THE ELASTICITY OF CUSTOMER VALUE TO RETENTION: THE DURATION OF A CUSTOMER RELATIONSHIP

Phillip E. Pfeifer and Paul W. Farris

Darden Graduate School of Business
P.O. Box 6550
Charlottesville, VA 22906-6550
Shipping : 100 Darden Boulevard, 22903

Email PfeiferP@virginia.edu

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ABSTRACT

A cornerstone of the CRM and Interactive Marketing literature is the Reichheld and Sasser statement that "reducing defections by 5% boosts profits 25% to 85%." The basic premise is that a relatively small increase in customer retention (loyalty) will drive relatively large increases in profits. As the practice of CRM matures, we believe that managers and researchers will be interested in a more exact quantification of the economic benefits of increased customer retention. This paper develops methods for determining percentage increases in expected customer (and prospect) lifetime values due to increased retention. In particular, we derive an equation for the elasticity of expected customer future value, the component of customer lifetime value contingent on retention. This equation for "retention elasticity" is based on a general model of a customer-retention relationship in which margins, retention spending, and retention probabilities vary with tenure. Using a numerical example, we investigate the factors that affect retention elasticity. We also show that this retention elasticity is equal to the financial duration of the customer asset. This connection between retention elasticity and financial duration offers a new perspective from which to understand and interpret retention elasticity. For example, just as duration is an important measure of a bond's risk, so too is retention elasticity a measure of one source of volatility in the value of a customer relationship.

INTRODUCTION

Arguably, no single empirical finding has had a bigger impact on the practice of interactive marketing than the following:

> Reducing Defections by 5% Boosts Profits 25% to 85%
>
> (Reichheld and Sasser, 1990)

This Reichheld and Sasser Statement (RSS) has been used as justification for increased attention to, and investments in, customer relationship management (CRM). Clearly, this statement struck a responsive chord with managers who viewed the reported 25 to 85 percent increases as impressive. More recently, Gupta and Lehman (2003) use publicly available financial data to estimate "a dramatic increase of 22% to 37% in customer lifetime value for a 5% increase in customer retention for Capital One and E*Trade."

Although no one doubts that improved customer retention is a good thing, it becomes important at some point for firms to know exactly how much of good thing it is. The purpose of this paper is to help managers measure and better understand the economic benefits of improved customer retention for their particular set of customer and prospect relationships. In order to make informed CRM investment decisions, firms need more precise measures of economic benefits than those provided by the simple RSS.

At the outset, let us attempt to clarify two points about the RSS. First, although the RSS uses the word "profit," a careful reading of Reichheld (1996) shows that the reported percentage increases refer to the net present values of cash flows from the average customer relationship. Consequently, the reported increases do not apply to company profits as others have concluded (see, for example, Heskett, Sasser, and Schlesinger, 1997, page 61). Second, to the extent that the initial period numbers in the Reichheld and Sasser study included allocated acquisition costs, the reported percentage increases are higher than they otherwise would have been. As with any percentage increase in value, subtracting costs from the baseline raises the resulting percentage increase. Thus, the RS percentage increases apply only to the value of customer relationships net of allocated acquisition costs.

This paper investigates the economic benefits of increased retention using a model of a general customer-retention relationship to derive an equation for the elasticity of expected customer future value (ECFV) to retention. This equation for "retention elasticity" can be tailored to the characteristics of an individual customer relationship or to a group of homogenous customers—allowing the firm to quantify the economic benefits of increases in retention for any imaginable set of customers. We go on to show that this retention elasticity is a number equal to the duration (as in the duration of a bond) of the customer financial asset. This connection to duration offers an additional perspective for interpreting the financial impact of increased retention. Increased retention will have the highest percentage effect for relationships of longest duration—those with high retention rates, retention rates that increase with tenure, and margins that increase with tenure. We illustrate the elasticity formula using a numerical example and use sensitivity analysis to illustrate the connection between retention elasticity and duration.

For a simple customer relationship in which expected margins, retention spending, and retention probabilities do not vary with tenure, we offer a simpler equation for retention elasticity. This simple constant retention, constant margin model is equivalent to the model used in Blattberg and Deighton (1996) and Gupta and Lehmann (2003). In this simpler context, we also explore the differences between the point elasticities used in this paper and the percentage increases used in the RSS and in Gupta and Lehmann (2003)—those that result from five percentage points *added* to the baseline retention rate. The five-percentage-point increases used in the RSS are likely to be more meaningful to many managers, and we will show that they behave differently than point elasticities.

