

Loyalty Rewards and Gift Card Programs: Basic Actuarial Estimation Techniques

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Abstract

In this paper we establish an actuarial framework for loyalty rewards and gift card programs. Specifically, we present models to estimate redemption and breakage rates as well as to estimate cost and value for use in both accrued cost and deferred revenue accounting methodologies. In addition, we provide guidance on various issues and considerations that may be required of an analyst when working with loyalty rewards and gift card programs.

Keywords: loyalty rewards, gift cards, redemption rate, breakage, liability estimation, cost estimation, accrued costs, deferred revenue

1. INTRODUCTION

The size and scope of loyalty reward programs has grown immensely over the last several decades. Since the rise of airline frequent flyer programs in the 1980s, loyalty programs in their modern form have become deeply intertwined within corporate marketing strategies. From the financial services industry with its rewards-based credit cards, to the hospitality services industry with hotel reward programs, to gift cards and other coupons issued by common brick and mortar industries such as food services and clothing retailers, to the frequent flyer airline miles programs, reward programs can now be found almost everywhere. While rewarding frequent customers with perks, benefits, discounts or complimentary product has been a long-standing business practice in marketing spheres, it has become ever more important to other areas of business practices within companies. In fact, member loyalty and gift card programs have moved into upper managements' companywide purview as a core component of brand strategies and are furthermore now often an integral part of corporate identities themselves. The elevation of importance now requires practitioners to stretch across the sometimes siloed practices of marketing, finance, accounting, and information technology departments within a company.

Reward programs essentially consist of promises made today to deliver something tomorrow, or next year, or potentially never. The nature of reward programs often brings with it significant challenges. Many reward programs' structures are built around uncertain

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future events: contingencies of “how much,” “when,” and “if.” Additionally, a program’s terms and conditions can change as the program evolves, leading to material changes to the benefits that participating members can obtain, or to the costs that sponsors will encounter. These uncertainties often obfuscate the value or costs that a sponsor is promising. Furthermore, these uncertainties can often challenge one’s ability to estimate the future benefits and costs of a program in an accurate and substantive way.

Fortunately, the amount of information collected and available to program providers presents an exceptional opportunity to truly understand the costs and revenue drivers of their programs and to measure them in an accurate and timely manner. This large amount of information can be used to design programs that provide better “rewards” to their members, maximize the value of the program to its sponsor by generating incremental revenue due to increased members’ loyalty, and help in providing quantified feedback to management and other financially interested players.

It is our hope that the tools presented in this paper can provide guidance to an analyst (and an actuary!) as to how to think about some of the economic fundamentals of loyalty rewards and gift cards programs, and to place a more structured quantitative framework around understanding and measuring their impact on the companies that offer them.

2. OVERVIEW OF REWARD PROGRAMS

2.1 Program Basics

The basic premise of reward programs consists of “members” purchasing goods or services in exchange for a promise, by the reward program sponsor, to provide additional future goods, services, or value to the member. One of the most important issues when attempting to understand the workings of a reward program is to understand the Terms & Conditions (T&C) that underlie the program. The T&C are essentially laws of the program from which all members’ individual and aggregate behaviors emerge. The importance of the T&C cannot be overstated. For example, there is generally no requirement that members actually claim the goods or services promised to them and in many cases, T&Cs are in place that make the promises disappear through expiration and forfeiture rules. Therefore, there is no guarantee that the sponsors will ever be required to make good on their promises. In fact,

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it is usually the case in reward programs that less than 100% of the rewards promised will ever be claimed, or “redeemed” by the members

On a program sponsor level, understanding the potential for reward redemptions, as well as the incurred cost when a reward is redeemed, is a critical exercise. The underlying “costs” of the program (or the quantification of the relative fair value being provided to members) should be treated just as importantly as the associated “lift” in revenues that is expected to be driven by the program. Together the two components drive profitability, or lack thereof, for the program’s sponsor. In fact, this understanding can enhance decision making surrounding the most profitable members and open up the potential to expand that profitability. On the other hand, high cost/low revenue centers or ineffective promotional marketing campaigns can be phased out in a timely, cost-effective, and customer perception-sensitive manner.

The uncertainties surrounding the cost of the promises made by the sponsor, which are themselves estimated based upon redemption rates and costs at redemptions, can lead to poor financial decision making and even poorer disclosure of the economic impacts that these programs have on the sponsor. The lack of guidance and established evaluation standards and methods, the uncertainties surrounding the ultimate costs, as well as the fact that potential benefits on promises may be immediate whereas the associated costs can be deferred, sometimes into the far distant future, may have created an environment for some sponsors where it is easier to address the issue “later rather than now.”

Due to the apparent challenges of understanding how best to estimate and measure the uncertainties of both redemption frequency and redemption cost/value, it may sometimes appear to be a daunting task to estimate either. However, actuaries and their techniques are uniquely prepared to tackle these issues. By applying many commonly accepted actuarial approaches, with appropriate modifications to address the uniqueness of reward programs, robust estimates of both redemption rates and costs can be derived.

In this paper we will generically refer to the currency of reward programs as “points,” the main benefactors of the programs as “members,” and the entities that create and manage the program on an ongoing capacity as “sponsors.” In addition, we will generically refer to the value or cost of the award simply as the “cost,” though the specific terminology that would

be used would be dependent on the accounting standards under which the program operates. In practice, there is a great diversity of names for these things but for clarity and simplicity we will standardize them in this paper.

2.2 Total Cost in Reward Programs

In its most basic form, a reward program's total cost can generally be broken out into three components: a currency component, a redemption rate component, and a cost component.

$$\text{Points} \times \text{Redemption Rate} \times \text{Cost per Point} = \text{Total Cost} \quad (2.1)$$

This generic equation will be used in a variety of applications. Generally the first item, the currency, "points," or "miles," is a known value. In fact it is typically the only number known at the time that an analysis is performed.

The redemption rate represents the percentage of points which are expected to be utilized or redeemed by the program members.

The cost per point represents the economic value of each point given that such point will be redeemed.

This formula can be used in balance sheet contexts where an analyst is interested in valuing either the accrued costs or the associated deferred revenue of a program.

The formula can also be used in income statement contexts where the analyst is interested in valuing either the incremental cost of an issued award or the incremental deferred revenue at point of sale.

When considering the formula above, it is important to maintain a common basis for all three components. For example, one should not apply a redemption rate expressed as a percentage of issued points to an outstanding point balance.

In the subsequent sections we will discuss the redemption rate and cost per point components of the model in further detail.

3. REDEMPTION RATE ESTIMATION APPROACHES

One of the key components of nearly every loyalty reward or gift card program is the redemption rate. The redemption rate is also frequently the single most challenging component to estimate. Developing a functional and predictive redemption rate model can be an exercise requiring significant time and effort. In many instances the degree of difficulty can be greatly increased by data quality and availability issues or, on the opposite end of the spectrum, overwhelmingly large quantities of data that are difficult to manipulate and organize.

Redemption rates are generally expressed as a function of one of two different bases; as the percentage of the points that are outstanding (points that have neither been redeemed nor forfeited) as of the valuation date or as a percentage of the cumulative amount of points issued to date to program members. As such it is important to keep in mind the basis on which redemption rates are expressed.

