price variance, this can be described as the inequation \( 0 < s < b_1 < b_2 \). We define as the cost of product per unit and assume it as fixed.

### 4 Model without order cancellation

#### 4.1 Model building

Based on the demand and prices, the profit function of an advance selling phase could be expressed as the following equation.

\[ R_1(P) = (a_1 - b_1 p_1)(p_1 - c) \]  (4.1)

Similarly, the profit function of a regular selling period can be obtained from the demand and prices of this period.

\[ R_2(P_1, P_2) = [a_2 - b_2 p_2 - s(p_2 - p_1)](p_2 - c) \]  (4.2)

So the total profit function is

\[ R(P_1, P_2) = R_1 + R_2 = (a_1 - b_1 p_1)(p_1 - c) + [a_2 - b_2 p_2 - s(p_2 - p_1)](p_2 - c) \] (4.3)

Take the derivative of from the total profit function and set it to be zero, then we can easily get the pricing strategy when the profit reaches maximum.
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\[
\frac{\partial R(P_1, P_2)}{\partial P_1} = a_1 - 2b_2 p_1 + p_2 s \tag{4.4}
\]

\[
\frac{\partial R(P_1, P_2)}{\partial P_2} = a_2 - 2b_2 p_2 + s(2p_2 - p_1) \tag{4.5}
\]

4.2 Model solving

Given fixed product costs, company profits will also reach the summit when revenue reaches the maximum. When the revenue reaches the maximum, the optimal prices are as follows:

\[
P_1^* = \frac{2a_1 b_2 + 2a_2 s + a_2 s}{4b_1 b_2 + 4b_2 s - s^2} \tag{4.6}
\]

\[
P_2^* = \frac{2a_2 b_1 + a_s}{4b_1 b_2 + 4b_2 s - s^2} \tag{4.7}
\]

We define variable \( k \) as the coefficient of comparisons for potential maximum demand, which reflects the ratio of potential largest demand between an advance selling period and an regular selling period \( k = \frac{a_1}{a_2} \ (k > 0) \). The prices \( P_1, P_2 \) vary with this variable \( k \).

There is no absolute limit for the size of \( P_1, P_2 \) in the advance selling model, even under certain circumstances that the price in an advance selling is higher than that in regular selling. Putting the best prices \( P_1, P_2 \) into the demand function, the demand in each stage are formulated as follow:

\[
D_1 = \frac{a_1 (2b_1 b_2 + 2b_2 s - s^2) - a_2 b_2 s}{4b_1 b_2 + 4b_2 s - s^2} \tag{4.8}
\]

\[
D_2 = \frac{(a_s + 2a_2 b_1)(b_2 + s) - a_2 b_2 s}{4b_1 b_2 + 4b_2 s - s^2} \tag{4.9}
\]

\[
D = \frac{2a_1 b_1 b_2 + 2a_2 b_2 + (2a_1 b_2 + a_1 b_2 + a_2 b_2) s}{4b_1 b_2 + 4b_2 s - s^2} \tag{4.10}
\]

The profit function is

\[
R_1(P) = \frac{a_1 (2b_1 b_2 + 2b_2 s - s^2) - a_2 b_2 s}{(4b_1 b_2 + 4b_2 s - s^2)^2} \tag{4.11}
\]

\[
R_2(P, P) = \frac{(b_2 + s)(2a_2 b_1 + a_1 s)}{(4b_1 b_2 + 4b_2 s - s^2)^2} \tag{4.12}
\]
4.3 Numerical simulation and sensitivity analysis

In this part, we use MATLAB to process numerical simulation and sensitivity analysis of the model. Assume that \(a_1 = 300, a_2 = 300, b_1 = 2, b_2 = 3, s = 1\), and then substitute these parameters into equations (4.6) and (4.7). We get the results including \(P_1, P_2, D_1, D_2, D, R_1, R_2,\) and \(R\) as follow. All the results are restricted to two decimals.

\[
R_2 (P_1, P_2) = R_1 + R_2 = \frac{-s(a_1 a_2 - a_1 b c - a_2 b c)}{4 b_2 + 4 b s - s^2}
\]  

\[ (4.13) \]

In order to verify the validity of the model, we conducted sensitivity analysis of \(k\) values. \(K\) represents the ratio of potential maximum demand of an advance selling period to a regular selling period, expressed as: \(k = \frac{a_1}{a_2} (k > 0)\). Sensitivity analysis means only by changing the value of \(k\), we can observe the changes of prices, demand and revenue of the two periods. Assume that \(a_1 + a_2 = 600, b_1 = 2, b_2 = 3, s = 1\). Giving different values to the parameter \(k\) and calculated the values of prices, demand, and profit. When \(k\) valued 1/5, 1/2, 1, 2, and 5, the results are demonstrated respectively in Tables 1, 2 and 3.

