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**METHODS OF ASSESSING  
THE CREDITWORTHINESS OF BANK PRIVATE CLIENTS****SERGIY SMERICHEVSKIY\*****OLENA KLIMOVA\***

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**Abstract**

In the paper the topical problem of the creditworthiness of bank private clients is investigated. Modern methods of assessing the creditworthiness of borrowers are considered, particular attention is paid to the scoring system of evaluation that has been applied by domestic banks not so long ago. It is stated that to achieve the best results it is appropriate to use both mathematical models and expert approaches to assessing the creditworthiness of private clients.

**Keywords:** Creditworthiness, Assessing, Bank, Private Clients.

**1. Introduction**

One of the main problems, which banks faced in the post-crisis period – is almost mass bad credit history of potential borrowers. As a result, by the time when banks re-open the doors to the population and make plans to increase retail portfolios, the question arose how to assess the creditworthiness of retail borrowers, particularly those hard hit by the global financial crisis.

It is known that the time interval required to accumulate a certain amount of savings, which is enough to purchase goods and services, significantly increases every year. In this regard, the significance of consumer credit (including auto loan, mortgage) for the population not only does not decrease, but rather increases every year, and sometimes is the only way to achieve the cherished goal. However, the recent financial crisis has greatly complicated the process of provision of consumer loans by banks to their borrowers.

Reasons for the sharp deterioration of the retail loan portfolios are numerous: job loss of the debtor or his closest relatives, which led to sharp reduction in revenues at constant costs, sales reduction in family business, reduction or delay of regular wages, etc. Clearly, similar problems were before, but during the crisis the situation greatly worsened.

Thus, determination of the creditworthiness of a borrower – private client is an integral part of the commercial bank's work at the stage of a new loan agreement.

**2. Methodology and Data**

Analysis of the creditworthiness of a borrower on a regular basis allows the bank to make quick decisions and implement actions aimed at fulfillment of obligations by the borrower. When assessing the creditworthiness of a borrower bank often means examining the possibility and feasibility of providing funds to the borrower, determining the likelihood of their return on time and in full.

Assessing the creditworthiness of a client is held in the loan department of the bank, based on the information about borrower's sources of income, his movables and real estate, last place of employment, residence, etc. which, if necessary, can serve as a provision of credits given out (Kirichenko O. A., *Bank Crediting of Consumer Market: Problems of Development*, Actual Problems of Economy, Vol. 7 (85), 2008, pp. 182-199).

In practice, Ukrainian and foreign commercial banks take different approaches to determine the credit risk of private borrowers – from the subjective evaluations by credit experts of commercial banks and up to automated systems for risk assessment. Most foreign banks use in their practice two methods of assessing the creditworthiness of borrowers.

1. Expert evaluation systems provide a reasonable assessment of the potential borrower's personal qualities, as well as his financial state. In international practice this method is paid special attention to and the monitoring network to analyze the credit history of a potential borrower actively develops. For example, in the USA loan officer will almost always ask a local or regional credit bureau of the credit history of clients. In the USA over two thousand credit bureaus are functioning that have information about large number of private clients who ever received a credit, the history of repayment of loans and the credit rating of borrowers.

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2. Credit rating systems, which estimate clients' creditworthiness, are created by banks on the basis of factor analysis. The system uses accumulated database of "good", "satisfactory" and "unreliable" borrowers, which allows to set the criteria level of assessment of a borrower.

The use of credit rating systems of assessing the creditworthiness of clients is the more objective and economically justified method of decision-making than expert assessments. Clear advantages of the credit rating system is that it allows to process the large amount of credit applications quickly and with little inputs of labor, thereby reducing operational costs. In addition, it is more efficient in assessment of applications, that loan officers, who do not have enough experience, can perform. Typically, scoring is meant by the credit rating system (Prymostka L. O., *Financial Management in a Bank*, Kyiv National Economic University Publishing, Kyiv, 2004).

In domestic commercial banks the most common method of assessment of the creditworthiness of borrowers – private clients is the scoring system of assessment, which as a rule implies the existence of three sections: information on the loan, information about the client and his financial state. David Durand first applied scoring technique in the classification of loans to "bad" and "good" in 1941.

Scoring of private clients is the method of assessing the creditworthiness of borrowers, based on various characteristics, such as income, age, occupation, marital status, etc. After analyzing the factors the integrated index is calculated that gives an idea of the degree of creditworthiness of the borrower based on the points, gained in the analysis. As a result, according to the rating the decision is made about credit parameters and whether to give out or deny a credit (Kristioglo G. M., *Application of Scoring Models in Conditions of Uncertainty and Risk of Consumer Crediting*, Forming of Market Relations in Ukraine, Vol. 7 (74), 2007, pp. 86-90).

Here is the approximate structure of a scoring card filled by loan officers. To the first section the data on the bank credit expert who is considering a loan, the number of client files, the type and amount of the loan, ways of loan repayment (annuity payment, an individual schedule), the estimated repayment schedule, interest rate, the estimated date of the loan are entered, answers to questions about the need for insurance, the amount of insurance premium, the total amount of interest, which will be paid by the bank, are given.