There are specific qualities by which every redemption rate must abide. Redemption rates, when expressed as a percentage of cumulative points issued, must always be bounded by a minimum of zero and by a maximum of unity. This can be interpreted to mean that there can never be more point redemptions in the future than the number of points issued to date or outstanding as of the evaluation date, and that there can never be negative redemptions, in aggregate. A situation where historical redemption rates are below zero or greater than unity would likely be due to data anomalies or exceptional situations related to a program's T&C that need to be better understood and corrected before moving forward with the projection of ultimate redemption rates.

Breakage is frequently a factor of interest. Breakage represents the portion of points issued (or outstanding) that will never be redeemed. Points that are "broken" will either forfeit out of the program or sit dormant until the program itself ceases to exist. The exact fate of the broken points is determined by the T&C of the program. The breakage rate is, by definition, the complement of the redemption rate. Therefore, unity less the redemption rate represents the breakage rate. Because of the simple relationship between redemption and breakage rates, we will focus on the redemption rate hereafter with the knowledge that we can readily convert the redemption rate into the breakage rate as needed. It should be noted

that while out of the scope of this paper, an analyst may be required to consider applicability of relevant laws relating to escheat property and how these laws may potentially affect the proper treatment of breakage.

The approaches for estimating an ultimate redemption rate for loyalty reward and gift card programs illustrated in this paper provide an estimate of the ultimate redemption rate expressed as a percentage of cumulative points issued as of the valuation date of the analysis. This redemption rate on issued points can be converted to a redemption rate on outstanding points, if needed. In addition, it should be noted that there are alternative approaches which may be more appropriate given a program's structure, data availability, or other reasons that could be comparably reasonable to the methods contained in this paper.

3.1 Point Issuance Period Method

The Point Issuance Period method is built on the premise that points can be tracked from the period in which they were earned by members until their ultimate redemption or dormancy/forfeiture, and that the "lifecycle" of a point from older issuance periods can be applied to points issued in subsequent periods. While it can be exceedingly difficult for a program's sponsor to track individual points and to come up with meaningful predictions of how, or even if, the points will be used, grouping points by issuance periods can make the underlying process statistically more practical and provide accurate aggregate estimates.

Constructing Point Redemption Triangles

The first step to this method consists of constructing historical point redemption triangles. Redeemed points are grouped by issuance period, and cumulative point redemptions associated with that issuance period (at multiple evenly spaced evaluations) are obtained in order to effectively track how historical redemptions are related to time since the original issuance period. Constructing triangles in this manner is analogous to constructing a cumulative loss development triangle, but instead of using an "accident period" we use an "issuance period."

In the triangle below, R_i^t represents the cumulative number of redeemed points, out of the total points issued in issuance period i at time t .

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Issuance Period	Evaluation Age			
	1	2	3	4
20X1	R_{20X1}^1	R_{20X1}^2	R_{20X1}^3	R_{20X1}^4
20X2	R_{20X2}^1	R_{20X2}^2	R_{20X2}^3	
20X3	R_{20X3}^1	R_{20X3}^2		
20X4	R_{20X4}^1			

We divide the cumulative point redemptions for each issuance period by the respective number of points that were issued in that period to generate a cumulative redemption rate triangle.

In the triangle shown below, r_i^t represents the cumulative number of redeemed points issued in period i at time t divided by the total number of points issued in that issuance period. It should be noted that the issued points in each issuance period are effectively “frozen” so that the denominator across each row is constant.

Issuance Period	Evaluation Age			
	1	2	3	4
20X1	r_{20X1}^1	r_{20X1}^2	r_{20X1}^3	r_{20X1}^4
20X2	r_{20X2}^1	r_{20X2}^2	r_{20X2}^3	
20X3	r_{20X3}^1	r_{20X3}^2		
20X4	r_{20X4}^1			

There are two primary benefits to immediately converting the redeemed points into redemption rates. First, this removes the effect of changing volumes of issued points between issuance periods and it also normalizes the redemption activities between periods making them more easily comparable. Second, this approach focuses directly on redemption rates from the outset of the analysis, which allows the analyst to immediately verify the boundary conditions so that redemption rates can neither exceed unity (i.e., 100%) nor be below 0%.

Estimating Ultimate Redemption Rates

Using the redemption rate triangle that was developed in the previous step, it should be immediately clear that one can apply standard actuarial projection methods (such as the chain ladder approach) to obtain estimates of the ultimate redemption rates by issuance period. There is generally no significant difference in methodology between estimating ultimate redemption rates on issued points and estimating ultimate losses in an insurance application, though there can be different considerations that an analyst may need to contemplate (e.g., loyalty programs may require consideration of promotions and expansion of enrollment into new classes of members instead of insurance considerations of claim handling stability and changes in underlying mix of coverages). Standard actuarial projection techniques on triangular data are covered in many other sources of actuarial literature and as such we will not expand on that topic in this paper.

At the end of the analysis one should have a completed triangle as is shown below.

Issuance Period	Evaluation Age				Ult
	1	2	3	4	
20X1	r_{20X1}^1	r_{20X1}^2	r_{20X1}^3	r_{20X1}^4	r_{20X1}^{ult}
20X2	r_{20X2}^1	r_{20X2}^2	r_{20X2}^3	r_{20X2}^4	r_{20X2}^{ult}
20X3	r_{20X3}^1	r_{20X3}^2	r_{20X3}^3	r_{20X3}^4	r_{20X3}^{ult}
20X4	r_{20X4}^1	r_{20X4}^2	r_{20X4}^3	r_{20X4}^4	r_{20X4}^{ult}

The ultimate redemption rates by issuance year can be used “as is” for each individual issuance year or, alternatively, a single volume weighted redemption rate on all issued points can be calculated if the analyst is focused on the overall ultimate redemption rate (“URR”) for all points issued by a loyalty reward or gift card program.

We note that this approach can be successfully applied to loyalty reward or gift card programs that include a point expiration policy in their T&C. In cases where issued points only remain valid for a fixed period after issuance, an analyst can quickly obtain the actual URR for each issuance period. Such an expiration policy can significantly facilitate the URR estimation for more recent issuance periods since the ultimate period is defined by the program sponsor.

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For programs without a point expiration policy, additional work may be needed to obtain an estimated URR. For example, in many instances there will be no historical information available upon which to base future expected point redemption activities beyond the most recent evaluation date. Often, this is simply a result of a reward program not being sufficiently mature to have reached its point redemption ultimate in any historical issuance period as of the evaluation date. Such an issue is comparable to determining a “tail” factor in conventional loss development triangles. In such instances an analyst may find that fitting a curve that exhibits decay characteristics is the most appropriate method to apply. Obviously, multiple such curves can be used to provide multiple projections. In such instances, it is also recommended that the analyst additionally apply a testing or ranking approach in order to determine which curve might provide the best fit to historical data.

For a full numerical example of this method please refer to Appendix 7.1.

3.2 Aggregate Member Join Period Method

The Aggregate Member Join Period method assumes that program members’ cumulative redemption activity at any given time is related to the time elapsed since the members have joined the program. Members are typically combined into join period cohorts so that points earning or redemption activity over the lifetime of the cohort can be related to the age or maturity of the members included in the cohort. Activities can be traced from the date that members first enroll into the reward program (join period) until their ultimate lapse (i.e., forfeiture), departure, or dormancy. We will generically refer to this as “dormancy,” though the program-specific T&C will dictate if points actually do get forfeited out of members’ accounts or not.

In this method, the triangle construction includes member join period cohort activity for both dormant and active members. As a result, any observed changes in cumulative redemption activity between evaluation ages are only attributable to members who remained active between evaluation periods.