A GENERAL CUSTOMER-RETENTION MODEL

To explore the relationship between retention and customer value, we start with a general model of a customer-retention relationship. As described by Dwyer (1989), a customer-retention situation is one in which customers not retained are considered lost for good. The RSS applies to customer-retention situations.

In modeling and defining customer lifetime values, the treatment of acquisition spending has been a source of discussion (see Jain and Singh, 2002). For want of a standard approach for constructing a single customer lifetime value metric, we are compelled to use several separate customer-value terms in this paper. We do so in the interest of distinguishing clearly among the equally valid but different ways of constructing customer-value metrics.

We begin by considering the component of customer value that is contingent on retention. Because this value is uncertain (the customer may or may not be retained) and in the future, we refer to this component of customer value as the expected customer future value (ECFV).

For a customer acquired at time t=0, let r_1 be the probability the customer is retained at time t=1 and let M_1 be the margin the firm receives if the retention effort is successful. Assume further that in the event the customer is retained at t=1, the firm is committed to attempt to retain the customer at time t=2.

In general, let R_t^{PV} be the present value at time t of the retention spending the firm will incur in the period between t and t+1 attempting to retain the customer active at time t. Spending R_t^{PV} results in probability r_{t+1} the firm will retain the customer at t+1. With R_t^{PV} so defined, we will think of R_t^{PV} as a lump sum occurring at time t. Thus, the R^{PV} amounts in our model occur at the beginning of the period. In contrast, Berger and Nasr

(1998) use the middle of the period and Blattberg and Deighton (1996) use the end of the period.

In the event the customer is retained at t+1, assume the firm receives M_{t+1} and spends R_{t+1}^{PV} at t+1. Let *ß* be the per-period discount ratio (the reciprocal of 1 plus the discount rate). It follows that the expected present value (at t=0) of the future cash flows from the newly acquired customer relationship is as follows:

$$ECFV = br_1(M_1 - R_1^{PV}) + b^2 r_1 r_2 (M_2 - R_2^{PV}) + \cdots b^t r_1 r_2 .. r_t (M_t - R_t^{PV}) + \cdots$$

which can be written more succinctly as

$$ECFV(b, \underline{r}, \underline{M}, \underline{R}^{PV}) = \sum_{t=1}^{\infty} b^t (\prod_{s=1}^{t} r_s)(M_t - R_t^{PV}), \qquad [1]$$

where the notation $\underline{r}$, $\underline{M}$, and $\underline{R}^{PV}$ refers to vectors of the time series of retention probabilities, margins, and retention spending amounts.

One can think of this value as the expected future lifetime value of an existing customer relationship. Notice that in the absence of retention (r_1=0), *ECFV* equals zero. It is in this sense that we say that *ECFV* is the component of customer value contingent upon retention. Notice also that *ECFV* does not include M_0 , the initial margin received at t=0, nor R_0^{PV} , the present value of the retention spending in the period between t=0 and t=1.

If we *do* include both M_0 and R_0^{PV} , the new metric represents the expected value of a newly acquired customer at a time point right before the firm receives M_0. To avoid confusion, we will call this new metric the expected customer lifetime value (ECLV):

$$ECLV = M_0 - R_0^{PV} + ECFV \qquad [2]$$

One might think of *ECLV* as the most the firm should be willing to pay to acquire this customer relationship.

To move one more small step back in time, let *A* be the dollar amount the firm spends at *t*=0 to convince a prospect to become a customer, and let *a* be the probability the firm is successful. If the expected present value of the resulting customer relationship is given by *ECLV* above, then the expected present value of the *A* investment is given as

$$EPLV = aECLV - A \qquad [3]$$

where *EPLV* stands for the expected prospect lifetime value. Only if *EPLV* is greater than zero should the firm spend *A* to attempt to convince the prospect to become a customer. One can think of *EPLV* as the value to the firm of the option to spend *A* on the prospect.

Excluding acquisition spending from customer lifetime value in [1] and [2] is consistent with the approaches taken by Berger and Nasr (1998) and Pfeifer and Carraway (2000). Blattberg and Deighton (1996) use "customer equity" to refer to what we call here *EPLV*.

Equations [1] through [3] summarize the economic value of a general customer-retention relationship. Equation [1] gives the expected value of a new customer excluding the initial cash flows. Equation [2] gives the expected value of a new customer including the initial cash flows, and equation [3] gives the expected value of a prospect.

