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A Model for Optimal Value of Loyalty Point in Loyalty Rewards Program

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ABSTRACT

Generally, one view held among consumers is that loyalty reward program that offered by the reward server are not significant benefits because most consumers are not able to redeem the reward due to several factors such as inconvenience to redeem reward points in accordance with the terms and conditions imposed, the length of time required to achieve the rewards or maybe the item that they want to redeem is not available. In this paper we develop a model for optimal value in providing the reward points in loyalty reward program so that the reward server and the consumers will get the maximum profitability. Almost 500 catalog items were examined for four loyalty programs spread in this country and we found that point's price is higher than market price which is not good for the viability of loyalty programs. Then we proposed a dynamic to find the optimal point value for a loyalty program. We focused on the pricing policies in cash and points for manager who would maximize expected profits and also considered the effects of important managerial implication.

Keywords: Loyalty program; Reward points; Dynamic programming; Optimization problem.

1. Introduction

Loyalty program are frequently referred to as "point" or "reward" programs. In a typical point based loyalty program (LP), members earn points for their purchases of products or services from an issuing firm and able to redeem accumulated points for awards, such as additional products, services or even cash. LP aim to engage program members by rewarding their repeated purchases of a firm's product through the redemption of loyalty points that members collect on their purchases. Therefore, the benefits of an LP for a member become most salient when redeeming a reward. Nunes and Drèze (2006) and Smith and Sparks (2009). There is growing evidence that consumers are becoming frustrated with the reward they receive for their effort in earning loyalty points as LP points often expire before members have an opportunity to cash in points or they need to buy and accrue more points to redeem an item where the same item can be purchased for a lower price outside of the LP. Previous studies have looked at the design of LPs to examine the fairness of loyalty program (e.g Dorotic et al. (2012),Demoulin and Zidda (2008) and So et al. (2015)).

However that is not purpose of this study. Instead, our main focus is to understand how these point price/valuation decision should be taken optimally. Danaher et al. (2016) had studied the fairness of what a LP member has to spend in terms of loyalty points in order to redeem a LP catalog item. Nasir and Lola (2018) had studied the optimality of profit sharing in loyalty rewards programs. They discussed how to share the profit between labor and customer but they did not study the optimal value in setting the point price. Our objective is to study how loyalty programs perform in terms of fairly rewarding their members by calculating the ringgit value of a loyalty points for four multi-vendor loyalty programs which are Bonus Link, Aeon, Tesco and Mydin to assess the benefit that consumers receive in exchange for earning their loyalty points. From the survey we found that consumers are not fairly rewarded for their points earning. Understanding how these point valuation should be taken optimally is the main focus of this study so that the customer will satisfy with the loyalty program. The success of the loyalty program lies in providing customers with specific rewards. Most businesses as retail business implemented loyalty program to increase their customer's satisfaction.Previous studies have also found that one of the major determinants of customer loyalty is customer satisfaction which is in every business and market, customer need to be satisfied before they can be loyal Wahab et al. (2016)

The structure of this paper is as follows. In Section 2 we evaluate four loyalty programs that have been done in this country which are AEON member, Bonuslink card, Meriah Loyalty program and Tesco clubcard. In Section 3 we

proposed a model for setting the optimal value of loyalty points and for section 4 we have a discussion. Lastly we draw a conclusion in the section 5.

2. Evaluation of Four LPs

Our data come from four large and well known LPs in this country (Malaysia). All of LPs allows consumers to accumulate points for later redemption. We provide details for data collection and how we calculate Ringgit value of a loyalty point for four LPs. Table 1 shows the summary of four loyalty programs in this study which are AEON, Bonus Link, My Din and Tesco.

Table 1: Summary of 4 loyalty programs in Malaysia which are Aeon, BonusLink, Mydin and Tesco

Loyalty program offered	Points	Redemption value	Fee
Aeon Member(AEON)	RM1:1 point	1500points=RM10 voucher	RM12 annually and RM24 for 3yrs
Bonus Link	RM2 :1 point	1000points=RM10 voucher	free for life
Meriah LP (MyDin)	RM1 :1 point	2000points=RM10 voucher	RM12 for 1yr
Tesco clubcard (Tesco)	RM1:1 point	400points=RM2 voucher	RM10.60 for 1yr

From the table 1, as we can see the reward points offered from AEON, Tesco and Mydin, when you spent RM1 you will get 1 reward point. Only for BonusLink they offered RM2 for 1 reward point. But Bonus Link offered you free fee to join their loyalty program. For the points expiry, Bonus Link, Aeon and MyDin have 3 years point expiry while Tesco offered 2 years points expiry, means if you do not collect any point in 2 years you will be remove from the program. For next section we will discuss the determination of monetary value of loyalty point.