Constructing Point Redemption and Points Issued Triangles

The first step to the Member Join Period method consists of constructing historical point redemption triangles. Redemption triangles in this method use cumulative member point redemptions at various maturities. Multiple evenly spaced evaluations of the cumulative redeemed points are obtained so that one can effectively track how redemptions are related to time passed since the original members join period. This triangle construction, similar to the Point Issue Period approach described earlier, is also analogous to constructing a cumulative loss development triangle, but instead of using an “accident period” approach we use a join period approach.

In the triangle below, R_j^t represents the cumulative number of redeemed points, out of the cumulative points issued to members joining in period j , at time t after the join date.

Join Period	Evaluation Age			
	1	2	3	4
20X1	R_{20X1}^1	R_{20X1}^2	R_{20X1}^3	R_{20X1}^4
20X2	R_{20X2}^1	R_{20X2}^2	R_{20X2}^3	
20X3	R_{20X3}^1	R_{20X3}^2		
20X4	R_{20X4}^1			

In the triangle below, I_j^t represents the cumulative issued points associated with members who joined in period j , at time t after the join date.

Join Period	Evaluation Age			
	1	2	3	4
20X1	I_{20X1}^1	I_{20X1}^2	I_{20X1}^3	I_{20X1}^4
20X2	I_{20X2}^1	I_{20X2}^2	I_{20X2}^3	
20X3	I_{20X3}^1	I_{20X3}^2		
20X4	I_{20X4}^1			

By dividing the cumulative redeemed point triangle by the cumulative issued point triangle we obtain the triangle shown below, which represents the cumulative redemption

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rates (r_j^t) for members, by join period. The cumulative redemption rates are expressed as a percentage of cumulative issued points. Unlike the Point Issuance Period method where the points included in the denominator are constant, the points included in this denominator continue to grow at each evaluation period, as long as at least one member included in a join period cohort continues to be active in the program and earns more points.

Join Period	Evaluation Age			
	1	2	3	4
20X1	r_{20X1}^1	r_{20X1}^2	r_{20X1}^3	r_{20X1}^4
20X2	r_{20X2}^1	r_{20X2}^2	r_{20X2}^3	
20X3	r_{20X3}^1	r_{20X3}^2		
20X4	r_{20X4}^1			

Given this triangle, an actuary can apply standard actuarial projection methods to estimate the pattern of future estimated cumulative redemption rates at ultimate for each join period. Projected values correspond to the areas within the boxed region in the triangle below.

Join Period	Evaluation Age			
	1	2	3	4
20X1	r_{20X1}^1	r_{20X1}^2	r_{20X1}^3	r_{20X1}^4
20X2	r_{20X2}^1	r_{20X2}^2	r_{20X2}^3	r_{20X2}^4
20X3	r_{20X3}^1	r_{20X3}^2	r_{20X3}^3	r_{20X3}^4
20X4	r_{20X4}^1	r_{20X4}^2	r_{20X4}^3	r_{20X4}^4

Terminal Redemption Period Considerations

The Member Join Period Method does not mathematically resolve itself to provide a clear “cut-off” where the analyst can cease development. In fact, because of the curve-like nature of the underlying cumulative data, mechanical development could perpetuate indefinitely with this method were an analyst to project out to infinity. Therefore, it is necessary to establish a terminal period (or maturity) out to which the projection should be performed. In general, there is no reason that the terminal period used cannot vary by join period.

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An actuarial analyst should consider multiple factors before establishing a terminal redemption period for the redemption rate projection. Generally, considerations include, but are not limited to:

- Current program Terms & Conditions
- Expected future changes in program Terms and Conditions
- Member, or points, dormancy patterns and trends
- Relative contribution of point activities associated with members at each respective expected dormancy period

Additionally, an actuary should discuss the issue with the program sponsor's management in order to ensure a thorough understanding of the program before implementing a specific maturity at which to end development.

Lastly, it should be mentioned that in some instances, an analyst may want to avoid projecting out to the estimated time of dormancy for the last active member(s) in a join year in the Member Join Period method (i.e., the time at which all members are dormant). The reason is that, were one to do this, the redemption rate provided by the model could overestimate the true redemption rate since that estimated time would implicitly account for points which would not yet have been earned as of the time of the evaluation. This would be inconsistent with the nature of establishing liability estimates as of a determined evaluation date for the points outstanding as of that date.

For a full numerical example of the Member Join Period approach please refer to Appendix 7.2.

3.3 Point Inventory Method and Choice of Redemption Estimation Method

It would be natural for individuals to try to draw comparisons between conventional inventory systems and loyalty programs. While such constructions are helpful in placing loyalty program operations into a well established and understood framework of conventional inventory systems, there exists a notable difference between conventional inventory and a loyalty program inventory system. The primary reason that the comparison is not perfect is due to the fact that tangible inventory typically has a value that is generally

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quantifiable via actual transactional evidence at the time of acquisition or manufacture (i.e., the cost of purchasing or producing an item included in the inventory is known) whereas the value of an issued and unredeemed point in a loyalty reward program will not actually have a known cost until the date that that point is actually redeemed (if ever) sometime in the future.

Nevertheless, constructing an inventory system that works for both financial reporting purposes and as a tool for the analyst estimating the associated liability can still be a very useful endeavor.

Basic Overview of Inventory Systems

Inventory systems in loyalty programs have similar structures to conventional inventory systems. Below is a brief summary of the types.

1- First In, First Out: In this method, the oldest points owned by a member are the first to get withdrawn.

2- Last In, First Out: In this method, the newest points owned by a member are the first to get withdrawn.

3- Average Weighted Cost Method (a.k.a. “Piggy Bank” Method): In this method, the time at which a point is issued is ignored and points go in and out of members’ accounts irrespective of when they were issued (either because these dates are intentionally disregarded or due to actual database constraints making them unavailable). As such, it is not possible to identify the exact issue time of any specific point and therefore, it is neither possible to identify the time of issuance for any point that was redeemed or forfeited. In essence, every point is completely impossible to distinguish from every other point. Nevertheless, the average future cost and average time of redemption can still be determined. Generally such a point inventory system is constructed specifically to focus on member point balances at any given time rather than to focus on the series of transactions that result in a given balance.

Inventory Systems and Redemption Rate Estimation

While there is no specific rule as to the best redemption rate approach to be used for each inventory system, or even which inventory system should or should not be used, we believe that some methods more naturally accommodate the different inventory systems and make

analyses more tractable and more easily explained. For example, the Point Issuance Period approach generally works well under a FIFO system. However, the reviewing analyst may frequently be required to consider issues which fall outside the scope of this paper before constructing or recommending any specific inventory system for a given program.

3.4 Understanding Redemption Rate Bases and Their Application

As noted previously, redemption rates can be expressed in terms of either percentage of outstanding points or percentage of issued points. Both measurements are potentially of interest to an actuary and to a program sponsor's management team. Up until this point, we have focused on estimating redemption rates stated on a points issued basis. Since there is a quantifiable relationship between the two bases, one can generally convert between the two as needed.

Typically, redemption rates expressed as percentage of issued points are utilized in an income statement context, either for deferred revenue or expense recognition calculations as they occur through the accounting period. Conversely, redemption rates expressed as a percentage of outstanding points are typically used in a Balance Sheet context, either for determining unpaid liabilities or in estimating cumulative deferred revenue at the financial reporting date.