<table>
<thead>
<tr>
<th>(k)</th>
<th>1/5</th>
<th>1/2</th>
<th>1</th>
<th>2</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(P_1)</td>
<td>41.94</td>
<td>51.62</td>
<td>87.10</td>
<td>109.67</td>
<td>132.26</td>
</tr>
<tr>
<td>(P_2)</td>
<td>67.74</td>
<td>58.06</td>
<td>48.39</td>
<td>38.71</td>
<td>29.03</td>
</tr>
</tbody>
</table>
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Table 2  Demand change with parameter $K$

<table>
<thead>
<tr>
<th>$k$</th>
<th>1/5</th>
<th>1/2</th>
<th>1</th>
<th>2</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$D_1$</td>
<td>16.13</td>
<td>70.97</td>
<td>125.81</td>
<td>180.65</td>
<td>235.48</td>
</tr>
<tr>
<td>$D_2$</td>
<td>270.97</td>
<td>232.26</td>
<td>193.55</td>
<td>154.84</td>
<td>116.13</td>
</tr>
<tr>
<td>$D$</td>
<td>287.10</td>
<td>303.23</td>
<td>319.35</td>
<td>335.48</td>
<td>351.61</td>
</tr>
</tbody>
</table>

Table 3  Profit change with parameter $K$

<table>
<thead>
<tr>
<th>$k$</th>
<th>1/5</th>
<th>1/2</th>
<th>1</th>
<th>2</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_1$</td>
<td>434.44</td>
<td>3,514.05</td>
<td>9,070.24</td>
<td>17,103.02</td>
<td>27,612.38</td>
</tr>
<tr>
<td>$R_2$</td>
<td>14,291.36</td>
<td>10,002.08</td>
<td>6,462.02</td>
<td>3,671.18</td>
<td>1,629.55</td>
</tr>
<tr>
<td>$R$</td>
<td>14,725.81</td>
<td>13,516.13</td>
<td>15,532.26</td>
<td>20,774.19</td>
<td>29,241.94</td>
</tr>
</tbody>
</table>

Tables 1, 2 and 3 illustrate how the prices, demand, and revenue vary with the parameter in two periods. It is obviously to observe that the prices rise as demand grows in both of the two periods. Prices, demand and revenue follow the same trend with the variance of $k$. When $k < 1$, which means the demand of advance selling is lower than in a regular selling period, the best prices for the two periods display the same trend. While $k > 1$ means that the potential demand of an advance selling period is larger than in the regular selling period. In this situation, the price in an advance selling period is higher than that in regular selling period. The best prices of the two selling periods can be obtained when the market reaches equilibrium. A seller can adjust the parameter by setting a limited advance selling quota or a certain period of pre-sale time. Potential demand determines the upper limit of the demand, which influences the demand of this stage to a great extent. From the data in the table, we can see the higher the potential demand is, the greater the actual demand is. Prices rise as demand rises, so as to the revenue.

5  Model with order cancellation

In the previous discussion, we studied the situation without considering order cancellation. However, it is quite common that consumers may cancel their orders after make a purchase decision. This happens in both an advance selling period and a regular selling period. To deal with this situation, we will revise our model with the consideration of order cancellation. With the demand and consumer assumption hold, we define $I_1(t)$ as the purchase quantity in advance selling and $I_2(t)$ as the purchase level in regular selling. Usually, there is a deposit in an advance selling period and consumer will lose the deposit if they cancel their orders after made a purchase. Seller will get the money as a compensation. We use $m_1$ and $m_2$ to represent the deposit of each period.

We define $\frac{n}{t}$ as order cancellation rate in an advance selling period, and it is a decreasing function of time $t$, where $n \in (0, 1)$ Order cancellation rate decrease with the time passes because the earlier consumer ordered, the greater possibility they would cancel their order. In a regular selling period, order cancellation rate means the return rate of goods and is expressed as $\lambda$. 
5.1 Model building

The purchasing level within a given period represents the demand of consumer need. Demand in both selling periods can be illustrated as the following functions.

\[
\frac{dI_1(t)}{dt} = a_1 - b_1 p_1 - \frac{n}{T} I_1(t), \quad 0 \leq t \leq T
\]

\[
\frac{dI_2(t)}{dt} = a_2 - b_2 p_2 - s(p_2 - p_1) - \lambda I_1(t), \quad T \leq t \leq T
\]

We assume that market demand increase from zero to \(N\) in a sales cycle. By using this boundary condition, the following solutions are obtained.