This model uses a general time series of retention probabilities, margins, and retention spending amounts. When applying the model to an individual customer, $\underline{r}$, $\underline{M}$, and $\underline{R}^{PV}$ are specific to the individual customer and $\underline{r}$ is a vector of retention *probabilities*. When applying the model to a pool of identical customers, we can refer to $\underline{r}$ as a vector of (expected) retention *rates*. Reichheld (1996) argues that retention rates and margins increase over the customer lifetime. This model is general enough to allow for such increases.

Before moving on to consider how improved retention increases these three expected values, we pause to consider the customer-value baseline used by Reichheld and Sasser (1990). Under the assumption that RS included allocated acquisition spending in their year-zero profit numbers, their percentage increases apply to expected *total* customer values (*ETCV*) that include both the initial purchase as well as allocated acquisition spending. In the context of our model, this represents a fourth customer-value metric:

$$ETCV = ECLV - A / a , \quad [4]$$

Note that *ETCV* is also equal to *EPLV/a*. Table 1 contains a summary of the four customer-value metrics we will examine.

*** Table 1 goes here *****

THE ELASTICITY OF VALUE TO RETENTION

To explore the economic impact of changing retention rates, we introduce parameter l , a multiplier applied to all retention rates. Since $\underline{r}$ represents the baseline time series of retention rates, the changed retention rates will be $l\ \underline{r}$.

Note that our model for changing retention rates is not consistent with the approach used by RS. Whereas here a l of 1.05 represents a five-percent increase in the baseline retention rates, RS ***added*** five percentage points to the weighted-average retention rate. We use l because it facilitates the algebra that follows and is consistent with the concept of elasticity. Because our purpose is to derive point elasticities (at l =1), we need not worry about the fact that the changed retention rates can exceed unity for large values of l . We also note that we intend to measure only the *benefits* of increased retention—recognizing that managers must compare those benefits to the costs required to increase retention.

Our approach ***is*** consistent with RS in that we examine the "accounting" effects of l on *ECFV*. Like RS, we simply change retention rates and recalculate customer value keeping everything else equal. Such an approach ignores dependencies that exist between $\underline{r}$, $\underline{M}$, and $\underline{R}^{PV}$ in the real world.

Expression [1] modified to include the l parameter is as follows

$$ECFV(b, l\underline{r}, \underline{M}, \underline{R}^{PV}) = \sum_{t=1}^{\infty} b^t (\prod_{s=1}^{t} l r_s)(M_t - R_t^{PV}),$$

which can be rewritten as

$$ECFV(b, l\underline{r}, \underline{M}, \underline{R}^{PV}) = \sum_{t=1}^{\infty} (lb)^t (\prod_{s=1}^{t} r_s)(M_t - R_t^{PV}). \quad [5]$$

Notice that parameter l plays the same role as parameter ß in expression [5]. In other words, increasing retention by one percent is equivalent economically to increasing the discount ratio by one percent (if we ignore the small effect ß might have on $\underline{R}^{PV}$).

For convenience we write

$$Elas_{ECFV} \equiv \frac{ECFV'}{ECFV},$$

where it is understood this is the elasticity and derivative with respect to l evaluated at l =1. This elasticity will measure the percentage increase in *ECFV* for a percentage increase in all retention rates. For convenience, we will call this a "retention elasticity."

Taking the first derivative of [5] with respect to l is straightforward, and after substituting one in for l and rearranging, we get an expression for *ECFV* retention elasticity:

$$Elas_{ECFV} = \sum_{t=1}^{\infty} t \times \frac{b^t (\prod_{s=1}^{t} r_s)(M_t - R_t^{PV})}{ECFV}. \quad [6]$$

Readers familiar with finance theory might notice that the right hand side of this equation represents the weighted average of the times of each expected cash flow—with weights equal to the proportion of *ECFV* accruing at each of the times. (To see this, think of the multipliers of *t* in [6] as weights. The sum of those weights will equal unity because the numerators in the weights sum to *ECFV* according to [1]. Thus, the right-hand-side of [6] represents the present-value-weighted length of the stream of expected cash inflows from the customer relationship.) Macaulay (1938) is credited with introducing the idea of the present-value-weighted time period measuring the "longness" or "duration" of a stream of future payments.

Hicks (1939) used the term "average period" to label this same concept. Hicks (1939) described the average period as

> the average length of time for which the various payments are deferred from the present, when the times of deferment are weighted by the discounted values of the payments.

Hicks also showed that the average period was a number equaling the elasticity of the present value of the payment stream with respect to the discount ratio ß.