Converting Redemption Rate on Issued Points to Redemption Rate on Outstanding Points

For the Point Issue Period method, the total redemption rate on outstanding points can be determined using the following equation:

$$r_i^{OS,T} = (r_i^{Ult} \bullet I_i - R_i^T) / (I_i - R_i^T) \quad (3.4.1)$$

The above equation can be interpreted as redemption rate on outstanding points for issue period i is the product of the total ultimate redemption rate on issued points for issue period i and the cumulative issued points less those points that have already been redeemed as of the evaluation date. This is then divided by the total outstanding points as of the evaluation date, which is itself equal to the total issued points less the total redeemed points. T represents the evaluation date.

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In programs that include forfeiture rules, the actuary must also subtract previously forfeited points from the denominator when expressing redemption rates as a percentage of outstanding points.

As the conversion from issued to outstanding for the Member Join Period approach is analogous to the method shown above, we have chosen not to show the equation.

3.5 Application to Gift Cards

As previously noted, the redemption rate approaches described above can also be applied to the estimation of gift card programs' redemption rates. The estimation method that is most appropriate is dependent on the nature of the program.

For gift card programs where cards are typically not reused (i.e., additional value is never or infrequently added back to the card after initial issuance), the Point Issue Period method is preferred.

For gift card programs where card users add value back to cards after the initial card issuance (i.e., cards can be "reloaded"), the Aggregate Member Join Period method is preferred.

3.6 Considerations of the Intended Use of the Redemption Rate Estimate

While it is generally not the responsibility of the actuary to determine the appropriate use of the redemption rate in an accounting context, it is the responsibility of the actuary to convey an appropriate understanding of the nature of the redemption rate estimate to management. It should be kept in mind that the redemption rate estimate is exactly that, an estimate. In some cases, the determination of a range of reasonable estimates around the actuarial central estimate provided to management may also be appropriate.

The potential risk of underfunding the liability related to the outstanding points (or unredeemed gift cards) may make management more cautious when it comes to selecting the ultimate redemption rate to use in their financial statements. As such, management may need to consider whether the expected value or potentially a higher confidence level estimate (or a selection toward the high end of the range of reasonable estimates) is a more appropriate estimate to use.

Please refer to the *Appendix* for further discussion on the potential accounting treatment of the methods.

4. COST OF REDEMPTION/VALUE OF DEFERRED REVENUE ESTIMATION APPROACHES

In order to fully understand the economic nature of the transactions related to loyalty rewards or gift card programs, it is necessary to consider the costs incurred by the plan sponsor for point redemptions (in an accrued cost accounting approach) or the value placed on the promised future redemptions (in a deferred revenue accounting approach). We will generically use the terms “cost” and “value” interchangeably hereafter, though the appropriate terminology will be determined by the accounting approach that the sponsor uses for financial reporting purposes.

In some instances there is little uncertainty surrounding the value or cost of a point redemption as the point redemption opportunities might be limited or priced in a fixed manner (i.e., a fixed number of points = a fixed amount of rewards). As such, no estimate of value is necessary. For example, in gift card programs the value of the transaction is generally already expressed in a currency (i.e., the value that remains outstanding on the card) and so the value to the cardholder is self-evident, regardless of when a redemption may ever occur. However, in many reward programs, redemptions will occur in the future and at a time when the value or cost of redemptions could be different from today and at values that are not necessarily already expressed in an easily valued form. Since variations over time in cost and value are relatively common, it is important to consider how these change over the duration of the expected redemptions. Costs can change for a variety of reasons: changes in T&C of the program, changes in redemption options available to members, or even price inflation of providing loyalty rewards to members at time of the redemption. Likewise, the actual value of rewards to the members may also change over time for many of the same reasons. To complicate matters more, many programs offer multiple redemption options, many of which can vary, perhaps significantly, in cost or value from each other.

A final complication relates to the determination of the correct value of a point under varying accounting systems. Recent changes in international standards have introduced the

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concept of "fair value" of a point to customers. This can be significantly different from the value that a program sponsor believes to be reasonable to use when estimating its outstanding liability, under current US GAAP accounting standards. Since the objective of this paper is not to take a "deep dive" into the accounting world, we will not discuss this issue any further. However, an analyst should consider this issue and seek appropriate guidance when determining the value of a point.

Any forward looking estimation of the potential cost of a point or of the value of a point requires a solid understanding of the past, a thorough understanding of expected future changes, and a deep knowledge of the T&C of the program. The value of a point at time of issuance is a function of the value that the point will have at the time that it will actually be redeemed. In instances where the value is constant over time there is no need to estimate that value (so long as the value is known today). When the value varies, however, the value of a point at time of issuance is not likely to be the same as when that point is going to be redeemed.

Under these conditions, we can build a framework that accommodates many potential scenarios of varying values or costs. The basic purpose of the approaches outlined in this paper is to determine the expected cost or value of a point at the time of issuance in order to include this variable in the current liability estimate.

4.1 Effectively Constant Cost/Value Per Point Model – Single Redemption Option

This is the trivial example where the value to the member or cost to the company remains constant, or at least effectively constant, over time. While, in this context, "constant" is relatively self-explanatory, "effectively constant" deserves more explanation. When we refer to "effectively constant," we refer to the fact that even though the cost or value of the reward will change over time, it is not expected to change between the issuance of the reward promise (i.e., the points) and the expected redemption of the points in return for that reward. In such instances the value or cost of the promised deliverable goods today, is the best indicator of the future cost or value.

4.2 Varying Cost/Value Per Point Model – Single Redemption Option

In many instances, the cost or value of a reward could vary over time in a manner that is reasonably estimable. Examples of such situations are plane tickets or hotel room rewards, both of which are impacted by relatively predictable seasonal changes as well as general inflationary pressures. To incorporate changes in cost or value of points over time into a predictive framework we can create a simple model. The model requires the following assumptions:

- 1) A redemption pattern, where ρ^t is the percentage of total point redemptions occurring in period t, and where $\sum_{t=1}^n \rho^t = 1.0$.
- 2) An estimation of the costs or values that overlap with the point redemption pattern, where we define c^t as the cost or value of points redeemed at time t.

With these two items an analyst can estimate the current average cost per point as:

$$\sum_{t=1}^n \rho^t \cdot c^t \quad (4.2.1)$$

4.3 Multiple Redemption Options

This approach essentially adds an extra level of complexity to the preceding method. This method includes a third component, i.e., the “utilization.” This is stated in terms of the relative percentages of all points that are expected to be redeemed on each redemption option, in each future period.

This component reflects the fact that most rewards programs offer multiple redemption options to their members. The objective is to capture the mix of future point redemptions across a “basket of goods” that is available to members. Once the utilization component has been defined, an analyst can apply this component to expected future cost or value of each available award type in each future period to obtain the current weighted average cost per point redeemed in each prospective period. In this way, the analyst can combine the estimated mix of redemptions with the respective costs associated at each expected time of redemption to obtain the total average cost or value per point redeemed in the future.

For example, hotel programs often allow their members to use their earned points to redeem for hotels, airline tickets and other merchandise. Airline programs frequently allow

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their members to redeem for free flights and miscellaneous merchandise. In many instances, the cost or value of the multiple redemption options may vary significantly when viewed in a by-point basis. While members usually decide how to use their points based on their individual needs, that decision has a direct impact on the costs incurred by a loyalty program sponsor. Some reward options can be significantly more costly to a program than others and therefore it is crucial for any program to have a good understanding of its customers expected redemption behavior.