To the second section the data on marital status, education and profession of the client, his experience at the last place of employment, employers, monthly income and expenses of the potential borrower are entered.

The third section provides information on the financial state of a potential borrower: data on the balances in current and savings accounts, the ratio of income and expenses.

Comparing expert and credit rating systems of assessment it is necessary to make the following clarification. Involvement of qualified experts to assess creditworthiness has several drawbacks: firstly, their opinion is one way or another subjective, secondly, people can not efficiently handle large amounts of information, and thirdly, to pay highly qualified professionals is associated with significant costs. In this regard, banks are more frequently showing interest in such systems of risk assessment, which would minimize the participation of experts and the impact of human factor in making decisions.

In turn, the scoring system of assessment is a mathematical model by which the bank based on "past" clients credit history may determine the probability of loan default.

The last two judgements form the following problem: the majority of Ukrainian commercial banks do not take into account the cause of the bad credit history of a borrower (perhaps arising from client-independent reasons), or, considering the bad credit history of "past" borrowers, make decision not in favour of a potential borrower, not being able (and sometimes want) to clarify the causes of "past" borrowers' default during the crisis. The problem is not seen by bank employees, but appreciably effects the clients.

Considering the poor adaptability of the scoring system of assessing the creditworthiness of private clients, the use of expert assessment in the analysis of borrower's data is most appropriate. Besides the problem of arrears there is a situation when a man was fired from high payed job during the crisis, for example, because of bankruptcy of the company, and got a new job less than 6 months ago. Thus, he can not qualify for a credit, because he has worked less than 6 months at the last place. Is it equitable? After all, the client is not guilty in his reduction which happened because of the bankruptcy of the employer.

Assessment of the creditworthiness of a borrower – private client is a complex process, and to decide on a loan based only on the scoring system data, under conditions of mass scale layoffs and inability to repay debts, is hardly correct. It is important to train personnel, who assess private clients, and possibly arrange collegial decision-making.

In modern conditions, as before, the main question remains, who to give out a credit, and to whom – not. To impose severe restrictions on recipients of credits – means losing revenue that could be obtained with more flexible constraints.

To work profitably in the retail crediting market an effective system of risk assessment is required, which would cut off unreliable clients beforehand and not deny reliable ones, would reasonably determine monthly payment for a consumer loan or the credit card limit. Such a system can create the safety margin of the bank, which will allow it to bring to the market products attractive for borrowers.

Despite these drawbacks of scoring systems, their prevalence in Ukraine and the obvious advantages force to think about the adaptation of scoring to the current situation in the country. But in this case it must be considered that the experts, who will be engaged in such adaptation, should be highqualified to adequately assess the current market situation and, therefore, highly paid. The result of the work will be a set of factors with weight coefficients plus some value (threshold), overcoming which, a private client, who applied for a credit, will be considered able to repay the loan plus interest. Unfortunately, the obtained results will be largely subjective, not statistically justified.

### 3. Empirical Analysis

In order to build the model of the creditworthiness assessment of a borrower – private client under scoring conditions the selection of bank clients, who somehow proved themselves, is made. Such a sample can vary from several thousands to hundreds of thousands depending on the accumulated statistics and the scope of the loan portfolio (Kaminsky A. B., *Modelling of Financial Risks*, Publishing Centre “Kyiv University”, Kyiv, 2006).

Methods of classification of loans are different and based on the multiple-factor linear regression, the logistic regression, the neural network, and the data mining technology.

The simplest, in our view, is the method of multiple-factor linear regression, which is given by:

$$PD = W_0 + W_1 X_1 + W_2 X_2 + \dots + W_n X_n, \quad (1)$$

$PD_j$  – probability of default of j-borrower;

$W_n$  – weight factors;

$X_n$  – analyzed factors.

The drawback of this model is that the left side of the equation is the probability that takes values from 0 to 1, and variables on the right side can take any value. But this drawback can be eliminated either by normalization of factors values, or by building a scale of interpretation of calculated financial or non-financial factors to the given scale (in current conditions – from 0 to 1).

Here is the example of building the interval scale for one of the most significant factors – the quality of the borrower – private client credit history (Tables 1 – 3).

**Table 1. Credit Experience**

Credit Experience (CE) (months)	Points
$\leq 12$	0,5
$12 < CE \leq 24$	0,6
$24 < CE \leq 36$	0,7
$36 < CE \leq 48$	0,8
$48 < CE \leq 60$	0,9
$> 60$	1,0

Possible combinations of the three factors (borrower's credit experience, number of arrears and their total duration) are given in Table 3.