2.1 Loyalty point determination

Item in Aeon's catalog can be purchased for a specified number of points. It can be seen that Shimono Handy Vacuum - SVC-1017 can be purchased by 112,830 points. AEON points: RM1 = 1 point. Redemption value estimate: $2000 points = RM5$ voucher, $3000 points = RM8$, $4000 points = RM15$. We solve these equations and obtain:

$2000\ points = RM5, 1point = RM5/2000 = 0.0025$

$3000\ points = RM8, 1points = Rm8/3000 = 0.0026$

$4000\ points = RM15, 1point = RM15/4000 = 0.00375$

That is, in average 1 aeon point is worth RM0.0029. Table 2 shows the average price per point for four LPs. Our data were collected from:

1. AEON website ($https://www.aeoncredit.com.my/rewards$),

2. TESCO website ($http://www.tesco.com.my/clubcard/clubcard.aspx$),

3. Mydin website ($http://www.mydin.com.my/mydin/loyalty-program$)

4. BonusLink website ($https://www.bonuslink.com.my/EN/Home.aspx$) in April 2017.

Table 2: Summary of average point value for four loyalty programs in the study

Loyalty program offered	No. of products	Average point value, RM
Aeon Member (AEON)	27561	0.0043
Bonus Link	30119	0.0067
Meriah LP (MyDin)	21225	0.0050
Tesco clubcard (Tesco)	20530	0.0050

2.2 Point price and market price

From the LP catalogs, the items can be purchased with a specified number of points. Table 2 gives the average ringgit point value (PV) for each four LPs in our study. Following Danaher et al. (2016) the PV essentially converts points to ringgit, enabling us to calculate the point's price for each item. Denote NP as the number of points required to redeem an item, then the points price is defined to be:

$$\text{Points price} = PV \times NP$$

For example in AEON loyalty program, 112,830 points are required to redeem a Shimono Handy Vacuum - SVC-1017. Table 1 gives a PV of 0.004 for the AEON LP, meaning the points price is $0.004 \times 112,830 =$ RM 451.32. However the market price for the Shimono Handy Vacuum - SVC-1017 is only RM358.80. Therefore the point price is considerably higher than the market

price for this product making it unattractive to 'buy' using points.Same as Bonuslink card, you need 14,500 points to redeem a FABER 19L electronic ovenwhich means the point price is $0.0067 \times 14,500$ =RM97.15 and the market price for the FABER 19L electronic oven is RM153.00 meaning this product is about RM55.85 cheaper when we boughth with points. For Tesco Clubcard, they only offer RM2 discount voucher for every 400 clubcard points. This means that you must spend RM400 to get discount voucher worth RM2 because for every RM1 you spend at Tesco you will get 1clubcard point.

3. Model formulation

In this section, we formulate a model to solve the problem. We assume that a company is selling a single type of products to its customers, operating as a monopoly and the company also runs a loyalty program (LP), whereby all customers who purchase products using cash are automatically awarded points. Points never expire and can be redeemed to acquire more units of the same products with any such redemption causing the firm to incur a per unit servicing cost c. The planning time horizon is assumed finite discrete time frame of $T+1$ period indexed by $t \in \{1, ..., T\}$. Some of the notation used for the model is given below:

p_t = unit cash price charged by the firm

q_t = number of points required in exchange for one product

$\theta_t = \frac{p_t}{q_t}$ = point value

b_t = the balance outstanding points at the beginning of period

s = products bought by customers in cash

r = acquire products by redeeming points

During period t, the customers buy s_t products in cash and acquire r_t products by redeeming points; both the cash sales and redemption (or point sales) are random and depend on the cash price and point value and the number of outstanding points. In connection with the cash sales, the firm awards points to its customers at a given rate of points for every ringgit spent, resulting in a total of new points issued during period. In contrast, redemption result in a total of points deducted from customer accounts, so that the balance of outstanding points at the end of period t (and beginning of period) becomes:

$$b_{t+1} = b_t + \lambda p_t s_t - q_t r_t$$

In period t, the firm generates sales revenue of $p_t s_t$. Adjusting for the deferred components associated with the newly issued and redeemed points, the firm's revenues at the end of period are:

Revenues = (sales revenues $p_t s_t$) - (newly deferred revenue) + (newly recognized revenue).