The model requires the following assumptions;

- 1) A redemption pattern, where ρ^t is defined as the percentage of total point redemptions occurring in period t , and where $\sum_{t=1}^n \rho^t = 1.0$.
- 2) Estimation of costs or values for each redemption options that overlap with the point redemption pattern, defined c_q^t as the cost or value of each redemption options at time t for redemption option q .
- 3) Utilization percentage, defined as u_q^t , which represents the percentage of total points redeemed at time t , for redemption option q . u_q^t can vary over time, however, $\sum_{q=1}^k u_q^t = 1.0$ at each t , where k is the total number of redemption options.

With these three items an analyst can estimate the total average cost per point as:

$$\sum_{t=1}^n \sum_{q=1}^k \rho^t \cdot c_q^t \cdot u_q^t \quad (4.3.1)$$

4.4 Additional Considerations in Cost/Value per Point Models

Redemption Pattern

The redemption pattern can be estimated using either of the redemption rate methods described in Section 3. Alternatively, other estimation approaches not covered in this paper may be used. Since redemption patterns can be expressed as either a percentage of outstanding points or a percentage of issued points, care should be taken by the analyst to ensure that the appropriate pattern is estimated and applied in a manner that is consistent with the intended purpose.

Value or Cost at Time of Redemption

There is not necessarily any *a priori* relationship between c^t and c^{t+x} , where x is some time displacement from t , though frequently the program T&C, business cycles, seasonal effects, and/or economic environment will create some framework into which to generalize future costs. In addition, considering expected future inflation or projected price changes may be a reasonable benchmark against which to determine changes in the value or cost of future reward redemptions.

Utilization

Utilization is generally expressed on a “of the points expected to be redeemed” basis. Therefore it generally ignores future points breakage.

5. ADDITIONAL GENERAL CONSIDERATIONS

5.1 Data Segmentation

Just as with traditional actuarial analyses, data segmentation is very important to consider in the analysis of any loyalty rewards or gift card program. Utilizing well understood data segments serves two roles. First, distortions can potentially occur when changes in the “mix of business” happen and appropriate segmentations can address and correct for these potential distortions. Second, it allows the actuary to “dial in” on smaller segments of the population and to better identify the individual behavior of each segment. This knowledge, besides being of use to the actuarial analyst, can be incredibly useful to internal parties such as a sponsor’s marketing, accounting or finance department, as well as with management reporting. Specifically, segmentation can help to understand how things such as targeted mailings, promotions, and program structure changes impact members’ behavior, and can ultimately influence cost/benefit analyses of the activities.

Identifying appropriate segmentations can be a significant task. This can be made even more challenging when the segments are fluid, such as in situations where transfers between segments are possible (or frequent). Often, such transfers are observed in hotel or airline

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programs where members can change membership levels (upgrade or downgrade) due to their recent activities within their program.

Some potential segmentation criterions that are often used are: Membership level/category, Product type, Average spend by members, and/or Geographic location.

This list is by no means intended to be comprehensive but rather a selected number of options which may be considered by the analyst.

5.2 Data Quality

Many programs have been in operation for several decades and, for all intents and purposes, pre-date the modern computing era and comprehensively managed database capabilities. As such, historical data may not be complete or may simply not be available anymore. Even in programs that are relatively young, the data may exhibit serious shortcomings or distortions. As a result, there may be limitations as to how the data can be provided to an analyst and, doubts may exist regarding data integrity.

Given the importance of data in actuarial analyses, it is important to make consideration of what is needed for the analysis and compare that to what is actually available from the program. In some cases, analytical decisions will be made based on data availability rather than theoretical optimization. In such instances, an analyst should consider and communicate to vested parties how data shortcomings may influence the estimated results or increase the uncertainty around the full understanding of the program.

5.3 Changes in Program Terms & Conditions

The Terms & Conditions of a program are one of the single most important parts of a loyalty rewards program and they need to be well understood before proceeding with an analysis of the estimated URR (or any other component of such program for that matter). In essence, the T&C are the rules by which the members and the program's sponsor must abide (at least in theory). It is imperative that the analyst gains a full understanding of the T&C of any program that is under review. It is also important to understand how strictly these rules are actually applied by the program sponsor.

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Changes in T&C can create large variations in a program's cost structure, members' redemption behavior, membership profile, and more. In some instances, changes may impact the fundamentals of a program to the extent that an analyst's ability to rely on historical data to support a URR analysis may be limited, at least without including significant adjustments to the original data. From an insurance point of view, changes in T&C can often be compared to legislative changes that affect all insurance policies in force (or even retroactively apply to all policies ever written). These changes can fundamentally change the "rules of the game" to the extent that the past's emergence may provide only limited assistance in predicting the future. An actuarial analyst would likely apply some adjustment techniques to the historical data prior to using it in an analysis. Similar adjustments can be made to historical point accumulation or redemption activities.

An analyst must be able to anticipate how a change (defined) can impact an analysis to avoid producing biased URR results.

5.4 Marketing

As touched upon briefly above, marketing decisions (e.g., point promotions) can introduce large shifts or spikes in member behavior and therefore can have an impact on actuarial analyses. In addition, it is not uncommon that these marketing campaigns will influence only portions of the membership populations, work in "calendar year" manner (i.e., across entire diagonals when actuarial triangles are used) or have effects that were very different from the intended outcome. As such, an actuary should work closely with a program's marketing department to understand the upcoming plans or campaigns, if possible.

More importantly, the insights that can be gained from quantitative analysis of the program can provide useful feedback to a company's marketing department as to the effectiveness (and costs) of various marketing programs.

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In fact, the confluence of marketing and fundamental data analysis to more deeply understand costs and rewards is an area that the authors believe to be a natural extension of the ideas contained in this paper.

5.5 Seasonal Effects

Many programs are heavily impacted by seasonal effects. For example, airline tickets typically tend to cost more in summer months than in the fall or spring. Another example is that credit card companies typically issue significantly more points in the holiday season due to the large increases in spending by members. As such it is important to understand how seasonal effects influence a reward program from both a member perspective as well as from the sponsor's perspective.

The good news for an analyst is that it is likely that these effects are consistent year after year, which should help gain a precise understanding of their timing and their potential impact on calendar year results. This would also be helpful information when performing a partial year analysis, with a roll-forward approach to the upcoming year-end evaluation date.

As with any actuarial analysis relying on historical data, data consistency through time is a key component of a loyalty rewards analysis.

6. CONCLUSION

The expansion in the universe of loyalty programs has opened a new opportunity for actuaries to expand the application of their traditional insurance practice body of knowledge into another area of expertise. The quantitative framework developed by actuaries and the associated actuarial projection methods are exceptionally well suited to address these non-traditional topics.

While this paper focused on basic estimation techniques and their application to loyalty rewards and gift cards programs, we acknowledge that more advanced techniques (including predictive modeling methods) might also be successfully applied to the questions and problems brought to us by these programs. We purposely decided to exclude that discussion from this paper in order to maintain our focus on the more basic approaches.

It is always exciting to venture into a new space and attempt to answer new questions. We hope that with this paper we will help the actuarial community continue its progression and remain at the forefront of these new challenges.

7. APPENDIX

7.1 Point Issue Period Approach - Numerical Example

Below we outline a simple case study example of how to obtain the estimated URR, expressed as a percentage of total issued points, for a hypothetical gift card program.

Step 1 – Understand the program

The program of interest involves the issuance of point gift cards which are charged with a specified point value at time of purchase. The gift card value can be redeemed by the cardholder for goods at the issuer's stores as if the value on the card were a cash equivalent. Cardholders cannot add additional value to the card after the original time of issuance. The accounting standards under which the reporting entity operates allows for the recognition of the associated breakage revenue if the likelihood of non-redemption is probable and the amount of breakage is reasonably estimable.

