Customer Lifetime Value (CLV)

This module covers the concepts of CLV, CLV Remaining, retention rate, attrition rate, discount rate, churn rate, and customer acquisition and related costs.

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Marketing Metrics Reference: Chapter 5

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Not All Customers Are Alike!

One can improve firm performance by treating different categories of customers differently, and developing relationships accordingly.

The first thing we will find is that all customers are not alike. A small number are very, very profitable. Some others may be decidedly unprofitable.
Customer Lifetime Value (CLV)

Just like we use NPV to evaluate investments and companies, we use CLV to evaluate customer relationships.

CLV is the expected NPV of the cash flows from a customer relationship.

Definition

The CLV of a customer is defined as the discounted sum of all future customer revenue streams minus product and servicing costs and remarketing costs. Sometimes this is also called “customer equity”.

So far we have talked about estimating CLVs using revenue and cost data from individual customers.

It is also possible to build models of customer relationships with the objective of estimating CLV.

We set out now to describe perhaps the simplest of all CLV models:

The situation is one in which the customer either purchases or does not purchase each period. The first time the customer does not purchase, the customer is considered “lost for good.” Thus the model better applies to telephone long distance, ISPs, and magazines. It does not apply to catalog firms, however, where customers purchase intermittently.
Modeling CLV: A Simple CLV Model

ASSUMPTIONS:

<table>
<thead>
<tr>
<th></th>
<th>Contribution per period from active customers. Contribution = Sales Price – Variable Costs*</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M</td>
<td>Contribution per period from active customers. Contribution = Sales Price – Variable Costs*</td>
</tr>
<tr>
<td></td>
<td>*be careful not to double count variable costs of retention spending if they have been included below in $R</td>
</tr>
<tr>
<td>$R</td>
<td>Retention spending per period per active customer.</td>
</tr>
<tr>
<td>r</td>
<td>retention rate (fraction of current customers retained each period)</td>
</tr>
<tr>
<td>d</td>
<td>discount rate per period</td>
</tr>
</tbody>
</table>

Definition

CLV = [$M - $R] × [(1 + d) / (1 + d - r)]
A Simple CLV Model

With a little algebra, someone came up with a formula for the NPV of these expected cash flows.

\[
\text{CLV} = [M - R] \times \frac{(1+d)/(1+d-r)}
\]

This situation is simple enough that a FORMULA for the NPV of these cash flows is obtainable. The NPV of the cash flows is the CLV of the customer relationship.

This formula applies to a situation in which the company estimates the value of a newly acquired customer. This value might be used to limit the cost of acquiring a new customer.

**EXPECTED CASH FLOWS**

<table>
<thead>
<tr>
<th>t=0</th>
<th>$M - R</th>
</tr>
</thead>
<tbody>
<tr>
<td>t=1</td>
<td>r [$M - R]</td>
</tr>
<tr>
<td>t=2</td>
<td>r² [$M - R]</td>
</tr>
<tr>
<td>t=3</td>
<td>r³ [$M - R]</td>
</tr>
<tr>
<td></td>
<td>etc.</td>
</tr>
</tbody>
</table>
Two Variations on the CLV Formula

1. The value of customers we anticipate acquiring and from whom we will receive an initial margin at the beginning of the customer relationship. Unlike other CLV formulas you may see, this one does NOT include acquisition cost. Hence it can be used to evaluate how much one would spend to acquire these customers.

\[
CLV = (M - R) \frac{1 + d}{1 + d - r}
\]

2. The value of (a) customers that we have already acquired (but are subject to being lost before we receive another margin, (b) customers that we intend to acquire with a free trial (no initial margin and may not be retained), or (c) customers for whom the initial margin was discounted and included in the acquisition cost. It is probably not obvious, but the difference between the two is a single, foregone \((M - R)\). We will refer to this as CLVrem (CLV remaining).