Now we also see that Macaulay's duration (or Hick's "average period") is a number that equals the elasticity of *ECFV* with respect to retention. Of course, this also means that the elasticity of *ECFV* with respect to retention is equal to the elasticity of *ECFV* with respect to *ß*. This last equivalency follows directly from our earlier observation that parameter *l* plays the same role as parameter *ß* in expression [5].

This connection between *ECFV* retention elasticity and duration gives us another way to interpret *ECFV* retention elasticity. Customer relationships with high retention elasticities are those with high durations. Here "duration" can be interpreted both in the strict sense as a number defined by [6] and in the more general sense as the how long something will last. Consequently, the longer the expected customer relationship, the greater the percentage economic benefits from a percentage increase in retention (everything else equal).

The connection between *ECFV* retention elasticity and *ECFV* elasticity with respect to *ß* also offers some insights. Since elasticity with respect to *ß* measures the amount of interest rate risk assumed by the holder of a fixed-income asset such as a bond, the connection to retention elasticity suggests that firms might consider the "retention rate risk" they face if circumstances can cause expected retention rates to change. We will say more about the implications of the connections between retention elasticity, financial duration, and retention-rate risk in the Summary.

Because the other three customer-value metrics are linear functions of *ECFV*, absolute increases in *ECFV* due to increased retention are "passed through" to the other metrics in accordance with equations [2], [3], and [4]. If one is interested in percentage increases in the other three metrics, one can use the following equations for retention elasticity:

$$Elas_{ECLV} = \frac{Elas_{ECFV}}{1 + \dfrac{M_0 - R_0^{PV}}{ECFV}} \quad [7]$$

$$Elas_{EPLV} = Elas_{ETCV} = \frac{Elas_{ECFV}}{1 + \dfrac{M_0 - R_0^{PV} - A/a}{ECFV}} \quad [8]$$

Notice that *EPLV* and *ETCV* have identical retention elasticities. This is because the later is the former divided by the constant *a*. Notice also that *ETCV* retention elasticity will be higher than *ECFV* retention elasticity whenever $M_0 - R_0^{PV} - A/a$ is negative. In situations where the firm loses money on prospecting (i.e., when $M_0 - R_0^{PV} - A/a$ is negative), *ETCV* elasticity will be higher than *ECFV* elasticity. This helps explain the high percentage increases reported in the RSS (which used the *ETCV* baseline) for industries with relatively high acquisition costs.

NUMERICAL EXAMPLE

Consider a firm marketing a financial newsletter. The firm intends to spend $0.65 per name prospecting a direct-mail list from which they expect to convince 1.2 percent of the prospects to purchase a trial subscription. The firm will make $44.00 from the trial subscription and then spend a present value of $4.50 during the first year to attempt to renew the new customer. The probability the firm will renew the first-time customer is 50 percent and the margin received is $54.00. During the second period, the firm will again spend a present value of $4.50 trying to convert the customer to regular status. The firm will be successful with a probability of 75 percent and if so, receive a regular margin of $87.00. In all subsequent periods, retention spending will be $4.50 in present value, the renewal probability will be 90 percent, and the margin will be $87.00. For simplicity, we will ignore inflation and referrals and use a discount ratio of 0.90. (A discount ratio of 0.90 corresponds to a discount rate of $0.\overline{11}$.)

This financial newsletter example is one for which the general customer-retention model applies. Table 2 gives the relevant numerical values for each of the model inputs and the resulting expected values and elasticities.

*** Table 2 goes here ***

The expected lifetime value of a customer is $193.67 ($39.50 of which comes at t=0 with the initial purchase, and $154.17 comes from future expected purchases.) The $0.65 cost per prospect brings a 0.012 probability of acquiring a customer with the $193.67 expected value. The expected value per prospect is thus $1.67. The expected prospect lifetime value per acquired customer is $1.67/0.012 = $139.50, which we have also called the expected total customer value. (The $139.50 *ETCV* is also the $193.67 *ECLV* minus the allocated acquisition spending of $0.65/0.012 or $54.17.)

Table 2 also gives the elasticities of these expected values with respect to retention. A one percent increase in the 0.50, 0.75, and 0.90 retention rates will increase *ECFV* by approximately 5.50 percent, *ECLV* by approximately 4.38 percent, and *EPLV* and *ETCV* by approximately 6.08 percent.