In this example, we assume that the card issuer has the capability to provide transactional level information showing the time and amount of all transactions well as the associated card number for each and every historical point redemption and issuance on a per card basis.

Step 2 – Obtain Data

The key data elements required for this approach are as follows:

The total value of issued gift cards grouped by issuance period and the incremental redemptions over time that correspond to the same issuance period – This information is shown on Tables A and B of Appendix 7.1.

Step 3 – Manipulate Data into Usable Format

This approach uses cumulative redemptions as a percentage of the total issued value. As such we first need to accumulate the incremental redemption triangle. Table C in Appendix 7.1 contains the result of this exercise. In our example the cumulative redemption percentage

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corresponding to 20X2 at 36 months is calculated using the total incremental redemptions ($37 + 25 + 7 = 69$) for that issuance period as of the evaluation date.

The next step is to divide the cumulative redeemed points for each issuance period by the cumulative issued points for each respective issuance period to obtain the cumulative redemption percentages at each evaluation period. The result of this is shown on Appendix 7.1, Table D. This table is the result of dividing Table C by Table A. As an example, the 55.2% on Table D is derived by dividing the 69 points redeemed at 36 months by the 125 points originally issued in that period.

Step 4 – Project Ultimate Redemption Rate

We can project the ultimate redemption rate using one of many commonly accepted actuarial projection methods. For this example, we have opted to use an exponential curve fitted on mortality basis redemptions for our ultimate projection. The benefit of this method is that we can use the curve to provide us with an estimate that extends beyond the oldest available data point (in this case actual data only extends to 48 months). The estimate of the tail portion is particularly important in this hypothetical example because we have assumed in this example that there can be no forfeitures of value in this program. As such, redemptions can theoretically happen beyond our latest data point, and perhaps significantly farther.

The first step for the exponential curve fit is to convert our cumulative redemption percentages into incremental redemption percentages. This can be seen on Appendix 7.1, Table E. We additionally create a triangle of the cumulative amount that has not been redeemed at any given maturity (done by subtracting the cumulative redeemed percentages from 100.0%) The result is shown in Appendix 7.1, Table F. We then calculate the mortality rate by dividing the incremental percentage redeemed in a given period by the cumulative “unredeemed” at the beginning of that period. Mortality rates are shown on Appendix 7.1, Table G and corresponds to Table E divided by Table F. We calculate the average mortality at each maturity (for example average mortality rate at 24 months is 26.6% which is equal to $[24.7\% + 28.4\% + 26.7\%]/3$). In this example we have chosen to fit an exponential decay

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function to the average mortality rates, though numerous other extrapolation techniques could be used. Table H of Appendix 7.1 shows the result of this exercise. Having estimated a mortality curve we can then project out the ultimate redemption rate for later maturities. Table I, on Appendix 7.1 shows the full projection of ultimate redemption rates for each issuance period. For example, the projection of cumulative redemption percentage of 53.8% for 20X4 at 36 months of maturity is calculated as $(100.0\% - 47.4\%) \times 12.1\% + 47.4\%$.

Having just estimated the ultimate redemption rate on issued gift card value, we can easily convert this into the redemption rate on outstanding value, if needed (please see Appendix 7.4 for an example of this conversion).

7.2 Aggregate Member Join Period Approach - Numerical Example

Below we outline a simple case study example of how to obtain the estimated URR, expressed as a percentage of total issued points, for a hypothetical hotel loyalty program.

Step 1 – Understand the program

This example program involves a hotel loyalty program where members earn points on every purchase that they make at a participating property. These earned points can then be redeemed in the future for hotel rewards. All members leave the program within three years of their original date of enrollment.

Step 2 – Obtain Data

The key data elements required for this approach are as follows:

Cumulative issued and redeemed points, by join period at fixed interval periods - These are shown on Appendix 7.2, Tables A and B, respectively.

Step 3 – Manipulate Data into Usable Format

Taking the raw data elements, we can divide the cumulative redeemed points shown on Table B by the cumulative issued points shown on Table A. The cumulative redemption rate

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results are shown on Table C of Appendix 7.2. As an example, the 18.6% shown in join period 20X4 at 12 months is equal to the cumulative redemptions made by members who joined the program in 20X4 divided by the cumulative issued points for the same members, i.e., $84 / 452 = 18.6\%$.

Step 4 – Project Redemption Rates

For our example we will use simple averages down columns. The results of these calculations are shown on Appendix 7.2, Table D. For this example, we will assume that 48 months of maturity is the appropriate terminal redemption maturity for all join periods.

7.3 Redemption Rate Basis Conversion - Numerical Example

In Appendix 7.3, we have included an example of converting ultimate redemption rates on issued points to ultimate redemption rates on outstanding points.

7.4.1 Varying Cost/Value Per Point Model – Single Redemption Option- Numerical Example

As noted above, this approach is appropriate when there is only a single point redemption option available to a loyalty program's members, and when the cost/value of points at redemption are expected to vary over time. If the cost does not vary over time, then an analyst may simply use the current value. In instances where there is more than one redemption option, an analyst should consider using the multiple redemption options model instead.

In the following example, we are faced with a program where we see that the expected value per point is expected to be diluted over time. This is due to the fact that the program has had significant "point inflation" in the past, i.e., the number of points needed to obtain a reward has been increasing through time, and the analyst expects this to continue in the future over the prospective redemption horizon. Therefore, if the company were to simply use the current value (of \$1.00) it would be over-estimating the value per point.

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The required data components are an estimated overall redemption pattern and a cost schedule that coincides with the expected redemption pattern timeline, and estimates of point utilization between award types over time. The example is shown on Appendix 7.4, Item 7.4.1 .

The expected value per point at time of redemption is equal to \$0.94, which is equal to $[35.0\% \times \$1.00 + 30.0\% \times \$0.95 + 20.0\% \times \$0.91 + 10.0\% \times \$0.86 + 5.0\% \times \$0.82]$.

7.4.2 Varying Cost/Value Per Point Model – Multiple Redemption Options- Numerical Example

As noted above, this approach is appropriate when there are multiple reward redemption options. Furthermore, the approach can accommodate variations in value per point over time and or variations in the relative expected utilization of the points over time.

The required data components are an estimated overall redemption pattern, a cost schedule that coincides with the expected redemption pattern timeline, and estimates of point utilization between award types over time. Utilization can be constant over all future periods or it can also vary, if the analyst believes that to be reasonable. The example shown on Appendix 7.4, Item 7.4.2 assumes constant utilization over time.

In this example, the cost per redeemed point is expected to increase over time to reflect an expectation that long-term inflation will be greater than 0% in each future period. Here, using the current average cost per point in each future period would materially understate the estimated value.

7.5 Accounting for Loyalty Programs

This paper is not intended to express any opinion on the appropriate accounting treatment for loyalty rewards or gift cards programs. However, having an understanding of the underlying accounting treatment is important to understand the purpose and application of the methods described in this paper. As such we will briefly describe two predominant

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approaches (the accrued cost approach and the deferred revenue approach) and describe how the tools in this paper can be used.

Accrued Cost Approach: This approach takes the point of view that the promise of future delivery of goods and services to the member represents a future sacrifice of economic resources by the sponsor. Given that the future sacrifice is both probable and reasonably estimable, a liability must be accrued at the time of point issuance. When the redemption does occur, the accrued liability can be relieved.