\[
CLV_{rem} = (M - R) \frac{r}{1 + d - r}
\]
Other Notes on CLV

1. Be sure to use equivalent periods for retention rates, margins, retention spending, and discount rates.

2. Convert annual discount rates to monthly or vice versa as needed.
   Effective rate for period = \((1 + \text{annual rate})^{(1 / \# \text{ of periods})} - 1\)
   Monthly rate = \((1 + \text{annual rate})^{(1/12)} - 1\)
   Quarterly rate = \((1 + \text{annual rate})^{(1/4)} - 1\)
   Annual Rates = \((\text{monthly rate} + 1)^{(12)} - 1\)

3. Retention rates = 1 - attrition rates and vice versa. Note also that attrition rate is sometimes referred to as the “churn rate”.

4. Convert annual retention rates to monthly or vice versa as needed.
   Effective rate for period = \(\text{annual rate}^{(1 / \# \text{ of periods})}\)
   Monthly rate = \(\text{annual rate}^{(1/12)}\)
   Quarterly rate = \(\text{annual rate}^{(1/4)}\)
   Annual Rates = \(\text{monthly rate}^{(12)}\)
5. If customers pay monthly and have the option of canceling each month, use a monthly model. If they have annual contracts and pay monthly, it is a little trickier—you need to use the NPV of the monthly payments in a annual model of retention.

6. Use the time period in which “retention happens” for CLV analysis

Although we can use the formulas on previous slide – to convert discount rates and retention rates from one period to another, the choice of which period to use to calculate CLV is not arbitrary.

The period used to calculate CLV must match the period over which customers decide to remain or leave. If customers can leave (and quit paying) at the end of each month, then you should use a monthly CLV calculation (converting annual retention rates and discount rates to their equivalent monthly rates, if necessary).

Hybrid models: It will sometimes be the case that customer payments and retention spending do not match the period with which customers churn. Customers may sign annual contracts, for example, with payments made each month. In those cases, you will want to first discount the 12 monthly payments to find the annual present value equivalent for use in an annual CLV calculation. The assumption here is that each successful annual renewal obligates the customer to 12 monthly payments. See the next slide for an example.
Example: CLV with monthly customer revenue and annual retention decisions:

- If customers pay monthly, but have annual contracts, you will need a hybrid CLV model.
- Example: customers pay $10 a month for a pest control service with an annual contract. The annual discount rate is 15% and annual retention rates are 80%. What is the CLVrem?
- First we convert 15% annual to a monthly rate of 1.1715% 

\[
P_{V_m} = \text{Annual PV of monthly payments} \\
= 10 \times (1-(1+.011715)^{-12}) / (.011715) \\
= \$111.34
\]

\[
CLV = P_{V_m} \times (.8) / (1+.15 -.8) \\
= \$254.49
\]
Example 1

Here is a numerical example that will help you check your understanding of this simplest CLV model:

An Internet Service Provider charges $19.95 per month. Variable costs are about $1.50 per account per month. With marketing spending of $6 per year, their attrition is only 0.5% per month.

At a monthly discount rate of 1%, what is the CLV of a customer we intend to acquire?

\[ M = 19.95 - 1.50 = 18.45 \]
\[ R = 6/12 = 0.50 \]
\[ r = 0.995 \]
\[ d = 0.01 \]

See next slide for solution . . .
Example 1 (Solution)

CLV = (M - R) x [(1 + d)/(1 + d - r)]

CLV = [$18.45 - $0.5] x [(1+.01)/(1+.01-0.995)]
CLV = [$17.95] x [67.333]
CLV = $1,209

The resulting figure of $1,209 is composed of two terms: the net contribution per period of $17.95 and a multiplier of 67.3. This multiplier is a function of the retention rate and the discount rate. The high retention rate produced this high multiplier of 67.3 leading to the relatively high CLV of $1,209.

While the ISP only makes $17.95 per period, the discounted value of the expected "annuity" of these payments total 67.3 times the per period amount.
Consider a Proposed Change

If the firm cuts retention spending from $6 to $3 per year, they expect attrition will go up to 1% per month. Should they do it?

