SYSTEM DYNAMICS MODELLING OF CREDIT RISK MANAGEMENT

Consumer lending has active development in Ukraine. Characteristics of this development have been dynamically changing since beginning. Thus, mortgages and car loans were in focus before crises of 2008 year. Period of 2009-2014 years was characterized by growth of unsecured loans. Since 2015-year segment of payday loans (PDL) has been actively developing. One of the crucial elements of organizing lending is risk management system. The modelling of credit risk management is in the centre of our attention. We have applied System Dynamics tools for modeling. Main prospects of such application include the possibilities analyzing crediting results during the time and identification of influence each system component for results.

Credit risk management at the segment of consumer lending represents system which has specific construction. This system includes different components affecting for efficiency of functioning. First component is determined by characteristics of creditor:
- budget for lending;
- credit rate;
- average amount of loan granting.

Second component involves constituents of credit risk management procedures. There are three basic constituents:
- verification of borrower;
- credit risk assessment realized by internal procedures (first of all application scoring);
- using information from credit bureaus.

Verification of the borrower includes procedures of checking documents through the different official data bases. First of all, it includes verification passport at the data base of loosen and stolen passports. As example, there are approximately 1,6 mln. passports in such Ukrainian data base. In general, focus of verification is hedging against fraud.

Credit risk assessment based on application scoring uses statistical regularities. These regularities reflect probability of default for borrowers with various characteristics. Such characteristics concern some classical parameters of the borrower (social-demographic, professional, earnings and other) and some advanced parameters (mobile scoring, scoring from social networks and so on). Application scoring is essentially depending from the type of loans.

Inquiries to credit bureaus are supposed analysis of information about current and previous borrower’s loans and their service. Taking into account active
development of consumer lending in Ukraine vast majority of borrowers have significant information in credit bureaus.

We have studied credit risk management system by applying System Dynamics (SD) approach. Causal loops diagrams were created (see Picture 1). Two abovementioned components were formalized in the SD model.

<table>
<thead>
<tr>
<th>Variant</th>
<th>Funds available for loans, mln UAH</th>
<th>Credit rate, %</th>
<th>Reject by verification, %</th>
<th>Reject by application scoring, %</th>
<th>Reject by credit bureau scoring, %</th>
<th>Bad rate, %</th>
<th>Inquired funds, mln UAH</th>
<th>Total income, mln UAH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Softness</td>
<td>35</td>
<td>55</td>
<td>0</td>
<td>14</td>
<td>16</td>
<td>5.7</td>
<td>67.3</td>
<td>32.1</td>
</tr>
<tr>
<td>Rigidity</td>
<td>35</td>
<td>55</td>
<td>4</td>
<td>46</td>
<td>33</td>
<td>0</td>
<td>29</td>
<td>20.6</td>
</tr>
<tr>
<td>Optimal</td>
<td>35</td>
<td>55</td>
<td>2</td>
<td>31</td>
<td>27</td>
<td>0.7</td>
<td>42</td>
<td>37.3</td>
</tr>
</tbody>
</table>

The basic logic of lending stability lies in balancing “rigidity” of risk management system. Rigid approach provides low Bad Rate but total income is also low. Soft approach leads for high Bad Rate and potentially high losses. So, it is actual to find optimal level of severity risk management functioning. It was founded by applying Stella Architect software.

Picture 2 illustrates optimal solution for the example which present below.
So, credit risk management system by applying System Dynamics approach was studied. The basic influencing factors were identified, a causal loop diagram was constructed, and the SD model was developed. The basic logic of lending stability lies in balancing “rigidity” of risk management system. SD approach allows evaluating behavior of consumer lending in dependency of risk attitude.

References
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POLICY FOR IMPROVING MORTALITY RATE IN THIRD-WORLD COUNTRIES

This project presents the development of the problem of high mortality rate in third-world countries and suggests two possible solutions of dealing with this issue using system dynamics modeling approach. The model consists of explanatory part, which represents the health sector of typical developing country, and two policies, which were built according to sustainable development principle.