Figure 1 helps illustrate the concept of duration. It charts the fraction of *ECFV* that accrues each period. For example, the expected present value of the cash flow at t=1 as a fraction of *ECFV* is $br_1(M_1 - R_1^{PV})/ECFV$ = 0.9(0.50)($54.0-$4.5)/*ECFV* = $22.275/$154.17 = 0.144. We calculated the fractions for other periods similarly and chart them in Figure 1. Because these fractions are positive and sum to unity, one can think of this as a probability mass function. The mean of this probability mass function is the "average period," or duration: 5.50 years in the current example. This duration is equal to the elasticity of *ECFV* with respect to retention.

*** Figure 1 goes here ***

A less sophisticated measure of the "longness" of the customer financial relationship is the 95th percentile of the probability mass function in Figure 1—roughly interpreted as the number of periods it takes for the firm to accrue 95 percent of *ECFV*. For the financial newsletter example, the 95th percentile is 15 years. It will take the firm 15 years to accrue 95 percent of the $154.17 *ECFV*.

A key finding of the Reichheld Sasser (1990) study was that retention rates increased over the lifetime of a customer relationship. Our numerical example captured that idea in that the retention rates increased from 0.50 to 0.75 to 0.90. To explore how the steepness of the retention rate pattern affects retention elasticity, we conducted two separate sensitivity analyses.

In the first, we systematically varied the initial retention rate r_1 (the 0.50 number in the base case), kept r_2 constant at 0.75, and adjusted the "eventual" retention rate $r_{3,4\ldots}$

so as to maintain a constant average retention rate. We define the average retention rate to be the ratio of the expected number of renewals over the lifetime of the relationship to the expected number of renewal opportunities. For the current situation,

$$\text{Average Retention Rate} = \frac{r_1 + r_1 r_2 + r_1 r_2 r_{3,4,..} + r_1 r_2 r_{3,4,..}^2 + ...}{1 + r_1 + r_1 r_2 + r_1 r_2 r_{3,4,..} + r_1 r_2 r_{3,4,..}^2 + ...}$$

$$= \frac{r_1 + r_1 r_2 /(1 - r_{3,4,..})}{1 + r_1 + r_1 r_2 /(1 - r_{3,4,..})}.$$

For the base case where $r_1 = 0.50$, $r_2 = 0.75$, and $r_{3,4...} = 0.90$, the average retention rate was 0.810. We selected the scenarios in Table 3 to maintain this 0.810 average retention rate while changing the initial and eventual retention rates.

*** Table 3 goes here ***

From Table 3 we see that steeper increases in the pattern of retention rates lead to longer duration (and higher retention-elasticity) relationships. This means that steeper increases in the pattern of retention rates lead to greater percentage gains from an across the board increase in retention. However, we also note that steeper increases in the pattern of retention rates (for a given average rate), result in lower-value relationships. Therefore, although steeply increasing retention rate patterns present greater opportunities for percentage gains due to increased retention, they also mean less valuable relationships to begin with.

Our second sensitivity analysis also looked at the effect of the pattern in retention rates, but now holding *ECFV* constant. We systematically varied $r_{3,4,...}$ and adjusted r_1 so as to keep *ECFV* equal to $154.17, the value in the base case. Table 4 displays the results. As in Table 3, duration increases with the steepness of the retention rate pattern. Now we also see that steeper retention rate patterns require higher average retention rates in order to maintain the same *ECFV*.

*** Table 4 goes here ****

To illustrate the effect of including allocated acquisition costs in the initial customer cash flow, we systematically varied *a* (the acquisition rate) from 0.0035 to 0.018 in our third and final sensitivity analysis. Recall that the baseline used *a*=0.012 resulting in an *EPLV* (*ETCV*) elasticity of 6.08. In Figure 2 we ignore the elasticities of *ECFV* and *ECLV* because they are unaffected by *a*. Figure 2 only charts $Elas_{EPLV}$. As *a* approaches break-even from above (calculated as *A/ECLV* = $0.65/$193.67 = 0.0034), $Elas_{EPLV}$ goes to infinity. The interpretation is that as the cost to acquire a new customer approaches the expected value of that new customer, expected prospect lifetime value (or expected total customer value) approaches zero. When the expected value of a prospect is close to zero, improvements in retention have a huge percentage effect on value. The implication is that for firms scraping the bottom of the barrel for new customers, improvements in retention can have a huge percentage impact on expected value per prospect and total customer value (including allocated acquisition spending)—even though the percentage affect the value of current customers may be relatively small.