If we let D_t denote the total value of the firm's deferred revenue in the beginning of period, we can rewrite the equation above as:

revenues = $p_t s_t + D_t - D_{t+1}$

Since the difference between the firm's total deferred revenues in periods and is precisely equal to the newly deferred revenue net of the newly recognized revenue in period t.

$D_t = b_t\ \theta_t \gamma_t$ where γ_t = redemption rate.

Similarly to the sales, the redemption rate γ_t depends on the cash, point's price and the number of outstanding points. We also refer D_t as the value of the LP in period t. Consequently, this means that all these values are essentially decided at the end of period , jointly with the revenue deferral. The firm incurs redemption servicing costs of cr_t. Let $k_t = p_t s_t - cr_t$ denote the firm's operating cash flow at the end of period t. Accordingly, the firm's profit at the end of period is given by

$$\pi_t = p_t s_t + D_t - D_{t+1} - cr_t = k_t + D_t - D_{t+1}$$

The manager obtains a reward $f_t(\pi_t)$ that is tied to the firm's profits, where f_t is a concave and increasing function. The manager's problem is to select a policy for setting the cash price and point value. The manager decision problem can be formulated as a dynamic problem (DP). A sufficient state is given by the number of outstanding points, the cash price and the point value, the triple (b_t, p_t, θ_t) since s_t, r_t, γ_t depend only on it. We denoting the manager's value function at the beginning of period t as V_t , the Bellman recursion can now be written as:

$$V_t(b_t, p_t, \theta_t) = E[max(f_t(\pi_t) + \alpha V_{t+1}(b_{t+1}, p_{t+1}, \theta_{t+1}))] \quad (1)$$

where

$$\pi_t = k_t + D_t - D_{(t+1)} \ \ \forall\, t \in \{1, ..., T\},$$
$$k_t = p_t s_t - c r_t \ \ \forall\, t \in \{1, ..., T+1\},$$
$$D_t = b_t \theta_t g_t \ \ \forall\, t \in \{1, ..., T+1\},$$
$$b_{(t+1)} = b_t + \lambda p_t s_t - q_t r_t \ \ \forall\, t \in \{1, ..., T\}$$

At the end of terminal period, all deferred revenue is recognized. The manager's optimal value function can be written as

$$V_t(b_t, p_t, \theta_t) = E[B_t(y_t)], \tag{2}$$

where $y_t = p_t s_t(p_t, D_t) - c\ r_t(p_t, D_t) + D_t$, for any $t \in \{1, ..., T+1\}$ and the function B_t satisfies the following one dimensional Bellaman recursion,

$$B_t(y) = max[f_t(y - D_{t+1}) + \alpha\ E[B_{t+1}(y_{t+1})]] \tag{3}$$

where $B_{T+1}(y) = f_{T+1}(y)$ .Furthermore, the following structural properties hold;

If $p_{t+1}(y_t)$ and $D_{t+1}(y_t)$ denote the optimal actions for the maximization problem in (3), then the optimal pricing policies in (1) can be obtained as

$p_{t+1} = p_{t+1}(y_t)$, $\theta_{t+1} = \frac{(\phi_{t+1}(p_{t+1}(y_t), D_{t+1}(y_t))}{b_{t+1}}$

The function B_t is concave an increasing.

According to (2), we can equivalently think of manager's decisions to be the cash price p_{t+1} and the value of loyalty point D_{t+1} for the next period instead of the point value θ_{t+1}. In particular, once p_{t+1} and D_{t+1} are optimally determined, the corresponding optimal θ_{t+1} can be readily derived.

4. Discussion

In this study we undergo the survey on 4 loyalty programs in Malaysia. From the survey we have listed all the information needed to understand and the features that are best being considered in the model development. From the additional features in previous section, we found that point value is higher than point price which is not good to customers' satisfaction. Thus, this motivated us to develop a model that consider the satisfaction in loyalty reward programs. We proposed a model to setting the optimal value for loyalty point by using dynamic programming. We implement the theory and fitting the model proposed.

5. Conclusion

In this paper, we had proposed a methodology for finding the optimal solution in setting the value of point for a firm operating loyalty program. We observed the numerous cases where LP catalog items showed that the point price is higher than market price. This is not good for viability of loyalty program. Then we proposed a model to solve the problem. Although our model considerate managers in charge of setting the points value, our framework nonetheless has some limitations. For further research, the model can be extend for the firm's operation that involve more complex dynamic problems.

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