On Modeling and Maximizing Online Customer Group Value

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Abstract. This study aims to examine the online customer group value, it proposes a novel approach to maximize customer value. Based on the concept of online customer group value was defined, the life time value of online customer was systematic described and analyzed. Subsequently, an evaluation index system of online customer value is established in the online P2P lending context. Then an online customer evaluation model was built on the basis of the grey system theory. The model solved the problem with complex structure of factors. Customer group value is different from an independent customer value, and was usually defined as the profits created by a group of customers with the same or similar properties in the whole lifetime maintaining customer relationships with the online services provider. From the perspective of the life cycle, it is consisted by the current value and future value, and the composition of the future value is differentiated with a single customer since the number of customers in a group is dynamically increasing or decreasing. The evaluation model was applied to the analysis of online customer group value of a typical online P2P financial website.

Introduction

The popularity of online business is growing with every passing day. With the development of information and communication technology, as well as the continuous improvement of network infrastructure, online customer has greater fluidity and uncertainty than traditional customer. Based on the increasing amount of online applications customers, the financial industry has entered the era of the Internet and e-commerce. Online P2P lending, as one of the representatives in the emerging field of Internet finance has developed rapidly and has gradually been accepted by the public in the online era. In recent years, due to the birth of a large number of peer-to-peer financial service websites, the competition has become increasingly fierce. Homogenization of the business mode, has led to many peer-to-peer online lending platform forced to be closed down. Customers are the core resources to maintain the survival and development of online P2P lending websites. Research on the customer behavior and customer value of online P2P lending websites has highly practical significance for business decision-making of online P2P financial enterprises [1, 2].

This research describes how the value of online customer group can be estimated and maximized. The evaluation model of online customer group value is set up, and a new approach is proposed to maximize the value via an empirical analysis on online P2P lending websites.

Literature Review

Online Customer Value

Online customer value constructed by three parts is a complete unit: historical value, current value and future potential value.

Historical value can be got the historical value according to the analysis of the consuming behavior data. The general statistical methods can be used to analysis the data.

Current value refers to the net profit value that brought by the online customers in a transaction cycle to service providers.

Potential value in the future refers to net profit produced by the online customers during the rest of its life cycle.
Online customer value is equal to customer profitability plus the potential profits and then minus cost for customers. If we use the term of gross profit, the customer value is equal to the period customer profitability plus profit potential \([3, 4]\). Online customer value comes mainly from the period of service consumption and the future service expectation. The historical value and current value of consumption are generated in the period of service consumption, and future value is generated in the period of future service expectation. This study established online customer lifecycle value model as follows \([2]\):

\[
CLV_i = \sum_{t=0}^{N_i} \pi_p(t_i)(1+d)^{N_i-t_i} + \pi_n(N_i) + \sum_{t=N_i+1}^{N_i+E_i} \pi_r(t_i) + B(t_i)
\]

- \(t_i\) stands for service period corresponding to individual consumer \(i\);
- \(N_i\) stands for service period corresponding to individual consumer \(i\) by now;
- \(D\) stands for discount rate;
- \(E(i)\) stands for the expected value of future service period to customer \(I\);
- \(\pi_p(t_i)\) stands for history profit contribution of consumer \(i\) at the time \(t_i\);
- \(\pi_n(N_i)\) stands for profit contribution of consumer \(i\) at the current time;
- \(\pi_r(t_i)\) stands for profit contribution in the future of consumer \(i\) at time of \(t_i\);
- \(B(t_i)\) stands for additional profit contribution of consumer \(i\) at time of \(t_i\).

As the calculation of the profit contribution value of online customer is based on service consumption, while the calculation of service consumption is based on consuming objects and process, therefore, the calculation of the online customer profitability is actually an assorted calculation.

Customer group generally refers to a set of customers with the same or similar characteristics. Attribute selection depends on the research needs, choose a different customer attribute may produce different customer group classification.

Online customer group value is not a simple superposition of multiple independent customer value, the calculation method is different.

Under the e-commerce environment, there are many standards to segment customer, such as age, gender, income, occupation, personality characteristics, consumption, customer consumption preference and customer online social relationships. Enterprises can divide customers into several categories according to these information.

**Grey System Theory**

The grey system refers to the part information is known and some unknown information system, according to the amount of uncertainty, using grey mathematical method to quantify. Subsequent research fuzzy mathematics is used to study the things that there is no clear boundaries, and with experience with the aid of the membership function and processing, and the grey system theory is that the amount of uncertainty is grey number, using the grey mathematics to deal with the amount of uncertainty, also can make the uncertainty to be good \([5]\).