*** Figure 2 goes here ***

ELASTICITIES OF VALUE TO RETENTION WHEN MARGINS, RETENTION SPENDING AND RETENTION RATES ARE CONSTANT

Equations [6], [7], and [8] are the elasticities of value to retention for the general customer-retention model in which margins, retention spending, and retention rates vary throughout the lifetime of the relationship. At the other extreme, consider a situation where all three of these are constant. This is the situation considered by Blattberg and Deighton (1996) who derived an expression for *EPLV* equivalent[1] to the following:

$$EPLV = a(M - R^{PV})(\frac{1}{1-br}) - A,$$

where *M* refers to the constant margin received per period, R^{PV} refers to the present value at the beginning of the period of the retention spending within each period, and *r* refers to

[1] Retention spending *R* in the Blattberg and Deighton (1996) model occurs at the end of each period. In such a situation R^{PV} will equal *ßR*.

the constant retention rate. Gupta and Lehman (2003) address this same situation and provide an equation for *ECFV* equivalent to the following

$$ECFV = (M - R^{PV})(\frac{br}{1-br})$$

as part of their research linking customer and firm value.

The three elasticities for this constant customer relationship are as follows:

$$Elas_{ECFV} = \frac{1}{1-br} \quad [9]$$

$$Elas_{ECLV} = \frac{br}{1-br}. \quad [10]$$

$$Elas_{EPLV} = Elas_{ETCV} \frac{\frac{br}{1-br}}{1-(\frac{A/a}{M-R})(1-br)} \quad [11]$$

Given the constant margin/spending/retention rate assumptions, all active customers are identical. Thus [9] refers to the elasticity of the expected value of a current customer, regardless of tenure, right after she makes a purchase. Equation [10] is the elasticity of the expected value of an active customer (regardless of tenure) right before a purchase. Equation [11] is both the elasticity of the expected value of a prospect and the elasticity of the total expected value of a new customer net of allocated acquisition spending.

From [9] we see that the elasticity of current customers increases with *r*. This is consistent with the connection between duration and retention elasticity. The higher the *r*, the higher is the percentage of expected present value that comes from later periods. From [11] we see that prospect elasticity and *ETCV* elasticity are affected by prospecting economics. As the acquisition rate falls (everything else equal) *EPLV* and *ETCV* approach zero, and increases in retention have huge *percentage* effects on both.

To this point, our approach to measuring and understanding the economic benefits of increased retention has been to examine point elasticities. While popular with academics and mathematically attractive, point elasticities measure only the instantaneous change in value for a small change in retention. Managers are often more likely to think in terms of improvements designed to add some finite number of percentage points to the firm's baseline retention rates. Indeed, this is the language used in the RSS.

To supplement our understanding of the economic benefits of increased retention, Table 5 reports the percentage increase in *ECFV* resulting from a five percentage-point addition to retention for the constant customer-retention situation with *M-R* = \$100.00 and *ß*=0.90. Also included in this table are *ECFV*, duration, and the 95th percentile—all as a function of retention probability *r*.

*** Table 5 goes here***

From the third column of Table 5, we see that the percentage increases in *ECFV* from adding five percentage points to *r* are relatively stable. Between *r* = 0.30 and *r* = 0.75, the increase in *ECFV* from adding 0.05 to *r* is surprisingly close to 20%. Only for *r* -values below 0.25 and above 0.80 do the percentage increases in *ECFV* from adding 0.05 to *r* exceed 30.

In contrast, point *ECFV* retention elasticities start at much lower values and increase rapidly at higher retention rates. This is a consequence of the nonlinear and accelerating relationship of *ECFV* to retention. Each percentage point increase in retention brings an increasing percentage increase in *ECFV*. Along with this accelerating increase in *ECFV*, however, comes a corresponding "lengthening" of the financial relationship. With an annual retention rate of 80 percent, the duration of the relationship is 3.57 years and it takes 10 years for the firm to accrue 95% of *ECFV*.

SUMMARY

The purpose of this paper is to help managers measure and better understand the economic benefits of improved customer retention. The RSS that "reducing defections by 5% boosts profits 25% to 85%" helped convinced many mangers and business consultants of the importance of improved customer retention. Although no one doubts that improved customer retention is a good thing, it is important to know exactly how much of good thing it is. The paper argues that in order to make informed CRM investment decisions, managers need more than the simple RSS. Managers need to know which of the reported percentage increases apply to their customer relationships. They also need to recognize to what customer-value metric the reported increases apply.

To answer these questions and help quantify the benefits of increased retention, we derive a formula for the elasticity of *ECFV* with respect to retention for a general customer-retention situation. We focus on *ECFV* because it is the only component of customer value contingent on retention. This equation will assist the firm in constructing estimates of the economic benefits from increased retention tailored to the specific nature of the firm's customer and prospect relationships.