Don’t move to the next slide until you have an answer.
To decide, we need to recalculate CLV under these new assumptions. If the new CLV is higher, we should do it. Otherwise, we should not.

While there are other ways to analyze this proposed change, one simple way would be to simply recalculate CLV for the new situation.
Example 2

An Internet Service Provider charges $19.95 per month. Variable costs are about $1.50 per account per month. With marketing spending of $3 per year, their attrition will be 1% per month.

At a monthly discount rate of 1%, what is the CLV of a customer?

\[ M = 19.95 - 1.50 = 18.45 \]
\[ R = \frac{3}{12} = 0.25 \]
\[ r = 0.99 \]
\[ d = 0.01 \]

See next slide for solution . . .
Example 2 (Solution)

\[
\text{CLV} = [\text{\$M} - \text{\$R}] \times \left[\frac{1 + d}{1 + d - r}\right]
\]

\[
\text{CLV} = [\text{\$18.45 - \$0.25}] \times \left[\frac{1+.01}{1+.01-0.99}\right]
\]
\[
\text{CLV} = [\text{\$18.2}] \times [50.5]
\]
\[
\text{CLV} = \text{\$919}
\]

Completing the calculation shows that the new CLV would be $919.

The new CLV is LOWER. The savings in retention spending is NOT worth the increased attrition. The firm should stick with the $6 retention spending. Since $919 is LESS than $1,209, the proposed change is not attractive.

Note: in this case you could have used either CLV or CLVrem formula to make the decision. The difference between the two is negligible.
Example 3

Company A’s Web site charges a subscription fee of $19.95 per month. The sum of variable and retention costs is about $10.00 per account per month.

If the CLV of each *newly acquired customer* is $200, what must be the monthly customer retention rate?

Assume a monthly discount rate of 1% and a constant renewal rate.

\[ M - R = 19.95 - 10.00 \]

\[ M - R = 9.95 \]

\[ d = 0.01 \]

\[ CLV = 200 \]

\[ r = ? \]

Instead of algebra, you can use a spreadsheet to solve this problem.

*See next slide for solution . . .*
Example 3 (Solution)

CLV = \([M - R] \times \left( \frac{1 + d}{1 + d - r} \right)\]

\[1 + d - r = \left( \frac{M - R}{CLV} \times \frac{1 + d}{CLV} \right)\]

\[1.01 - r = [9.95] \times [1.01] / 200\]

\[1.01 - r = 0.05\]

\[r = 0.959….\text{rounding to .96}\]

In this case, we will get (almost) the same answer using the CLVrem formula for current customers. See the next slide for that approach.
The CLVrem formula (Example 3)

CLVrem = [$M - $R] x [(r/(1+d-r)]

1+d-r = [$M - $R] x [r/CLVrem]

1.01-r = 9.95 x r/200
202 –200r = 9.95r
209.95r = 202

r = .962 ..rounding to .96
Example 4

A wine-of-the-month club estimates that the CLV of their average current customer is $250.

If their annual attrition rate is 0.36 and their monthly retention spending equals $5 per customer, what must be the monthly dollar contribution per customer? Assume a monthly discount rate of 1% and a constant renewal rate.

\[ M = ? \]

\[ R = 5 \]

\[ d = 0.01 \]

\[ CLV = 250 \]

\[ r = (1 - 0.36)^{(1/12)} = 0.963 \]

See next slide for solution . . .
Example 4 (solution)

\[
CLV_{rem} = [M - R] \times \frac{r}{(1 + d - r)}
\]

\[
M = R + CLV_{rem} \times \frac{(1 + d - r)}{r}
\]

\[
M = 5 + 250 \times \frac{(1.01-0.963)/0.963]}{12.20}
\]

\[
M = 5 + 12.20
\]

\[
M = 17.20 = \text{Contribution per customer}
\]

In this instance you would have gotten a slightly different answer if you had used the formula for newly acquired customer.