Grey system mainly has the following characteristics. Make full use of system information known to discover the laws of motion system. The key of grey system theory mainly includes two aspects: one is how to deal with the grey element, the second is how to guide the grey system in the structure, model, correlation from gray to white, making the system more whiter, modeling and optimization.

The main research contents include: grey system theory of modeling theory, control theory of grey system, grey forecasting method, grey correlation analysis method, the grey planning method, the grey decision method, etc.

Information of the grey system is often part clear, and some are not clear; you can discuss USES the grey correlation analysis method, using the correlation degree to describe the link between the various information order. Grey correlation analysis method is essentially the analysis of the correlation coefficient, first ask the various solutions and is composed of the best indicators of ideal correlation coefficient, the correlation coefficient often depends on the size of the correlation in sorting, analysis, solution related conclusions.
Research Method

Online customer value evaluation is a systematic project, it can be regarded as a system. From the perspective of the structure of online customer value evaluation index system, with some characteristics of gray system, it has a good adaptability to use the grey correlation analysis method to evaluate value of online customer group [6, 7].

In the Internet environment, many factors affect the value of online customer group and its structure is complicated, when evaluate the customer value, often can only choose some of the major indicators for analysis; In addition, the selection of a lot of evaluation index data, some of which are known from the history of online service providers in the database, and some of the indicators is unable to gain or obtain because it is high cost [2, 8]. Therefore, the evaluation information system has the characteristics of gray, so using the theory of grey system to study has good feasibility.

According to the analysis of the online service providers’ needs and the attribute, customer groups can be divided. To evaluate their value, the hierarchical structure model was often constructed [2,9].

Then, we can collect the original data calculation of relevant indicators required from the online service providers historical customer database, processing the data, calculate the actual value of the index [10]. The evaluation of the M group as a row of the matrix vector, the online customer value evaluation of the selected n index as the column vector of evaluation matrix, To construct an evaluation matrix \( X = (X_{ij})_{m \times n} \), index value is \( X_{ij} \) (1 \( \leq I \leq m \), 1 \( \leq J \leq n \))

\[
X = \begin{bmatrix}
X_1 \\
X_2 \\
X_3 \\
... \\
X_m
\end{bmatrix} = \begin{bmatrix}
x_{11} & x_{12} & x_{13} & x_{14} & ... & x_{1n} \\
x_{21} & x_{22} & x_{23} & x_{24} & ... & x_{2n} \\
x_{31} & x_{32} & x_{33} & x_{34} & ... & x_{3n} \\
... & ... & ... & ... & ... \\
... & ... & ... & ... & ... \\
... & ... & ... & ... & ... \\
x_{m1} & x_{m2} & x_{m3} & x_{m4} & ... & x_{mn}
\end{bmatrix}
\]

In the evaluation index, the scope of each data sequence is different, and different dimensions are not comparable, to normalize process of data sequences, thus make it fall within the interval [0, 1], and to ensure each index in the evaluation matrix and the value of online customers are related, using the linear interpolation method to deal with sample data.

Measurement and Results

In this paper, we choose the Lending Club, one of the typical P2P lending platforms as empirical research object, establish model of online customer value evaluation based on grey correlation analysis, give comparative study of different customer groups.

Lending Club is a private borrowing platform for users, users can realize small borrowing or lending through this platform. Lending Club website customer groups are shown as Table 1.

<table>
<thead>
<tr>
<th>Goal of loan</th>
<th>Total number of loan</th>
<th>The ratio in total loan number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>19071925</td>
<td>1.23%</td>
</tr>
<tr>
<td>Credit card</td>
<td>293551125</td>
<td>18.86%</td>
</tr>
<tr>
<td>Debt consolidation</td>
<td>933233800</td>
<td>59.97%</td>
</tr>
<tr>
<td>Home improvement</td>
<td>91369775</td>
<td>5.87%</td>
</tr>
<tr>
<td>House</td>
<td>14523275</td>
<td>0.93%</td>
</tr>
<tr>
<td>Major purchase</td>
<td>35229150</td>
<td>2.26%</td>
</tr>
<tr>
<td>Medical</td>
<td>12372750</td>
<td>0.80%</td>
</tr>
<tr>
<td>Moving</td>
<td>7637275</td>
<td>0.49%</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>1785075</td>
<td>0.11%</td>
</tr>
</tbody>
</table>
The weighted grey correlation evaluation sequence and ideal sequences, and the present value, future value, credit value, growth, value of the weighted grey correlation degree, the results as shown in Table 2.

Table 2. Lending Club grey correlation degree of customer value.