The paper shows that the percentages reported in the RSS apply to the expected value of customers after accounting for allocated acquisition spending. In situations (such as credit cards) where firms lose money on prospecting, we show that the percentage increases reported in the RSS overstate the percentage increases firms should expect from their existing customer relationships.

The elasticity equations for a general customer-retention relationship also allow us to identify the drivers of retention elasticity and thus develop a better understanding of the conditions under which improved retention is most important. Particularly helpful in achieving this better understanding is the finding that *ECFV* retention elasticity is a number equal to the financial duration of the customer relationship. Retention elasticity is highest in situations of high duration—those in which the components of expected

present value are relatively back loaded. High retention rates, retention rates increasing with tenure, and margins increasing with tenure all lead to higher duration relationships and higher retention elasticities.

The equivalence between *ECFV* retention elasticity and the financial duration of the customer relationship also offers a new perspective for interpreting retention elasticity. The duration of a bond is equal to the elasticity of the bond's value with respect to the discount ratio. It is a measure of the interest-rate risk assumed by the bondholder. The higher the bond's duration, the more the bond's value changes in response to changes in interest rates. Thus, bond duration measures of the volatility of the bond's value. The duration of a customer relationship also measures the sensitivity of the value of the relationship to changes in either the discount ratio or, as we have shown, the expected retention probabilities. While the RSS helped convince managers of the benefits of increased retention, this connection to discount-ratio elasticity might also get them to think about the consequences of decreased retention rates. High retention elasticities are a good thing only if expected retention rates go up. If circumstance can cause expected rates might also fall, then retention elasticity measures one source of risk associated with customer relationships. In our opinion, accounting for risk in the valuation of customer relationship is a topic that deserves more attention.

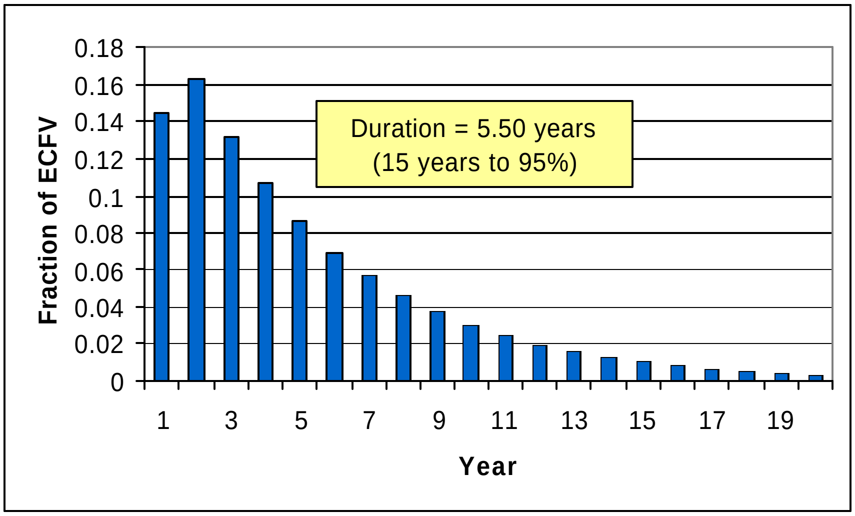

Figure 1. The Duration of the Customer Asset as the Weighted-Average Period.

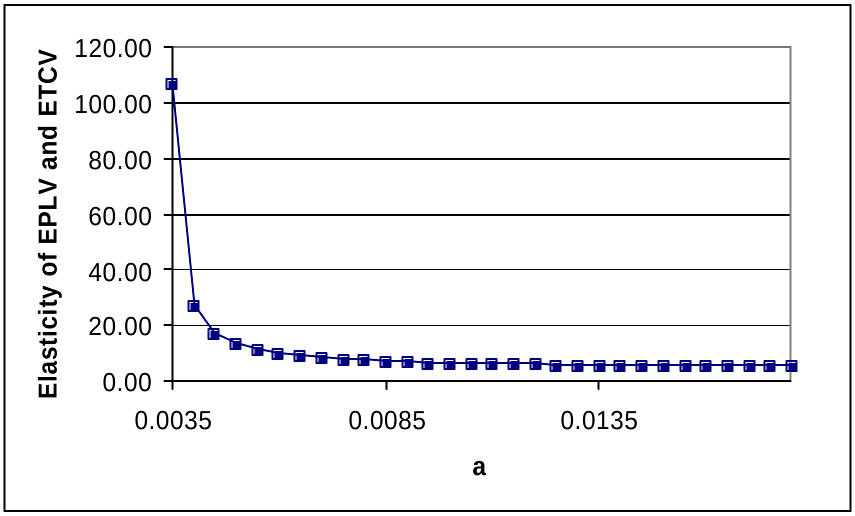

Figure 2. *EPLV* and *ETCV* Retention Elasticity as a Function of the Acquisition Probability