Deferred Revenue Approach: This approach takes the point of view that transactions giving rise to the issuance of loyalty awards should be viewed as contingent sales whereby the member is purchasing goods or services with the expectation that he will receive additional goods and services from the sponsor in the future. As such, this approach assumes that the earnings process inherent to revenue recognition is tied to the future performance (sometimes referred to as contingent performance) or future delivery of goods or services. Furthermore, until that performance or delivery is actually completed by the sponsor, the revenue associated with that transaction should not be fully recognized. As such, a deferred revenue account must be estimated and established.

The primary difference between the two approaches is simply the resulting timing of revenue and expense recognition. In order to help understand the differences between the two methods we are providing a hypothetical example in Appendix 7.6 that shows the transactional journal entries as well as the final financial statements resulting from the transactions under both accounting systems.

The ¡Burrito Fresco! Program – An Illustrative Frequent Burrito-Eater Loyalty Program

¡Burrito Fresco! Program description is as follows:

1) Burritos cost the program sponsor (¡Burrito Fresco!) \$2.00 each, 2) Burritos are sold to members (Frequent Burrito-Eaters) for \$4.00, 3) Program terms and conditions: Frequent Burrito-Eaters receive one burrito point for every burrito that they purchase. Frequent Burrito-Eaters can redeem 10 burrito points for one free burrito and 4) Expected Redemption Rate of burrito points: 75.0%

For simplicity, we assume that the cost and the sale price of burritos do not change through the years and that all buyers of burritos are members of the ¡Burrito Fresco! Loyalty Program (therefore every burrito sold yields the issuance of a burrito point).

Additionally, assume that Frequent Burrito-Eaters purchase 500 burritos in period 1 and 500 burritos in period 2. All of the free burrito redemptions occur at the very end of period 2 and none in period 1.

The journal entries for both of these examples are shown on Appendix 7.5, Sheet 2.

Accrued Cost Approach:

Using this approach we see that every burrito point that the sponsor issues will cost \$0.15. This is determined by the fact that every burrito sold yields one burrito point and a single burrito point can effectively buy one tenth of a burrito. This costs ¡Burrito Fresco! $\$0.20 = 1/10 \times \2.00 . In addition, only 75.0% of the burrito points issued will be redeemed by members for free burrito rewards. Therefore, the effective cost that must be accrued for each burrito sold is $\$0.15 = 0.750 \times \0.20 . In general, we can see that the cost per point is $r * c$, where r is the redemption rate and c is the cost of the redemption.

Deferred Revenue Approach:

Using this approach, we see that every burrito sold requires ¡Burrito Fresco! to defer \$0.279 of the \$4.00 of revenue. The \$0.279 is derived using the following approach:

$$\Delta = S * [1.0 - S / (S + c * r)]$$

Where Δ is the deferred revenue per transaction, S is the sale price (in this case \$4.00), c is the value of an issued reward (here it is one-tenth the price of a burrito, \$0.40), and r is the redemption rate (75.0%).

We will discuss in the next section how the \$0.279 gets spread across the earnings period.

Financial Statement Comparison:

We can construct income statements and balance sheets for periods 1 and 2 under each of the accounting approaches for ¡Burrito Fresco!. These are shown on Appendix 7.5, Page 1.

As we can see, on the income statement on Appendix 7.5, Page 1, the deferred revenue approach yields lower revenue and net income in period 1 than the accrued cost approach (\$1,860.47 compared to \$2,000.00) due to the fact that \$0.279 of revenue per burrito sold (i.e., 500 in period 1) gets deferred. However, in period 2, once the free burrito rewards redemptions are made, the deferred revenue can be recognized. At that time, the revenue and the corresponding net income are higher under the deferred revenue approach. This example illustrates that under the deferred revenue approach, revenue and net income will generally be less in earlier years and greater in later years than what the accrued cost approach would produce. It should also be noted that in our example, we have opted to show both cost and deferred revenue on a net-of-breakage basis. However, it would also be expected to see companies recording gross-of-breakage values with a contra-account posting that explicitly captures the associated breakage.

We can also contrast the two methods effects on the balance sheets shown on Appendix 7.5, Page 1. Under the deferred revenue approach, we see that at the end of period 1, the equity produced is lower than for the accrued cost approach. This is a result of the reduced

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period 1 revenue and net income that this method generates. Also note that the deferred revenue approach carries no accrued expenses and conversely the accrued cost approach involves no deferral of revenue. Both methods ultimately provide the same resulting final equity.

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Table A

Issued Points

Issuance Period	Issued Points
20X1	105
20X2	125
20X3	150
20X4	115

Table B

Incremental Redemptions

Issuance Period	Evaluation Age			
	0 - 12	12 - 24	24 - 36	36 - 48
20X1	32	18	6	3
20X2	37	25	7	
20X3	45	28		
20X4	34			

Table C

Cumulative Redemptions

Issuance Period	Evaluation Age				
	12	24	36	48	
20X1	32	50	56		59
20X2	37	62	69		
20X3	45	73			
20X4	34				

Table D

Cumulative Redemptions (% of Issued)

Issuance Period	Evaluation Age			
	12	24	36	48
20X1	30.5%	47.6%	53.3%	56.2%
20X2	29.6%	49.6%	55.2%	
20X3	30.0%	48.7%		
20X4	29.6%			

Table E

Incremental Point Redemptions (% of Issued)

Issuance Period	Evaluation Age			
	0 - 12	12 - 24	24 - 36	36 - 48
20X1	30.5%	17.1%	5.7%	2.9%
20X2	29.6%	20.0%	5.6%	
20X3	30.0%	18.7%		
20X4	29.6%			

Table F

Unredeemed at Beginning of Period

Issuance Period	Evaluation Age				
	0	12	24	36	48
20X1	100.0%	69.5%	52.4%	46.7%	43.8%
20X2	100.0%	70.4%	50.4%	44.8%	
20X3	100.0%	70.0%	51.3%		
20X4	100.0%	70.4%			

Table G

Mortality Rates

Issuance Period	Evaluation Age			
	0 - 12	12 - 24	24 - 36	36 - 48
20X1	30.5%	24.7%	10.9%	6.1%
20X2	29.6%	28.4%	11.1%	
20X3	30.0%	26.7%		
20X4	29.6%			

Table H

Mortality Rates

	Evaluation Age									
	12 - 24	24 - 36	36 - 48	48 - 60	60 - 72	72 - 84	84 - 96	96 - 108	108 - 120	120 - Ult
Avg. Mortality Rate	26.6%	11.0%	6.1%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Fitted Mortality Rate	25.3%	12.1%	5.8%	2.8%	1.3%	0.6%	0.3%	0.1%	0.1%	0.0%

Table I

Cumulative Point Redemptions (Percentage of Issued)

Issuance Period	Evaluation Age										
	12	24	36	48	60	72	84	96	108	120	Ultimate
20X1	30.5%	47.6%	53.3%	56.2%	57.4%	58.0%	58.3%	58.4%	58.4%	58.5%	58.5%
20X2	29.6%	49.6%	55.2%	57.8%	59.0%	59.5%	59.8%	59.9%	60.0%	60.0%	60.0%
20X3	30.0%	48.7%	54.9%	57.5%	58.7%	59.3%	59.5%	59.7%	59.7%	59.7%	59.7%
20X4	29.6%	47.4%	53.8%	56.5%	57.7%	58.3%	58.5%	58.7%	58.7%	58.7%	58.7%