Table 2. Amount and Duration of All Borrower's Arrears

Number of Arrears (A)	Total Duration of All Borrower's Arrears (TD) (days)		
	$\leq 30$	$30 < TD \leq 60$	$> 60$
1	0,9	0,5	0,3
2	0,8	0,4	0,2
3	0,7	0,3	0,1
4	0,6	0,2	0,0
5	0,5	0,1	0,0
$> 5$	0,4	0,0	0,0

Table 3. Aggregated Table for the Estimation of Borrower's Credit History

Number of Arrears (A) and Their Total Duration (TD)	Credit Experience (CE) (months)					
	$\leq 12$	$12 < CE \leq 24$	$24 < CE \leq 36$	$36 < CE \leq 48$	$48 < CE \leq 60$	$> 60$
A = 0	0,500	0,600	0,700	0,800	0,900	1,000
A = 1, TD $\leq 30$	0,450	0,540	0,630	0,720	0,810	0,900
A = 1, $30 < TD \leq 60$	0,250	0,300	0,350	0,400	0,450	0,500
A = 1, TD $> 60$	0,150	0,180	0,210	0,240	0,270	0,300
A = 2, TD $\leq 30$	0,400	0,480	0,560	0,640	0,720	0,800
A = 2, $30 < TD \leq 60$	0,200	0,240	0,280	0,320	0,360	0,400
A = 2, TD $> 60$	0,100	0,120	0,140	0,160	0,180	0,200
A = 3, TD $\leq 30$	0,350	0,420	0,490	0,560	0,630	0,700
A = 3, $30 < TD \leq 60$	0,150	0,180	0,210	0,240	0,270	0,300
A = 3, TD $> 60$	0,050	0,060	0,070	0,080	0,090	0,100
A = 4, TD $\leq 30$	0,300	0,360	0,420	0,480	0,540	0,600
A = 4, $30 < TD \leq 60$	0,100	0,120	0,140	0,160	0,180	0,200
A = 4, TD $> 60$	0,000	0,000	0,000	0,000	0,000	0,000
A $\geq 5$ , TD $\leq 30$	0,250	0,300	0,350	0,400	0,450	0,500
A $\geq 5$ , $30 < TD \leq 60$	0,050	0,060	0,070	0,080	0,090	0,100
A $\geq 5$ , TD $> 60$	0,000	0,000	0,000	0,000	0,000	0,000

Quality evaluation of the credit history of each borrower is made in three steps.

Step 1. Calculation of points for accumulated credit experience, depending on the age of the borrower (*Point<sub>Credit Experience</sub>*) (see Table 1).

Step 2. Calculation of points for the arrears on the basis of their number and total duration (*Point<sub>Arrears</sub>*) (see Table 2). Absence of arrears means that *Point<sub>Arrears</sub>* = 1.

Step 3. Calculation of the final point for the "quality of borrower – private client credit history" factor is made with the formula:

$$C = \text{Point}_{\text{Credit Experience}} * \text{Point}_{\text{Arrears}} \quad (2)$$

*Point<sub>Credit Experience</sub>* – point for accumulated credit experience;

*Point<sub>Arrears</sub>* – point for arrears that arose.

Thus, the example confirms the possibility of eliminating the above mentioned drawback of the multiple-factor linear regression through the alignment of the left and the right parts of the equation.

Equally common is the method of logistic regression, which is also used in scoring systems. Logistic regression provides segmentation of precedents based on partitioning the factor space by the n-dimensional scale, where n – number of significant factors. The method of logistic regression implies the use of several variables that form the resulting point of each potential borrower. If the resulting point exceeds the specified level, then with the absence of other compromising information the credit will be given out. If the point of the potential borrower does not reach the specified level and there are no mitigating circumstances, the loan will most likely be denied.

The most important variables used in such systems include data on the borrower's credit history, information about marital status, presence and number of dependents, movables and real estate of a potential borrower, his income level, the availability of home phone, number and types of bank accounts, occupation and period of work at the last place.

One of the most attractive ways of assessing the creditworthiness of private clients is the use of algorithms to solve the problem of referring any object (potential borrower) to one of the pre-known classes (whether to give out a credit or not). Such tasks can be solved using one of the data mining methods – the classification tree, which is the more general segmentation algorithm of precedents sample than the logistic regression. Unlike the method of logistic regression, in the classification tree method the precedents segmentation is set not by using the n-dimensional scale, but by successive splitting of the factor space to enclosed rectangular areas.

Further improvement of the model of assessing the creditworthiness of a private client based on the data mining technology (using classification trees) may include:

- more justified selection of parameters which characterize the creditworthiness of a potential borrower;
- use of detailed scales in the model for the assessment of different parameters.

#### 4. Conclusion

Various methods for assessing creditworthiness differ in the set of factors used in the overall credit rating of the borrower, as well as in approaches to evaluation each model parameter and the degree of importance of each of them. Unfortunately, the set of factors in the model is not universal for all banks and countries, that, in turn, prevents the global banking community to exchange statistics and improve their scoring systems.

At the same time, complexity and ambiguity of assessing the creditworthiness of private clients stipulates the use of various methods and approaches. At this it is important to note that to achieve the best results the most appropriate, in our opinion, is the use of mathematical models and expert evaluation systems in complex.

Today in approving the methods of assessing the creditworthiness of private borrowers it is important to check how the selected methods are adapted to the current situation in the country. For example, how detailed are the causes of past financial difficulties of potential borrowers analyzed. It is important to approach with interest the questions connected with negative credit history, relatively short experience at the last place of employment, etc. After all, the problem may not be in dishonesty of the borrower, but in adverse circumstances, that regardless of the borrower's will has lead to negative consequences from the standpoint of getting a new loan.

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