<table>
<thead>
<tr>
<th>Customer group</th>
<th>Customer group value</th>
<th>Current value</th>
<th>Future value</th>
<th>Credit value</th>
<th>Growth value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>0.550</td>
<td>0.399</td>
<td>0.686</td>
<td>0.621</td>
<td>0.836</td>
</tr>
<tr>
<td>Credit Card</td>
<td>0.519</td>
<td>0.510</td>
<td>0.527</td>
<td>0.586</td>
<td>0.392</td>
</tr>
<tr>
<td>Debt Consolidation</td>
<td>0.718</td>
<td>0.930</td>
<td>0.526</td>
<td>0.527</td>
<td>0.523</td>
</tr>
<tr>
<td>Home Improvement</td>
<td>0.567</td>
<td>0.420</td>
<td>0.701</td>
<td>0.759</td>
<td>0.568</td>
</tr>
<tr>
<td>House</td>
<td>0.527</td>
<td>0.435</td>
<td>0.610</td>
<td>0.613</td>
<td>0.603</td>
</tr>
<tr>
<td>Major purchase</td>
<td>0.530</td>
<td>0.402</td>
<td>0.647</td>
<td>0.652</td>
<td>0.634</td>
</tr>
<tr>
<td>Medical</td>
<td>0.461</td>
<td>0.432</td>
<td>0.488</td>
<td>0.491</td>
<td>0.482</td>
</tr>
<tr>
<td>Moving</td>
<td>0.512</td>
<td>0.441</td>
<td>0.577</td>
<td>0.584</td>
<td>0.561</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>0.514</td>
<td>0.436</td>
<td>0.584</td>
<td>0.515</td>
<td>0.742</td>
</tr>
<tr>
<td>Small business</td>
<td>0.526</td>
<td>0.477</td>
<td>0.571</td>
<td>0.639</td>
<td>0.414</td>
</tr>
<tr>
<td>Vacation</td>
<td>0.488</td>
<td>0.424</td>
<td>0.546</td>
<td>0.468</td>
<td>0.723</td>
</tr>
<tr>
<td>Wedding</td>
<td>0.516</td>
<td>0.454</td>
<td>0.572</td>
<td>0.611</td>
<td>0.482</td>
</tr>
<tr>
<td>Other</td>
<td>0.444</td>
<td>0.453</td>
<td>0.436</td>
<td>0.481</td>
<td>0.333</td>
</tr>
</tbody>
</table>

Using SPSS statistical software to do Ward clustering analysis, the former 12 customers as 12 samples, each sample contains nine indicators, according to the data have been normalized processing system to do clustering analysis, clustering process as shown in Figure 1.
Through Ward clustering analysis, as a result, segmentation of 12 customer group is divided into three categories according to the loan purpose.

Table 3. Lending Club customer classification result.

<table>
<thead>
<tr>
<th>Category</th>
<th>The structure of customer group</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Debt consolidation, Credit Card</td>
</tr>
<tr>
<td>II</td>
<td>Car, Major purchase, House, Home improvement, Renewable energy</td>
</tr>
<tr>
<td>III</td>
<td>Moving, Medical, Vacation, Wedding, Small business</td>
</tr>
</tbody>
</table>

Online customer value evaluation model based on grey correlation analysis calculate the weighted grey correlation degree, the 13 customers group which is divided according to the client borrowing purpose, based on results of calculating the grey correlation degree, the comparison value, the 13 customer groups in Figure 2 is a customer group value of grey correlation degree sorting line chart.

Discussion

According to grey relation analysis and system clustering analysis it is concluded that the current Lending Club 12 customer group can be divided into the following three categories [11, 12].

Group I: including Debt consolidation (Debt repayment) and Credit card (Credit card) two customer groups, from the point of future value, facing the credit risk and growth value order is low, the customer group has formed a certain market scale and influence, the enterprise shall continue to implement stable to promote customer relationship strategy, and pay attention to the increase of the customer credit risk control.

Group II: including the Car (Car loans), a Major purchase (bulk purchase), House (housing loans), Home improvement, Home decoration) and Renewable energy, Renewable energy (investment). Its future value and ideal sort of correlation between customer group is higher, shows that the group has a higher market potential. The customer credit value and the value of growth performance is better.

Group III: including Moving (move), Medical (health), Vacation (holiday), Wedding loans (marriage), and Small business (Small business). Compared with the group I and group II, the current value sorts slightly higher than the group II, but far less than the first group I, its present value, future
value ranking slightly higher than the group I, overall customer group of the current value and future value of the class are in the middle level.

On the marketing plan in the future, for the group II, it can focus on to develop these customers including auto loans, bulk purchase loans, housing loans and other such future value higher customer group, targeted advertising, such as in some cars, real estate portal to further increase the intensity of advertising, and to conduct some targeted customer feedback and discount rates; For the group I, it already has a certain influence, it continued to maintain a stable investment strategy. For the group III requires in-depth analysis the reason, consider whether have space to expand customers in the future.

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References