\[
I_1(t) = \frac{a_1 t - b_1 p_1 t}{n+1}
\]

\[
I_2(t) = \frac{a_2 - b_2 p_2 - s(p_2 - p_1) + e^{\lambda(T-t)}}{\lambda} \left[ N - \frac{a_2 - b_2 p_2 - s(p_2 - p_1)}{\lambda} \right]
\]

To calculate sales revenue, we define \(n^a\) and \(n^r\) as demand in an advance selling period and a regular selling period. It is obvious to know \(n^a + n^r = N\), where

\[
n^a = \int_0^{\frac{T_1}{n}} D_t \left( R_t \right) \frac{\lambda}{T} I_1(t) dt = \frac{a_1 T_1 - b_1 p_1 T_1}{n+1}
\]

\[
n^r = N - n^a = N - \frac{a_1 T_1 - b_1 p_1 T_1}{n+1}
\]

Define \(n^b\) as the number of order that consumer cancelled in an advance selling period and it can be formulated as follow.

\[
n^b = \int_0^{\frac{T_1}{n}} I_1(t) dt = \frac{n a_1 T_1 - n b_1 p_1 T_1}{n+1}
\]

Based on previous equations, we can calculate the sales revenue by the following formula.

\[
R_v = n^a \left( p_1 - c \right) + n^r \left( p_2 - c \right) + \frac{a_1 T_1 - b_1 p_1 T_1}{n+1} + \left( N + \frac{a_1 T_1 - b_1 p_1 T_1}{n+1} \right)(p_2 - c)
\]

Define as the number of order that consumer cancelled in regular selling period and it can be formulated as follow.

\[
n^b = \int_0^{T} \lambda I_2(t) dt = N \left( e^{\lambda(T-n)} - 1 \right) + \left( T - T_1 + \frac{1 - e^{\lambda(T-n)}}{\lambda} \right) \left[ a_2 - b_2 p_2 - s(p_2 - p_1) \right]
\]
We use $R_b$ to present the deposit that consumers pay to seller because of order cancellation. According to our hypothesis, only when consumers cancel their order in an advance selling period, they need to pay the deposit to seller. So we get by the following formula.

$$R_b = n_b^1m_1 + n_b^2m_2 = \frac{na_1T_1 - nb_1p_1T_1}{n+1}m + \left\{N\left(e^{\lambda(T-T_1)} - 1\right) + \left(T - T_1 + \frac{1 - e^{\lambda(T-T_1)}}{\lambda}\right)[a_2 - b_2p_2 - s(p_2 - p_1)]\right\}m_2$$

(5.10)

The whole sales period is a continuous process, so the sales quantity at the end of an advance selling period is the sales quantity at the beginning of a regular selling period. Define the time demarcation point as $T_1$ and there is the equation $I_1(T_1) = I_2(T_1)$. The relationship between $T_1$ and $T$ can be expressed as the equation: $T_1 = kT$ ($0 < k < 1$). So the total sale quantity $N$ can be expressed as:

$$N = n_1^1 + n_1^2 = \frac{kT e^{\lambda(T-k-1)} - (a_1 - b_1 p_1)}{n+1}$$

$$+ \left[1 - e^{\lambda(T-k-1)}\right]\left[a_2 - b_2p_2 - s(p_2 - p_1)\right]$$

(5.11)

To make the best decision for a seller means determine the optimal prices $p_1$ and $p_2$ when the total revenue reaches the maximum.

In a regular selling period, we can calculate the revenue by the following formula:

$$R_2 = n_2^1p_2 + n_2^2m_2 = \left\{N = \frac{a_1T_1 - b_1 p_1 T_1}{n+1}\right\}(p_2 - c)$$

$$+ \left\{N\left(e^{\lambda(T-T_1)} - 1\right) + \left(T - T_1 + \frac{1 - e^{\lambda(T-T_1)}}{\lambda}\right)[a_2 - b_2p_2 - s(p_2 - p_1)]\right\}m_2$$

(5.12)

We use $kT$ to represent $T_1$ and $S$ to represent $e^{\lambda(T-T_1)} - 1$, and then the above formula can be transformed to:

$$R_2 = \frac{SkT(a_1 - b_1 p_1)(p_2 - c)}{n+1} - \left[\frac{S[a_2 - b_2p_2 - s(p_2 - p_1)](p_2 - c)}{n+1}\right]$$

$$+ \left[\frac{S[a_2 - b_2p_2 - s(p_2 - p_1)]}{\lambda}\right]\left[\frac{SkT(a_1 - b_1 p_1)}{n+1}\right]m_2$$

(5.13)

Differentiate $R_2$ on $p_2$, and let $R_2$ to be zero we get the best price $p_2^*$ for regular selling period.
For an advance selling period, the seller should make a decision of optimal price to reach the maximum total revenue. The total revenue is the sum of both sales periods, including sales and deposit. 