Table A

Cumulative Issued - Aggregate

Join Period	Evaluation Age			
	12	24	36	48
20X1	436	445	528	555
20X2	525	573	609	
20X3	475	486		
20X4	452			

Table B

Cumulative Redemptions - Aggregate

Join Period	Evaluation Age			
	12	24	36	48
20X1	73	192	334	379
20X2	78	214	401	
20X3	90	193		
20X4	84			

Table C

Cumulative Redemption Rates - Aggregate

Join Period	Evaluation Age			
	12	24	36	48
20X1	16.7%	43.1%	63.3%	68.3%
20X2	14.9%	37.3%	65.8%	
20X3	18.9%	39.7%		
20X4	18.6%			

Table D

Projected Cumulative Redemption Rates - Aggregate

Join Period	Evaluation Age			
	12	24	36	48
20X1	16.7%	43.1%	63.3%	68.3%
20X2	14.9%	37.3%	65.8%	68.3%
20X3	18.9%	39.7%	64.6%	68.3%
20X4	18.6%	40.1%	64.6%	68.3%

Point Issuance Period Approach

Appendix 7.3

Redemption Rate on Issued to Redemption Rate on Outstanding Points

Issuance Period	Points Issued As of 12/31/20X4	Ultimate Redemption Rate On Issued	Expected Ultimate Redemptions	Cumulative Redeemed Points As of 12/31/20X4	Estimated Points Redeemed In Future	Un-redeemed Points As of 12/31/20X4	Ultimate Redemption Rate On Outstanding
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
20X1	105	58.5%	61	59	2	46	5.2%
20X2	125	60.0%	75	69	6	56	10.7%
20X3	150	59.7%	90	73	17	77	21.6%
20X4	115	58.7%	68	34	34	81	41.4%
Total	495		294	235	59	260	22.5%

Notes:

(2), (5)	From database.	(6)	(4) - (5).
(3)	Estimated ultimate redemptions using PIP method.	(7)	(2) - (5).
(4)	(2) x (3).	(8)	(6) / (7).

7.4.1: Value Per Point - Single Redemption Option - Example

		Redemption Period				
		1	2	3	4	5
(1)	Redemption Pattern	35.0%	30.0%	20.0%	10.0%	5.0%
(2)	Value At Time of Redemption	\$1.00	\$0.95	\$0.91	\$0.86	\$0.82
(3)	Estimated Weighted Value of Unredeemed Points	\$0.94				

7.4.2: Value Per Point - Multiple Redemption Option - Example

		Redemption Period					Utilization
		1	2	3	4	5	(6)
(4)	Redemption Pattern	15.0%	15.0%	20.0%	25.0%	25.0%	
(5)	Value at Time of Redemption:						
	Option A	\$1.05	\$1.10	\$1.16	\$1.22	\$1.20	50.0%
	Option B	\$0.90	\$0.99	\$1.09	\$1.20	\$1.32	45.0%
	Option C	\$0.25	\$0.25	\$0.25	\$0.25	\$0.25	5.0%
(7)	Estimated Weighted Value of Unredeemed Points	\$1.10					

Notes:

- (3) $[\text{Sumproduct of (1) and (2) at each respective maturity}] / [\text{Sum of (1) at each respective maturity}]$
- (7) $[\text{Sumproduct of (4) and (5) at each respective maturity} \times \text{(6) for each respective utilization option}] / [\text{Sum of (4) at each respective maturity}]$

	Balance Sheet			Balance Sheet		
	Accrued Cost Approach			Deferred Revenue Approach		
	Beginning Of Period 1	End of Period 1	End of Period 2	Beginning Of Period 1	End of Period 1	End of Period 2
Cash	\$0.00	\$2,000.00	\$4,000.00	\$0.00	\$2,000.00	\$4,000.00
Burrito Inventory	\$2,150.00	\$1,150.00	\$0.00	\$2,150.00	\$1,150.00	\$0.00
Total Assets	<u>\$2,150.00</u>	<u>\$3,150.00</u>	<u>\$4,000.00</u>	<u>\$2,150.00</u>	<u>\$3,150.00</u>	<u>\$4,000.00</u>
Accrued Expenses	\$0.00	\$75.00	\$0.00	n.a.	n.a.	n.a.
Deferred Revenue	n.a.	n.a.	n.a.	\$0.00	\$139.53	\$0.00
Equity	\$2,150.00	\$3,075.00	\$4,000.00	\$2,150.00	\$3,010.47	\$4,000.00
Total Liabilities & Equity	<u>\$2,150.00</u>	<u>\$3,150.00</u>	<u>\$4,000.00</u>	<u>\$2,150.00</u>	<u>\$3,150.00</u>	<u>\$4,000.00</u>

	Statement of Income			Statement of Income		
	Accrued Cost Approach			Deferred Revenue Approach		
	Period 1	Period 2	Cumulative	Period 1	Period 2	Cumulative
Revenue	\$2,000.00	\$2,000.00	\$4,000.00	\$1,860.47	\$2,139.53	\$4,000.00
Expenses	\$1,075.00	\$1,075.00	\$2,150.00	\$1,000.00	\$1,150.00	\$2,150.00
Net Income	<u>\$925.00</u>	<u>\$925.00</u>	<u>\$1,850.00</u>	<u>\$860.47</u>	<u>\$989.53</u>	<u>\$1,850.00</u>

Hypothetical Financial Statements
Journal Entries

Accrued Cost Method

Period 1: Sales and Burrito Point Cost Accruals

Sales of Burritos and Issuance of Associated Burrito Points

Db Cash	\$2,000.00		
		Cr Revenue	\$2,000.00
Db Expenses (Cost of Goods Sold)	\$1,000.00		
		Cr Burrito Inventory	\$1,000.00
Db Expenses (Issued Burrito Points)	\$75.00		
		Cr Accrued Burrito Point Liability	\$75.00

Period 2: Sales and Burrito Point Accrued Expenses and Burrito Point Redemptions

Sales of Burritos and Issuance of Associated Burrito Points

Db Cash	\$2,000.00		
		Cr Revenue	\$2,000.00
Db Expenses (Cost of Goods Sold)	\$1,000.00		
		Cr Burrito Inventory	\$1,000.00
Db Expenses (Issued Burrito Points)	\$75.00		
		Cr Accrued Burrito Point Liability	\$75.00

Redemptions of Outstanding Burrito Points

Db Accrued Burrito Point Liability	\$150.00		
		Cr Burrito Inventory	\$150.00

Deferred Revenue Method

Period 1: Sales and Burrito Point Deferred Revenue

Sales of Burritos and Issuance of Associated Burrito Points

Db Cash	\$2,000.00		
		Cr Revenue	\$1,860.47
		Cr Deferred Revenue	\$139.53
Db Expenses (Cost of Goods Sold)	\$1,000.00		
		Cr Burrito Inventory	\$1,000.00

Period 2: Sales and Burrito Point Deferred Revenue and Burrito Point Redemptions

Sales of Burritos and Issuance of Associated Burrito Points

Db Cash	\$2,000.00		
		Cr Revenue	\$1,860.47
		Cr Deferred Revenue	\$139.53
Db Expenses (Cost of Goods Sold)	\$1,000.00		
		Cr Burrito Inventory	\$1,000.00

Redemptions of Outstanding Burrito Points

Db Deferred Revenue	\$279.06		
		Cr Revenue	\$279.06
Db Expenses (Cost of Goods Sold)	\$150.00		
		Cr Burrito Inventory	\$150.00