Customer Value Metric	Equation
ECFV	$ECFV(b, \underline{r}, \underline{M}, \underline{R}^{PV}) = \sum_{t=1}^{\infty} b^t (\prod_{s=1}^{t} r_s)(M_t - R_t^{PV})$ [1]
ECLV	$ECLV = M_0 - R_0^{PV} + ECFV$ [2]
EPLV	$EPLV = aECLV - A$ [3]
ETCV	$ETCV = ECLV - A / a$ [4]

Table 1. Customer-Value Metrics for a General Customer-Retention Model

Input Variable	Equation	Value
M_0		\$44.00
M_1		\$54.00
$M_{2,3,...}$		\$87.00
$R_{0,1,...}^{PV}$		\$4.50
r_1		0.50
r_2		0.75
$r_{3,4,...}$		0.90
a		0.012
A		\$0.65
ß		0.90
Output Variable	**Equation**	**Value**
ECFV	[1]	\$154.17
ECLV	[2]	\$193.67
EPLV	[3]	\$1.67
ETCV	[4]	\$139.50
$Elas_{ECFV}$	[6]	5.50
$Elas_{ECLV}$	[7]	4.38
$Elas_{EPLV}$ and $Elas_{ETCV}$	[8]	6.08

Table 2. Numerical Example Model Inputs and Results

r_1	r_2	$r_{3,4,...}$	**Average *r***	***ECFV***	$Elas_{ECFV}$	**95th Percentile**
0.10	0.75	0.982	0.810	$ 47.56	8.80	25
0.20	0.75	0.963	0.810	$ 84.09	7.71	22
0.30	0.75	0.943	0.810	$112.76	6.83	19
0.40	0.75	0.922	0.810	$135.66	6.11	16
0.50	0.75	0.900	0.810	$154.17	5.50	15
0.60	0.75	0.877	0.810	$169.28	4.99	13
0.70	0.75	0.852	0.810	$181.69	4.55	12

Table 3. Sensitivity Analysis for the Numerical Example: Varying Steepness of the Retention Rate Pattern While Maintaining Constant Average Retention

r_1	r_2	$r_{3,4,...}$	**Average *r***	***ECFV***	$Elas_{ECFV}$	**95th Percentile**
0.282	0.75	1.00	NA	$154.17	10.184	29
0.395	0.75	0.95	0.863	154.17	7.109	20
0.500	0.75	0.90	0.810	154.17	5.503	15
0.598	0.75	0.85	0.782	154.17	4.520	12
0.690	0.75	0.80	0.766	154.17	3.860	10
0.776	0.75	0.75	0.756	154.17	3.387	8

Table 4. Sensitivity Analysis for the Numerical Example: Varying Steepness of the Retention Rate Pattern While Maintaining Constant *ECFV*

r (retention probability)	***ECFV***	**Increase in *ECFV* for a five-point increase in retention**	**DURATION** (point *ECFV* retention elasticity)	**95th PERCENTILE** (Number of periods to achieve at least 95% of *ECFV*)
0%	$ 0.00	Infinite%	1.0	N/A
5%	4.71	109.9%	1.0	1
10%	9.89	57.8%	1.1	2
15%	15.61	40.7%	1.2	2
20%	21.95	32.3%	1.2	2
25%	29.03	27.4%	1.3	3
30%	36.99	24.3%	1.4	3
35%	45.99	22.3%	1.5	3
40%	56.25	21.0%	1.6	3
45%	68.07	20.2%	1.7	4
50%	81.82	19.8%	1.8	4
55%	98.02	19.8%	2.0	5
60%	117.39	20.1%	2.2	5
65%	140.96	20.8%	2.4	6
70%	170.27	22.0%	2.7	7
75%	207.69	23.8%	3.1	8
80%	257.14	26.6%	3.6	10
85%	325.53	31.0%	4.3	12
90%	426.32	38.3%	5.3	15
95%	589.66	52.6%	6.9	20
100%	900.00	N/A	10.0	29

Table 5. *ECFV*, Percent Increase in *ECFV* at *r*+0.05, Duration, and 95th Percentile as a Function of *r* for a Constant Customer-Retention Relationship with *M-R* = $100.00 and *ß*=0.90.

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