Namely,

\[
R_1 = n_1^2 (p_1 - c) + n_1^2 m_1
\]

\[
R_2 = \frac{a_k T - b_1 pk T}{n + 1} \left( p_1 - c \right) + \frac{na_k T - nb_1 pk T}{n + 1} m_1
\]

So we get the formula of the total revenue as follow:

\[
R = \frac{a_k T - b_1 pk T}{n + 1} \left( p_1 - c \right) + \frac{na_k T - nb_1 pk T}{n + 1} m_1
\]

\[
+ \frac{Sk T (a_1 - b_1 p_1) (p_2 - c)}{n + 1} \left[ a_2 - b_2 p_2 - s (p_2 - p_1) \right] (p_2 - c)
\]

\[
+ \frac{Sk T (a_1 - b_1 p_1)}{n + 1} \left[ a_2 - b_2 p_2 - s (p_2 - p_1) \right] m_2
\]

According to previous analysis, we know that when \( R_1 \) reaches maximum, \( p_2 \) can be expressed with \( p_1 \), and then we can get the best price of an advance selling period \( p_1^* \) as follow:

\[
p_1^* = \frac{x_1 S + x_2}{x_0}
\]

where

\[
x_0 = \left[ \lambda^2 k^2 T^2 b_2 b_2 + 2s \lambda k T b_1 (n + 1) + (n + 1) s^2 \right] S + 4 \lambda k T b_1 (n + 1) (b_2 + s)
\]

\[
x_1 = \left[ s(n + 1) + \lambda k T b_1 \right] \left[ (n + 1) (b_2 + s) m_2 + (n + 1) a_1 + \lambda k T a_1 \right]
\]

\[
x_2 = T \lambda (n + 1) (b_2 + s) \left[ 2k (a_1 - nb_1 m_1) + (n + 1) (1 - k) s m_2 \right]
\]

Then, we can get \( p_2^* \) by using the expression of \( p_1^* \):

\[
p_2^* = \frac{m_2 + (x_1 S + x_2 S + x_3)}{x_0 S}
\]
Where

\[ x_3 = T\lambda \left[ s(n+1) + \lambda kTb \right] \left[ k (a_1 - nb_1 m_1) + (n+1)(1-k)sm_2 \right] \]
\[ x_4 = (n+1) \left[ 2a_2 + (b_2 + s)(2m_2 - 4) m_2 \right] \lambda kTb \]
\[ x_5 = 2k(1-k)T^2 \lambda \left[ (n+1)(b_2 + s) bm_2 \right] \]

5.2 Numerical simulation

Assume that the total selling period \( T \) for a certain perishable product is forty days, and an advance selling period time accounts for 40%. This indicates \( k = 0.4 \). The order cancelling rate \( n = 0.12 \) and cancellation deposit \( m_1 = 4 \). Return rate \( \lambda = 0.1 \) and return cost \( m_2 = 10 \). Potential consumer for an advance selling period \( a_1 = 150 \) and consumer for a regular selling period \( a_2 = 350 \). Price sensitivity coefficient \( b_1 = b_2 = 3 \). The price sensitivity degree of strategic consumer \( s = 1.5 \).

Use the above data in previous model, we can obtain the best solution as follow:

\( p_1^* = 24.669 \), \( p_2^* = 36.542 \), \( N^* = 2,674 \), \( R^* = 63,882 \).

6 Conclusions

This article developed a pricing model for perishable items with an advance selling mechanism in e-business environments. A two-period pricing model of perishable items is developed in an advance selling strategy, considering scenarios both with and without order cancellation. This model managed to give the best prices for both advance selling periods and regular selling periods.

This study on pricing of perishable items under an advance selling strategy is a quite new point of view in academic research. Especially when advance selling is adopted more widely with the fast development of e-commerce. The pricing decision in advanced selling period is more common for internet sellers. The practice of this model helps companies to determine the optimal pricing strategy in order to achieve maximum revenue.

There are implications from the findings for perishable item sellers, especially when they would like to use an advance selling strategy. The ratio of potential customer in the two selling periods mainly affects seller’s pricing decision and also the total revenue. It is suggested that a seller can make a best decision by adjusting the length of an advance selling period.

In future studies, the game behaviour of consumers and business enterprises can be considered as an extension of this model. Besides, there might be more than two selling periods for perishable items, for example, when it comes to approach the end of a sales cycle, some discount is usually offered to accelerate sales. Thus, a multi-period or dynamic pricing model could be studied for more complex context.
References


