Information Support for Decision-Making in Bank Crediting System

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Abstract[1]

In this paper possibility of developing a decision support system for information support of commercial banks employees in determining the creditworthiness of potential borrowers in the process of evaluating real estate loan applications is considered.

Process of loan application evaluating using decision making support system is considered.

1. Introduction

The problem of increasing volumes of loans to individuals, at least to return to level that was before financial crisis, for the majority of banking establishments is actual nowadays. The decision of this problem largely depends on speed and quality of analyzing of potential borrowers creditworthiness.

In banking sector creditworthiness is understood as possibility and desire of the borrower to execute the debt-service obligation.

The analysis of the loan application is carried out by several bank divisions (Lending Department, Security Service, Credit Analysis Department and Legal Service) that are reflected in decision-making time [1].

The most labour-consuming is determining the creditworthiness which is carried out by employees of Credit Analysis Department. Analysts estimate set of factors: income, age, credit history, seniority, collateral etc., thus leaning basically on the experience and intuition that can lead to adding into the decision subjective reasons that don't have sufficient bases. In a real situation the analysts' opinions often differ, especially if discussing questions have set of alternative decisions.

The situation becomes complicated if the credit organization doesn't have standard documents regulating procedure of finding-out of client's ability and intentions to abide by the terms of the agreement on debts repayment. Thereof, in estimation the excessive weight is got by subjective factors: qualification and interest of the expert and then incompetent or deliberate interpretation of the information as a result leading to decision-making defective for bank. Absence of regulations and procedure formalization leads to impossibility of the subsequent analysis and a well-founded estimation of experts decisions.

Decrease of possible influence of the expert on the decision and increase a share of objective factors can be provided by automation process of potential borrowers' creditworthiness estimation.

In the given article possibility of working out and use of decision making support system in process of evaluating of mortgage credit borrowers' creditworthiness based on fuzzy logic is considered.

2. Decision making support system

For the purpose of increasing volumes of mortgage crediting it is necessary for Russian banks to increase speed and to improve quality of accepted decisions, i.e. to carry out the analysis of credit status of potential borrowers in which person making decision can get information support for some question decision: to give out the credit to the person or not, additional collateral is necessary or not, etc.

Real estate loans differ from most other kinds of loans, as a rule, the average loan size and maturity is much longer, these factors cause more careful verification of credit status of potential borrowers.

During the analysis the expert assesses many factors affecting the creditworthiness of the individual (table 1).

Table 1. Factors affecting individual creditworthiness

Category	Category factors
Basic personal information	Sex, age, education
Information about marriage status	Marital status, number of children, number of dependents
Registration information	Residence permit, residing term to the given address
Information about employment	Workplace, position, enterprise area, term of existence of the enterprise
Information about financial position	Salary, other sources of incomes
Information about property	Estate, securities
Information about credit history	Number of previous loans, the timeliness of payment, current obligation

A wide variety of factors that influence on creditworthiness of potential borrowers requires processing and analysis of large amounts of information in a short time. Past experience suggests the possibility of using banks decision support system banks for such tasks (Fig. 1).

Decision making support system use a database containing personal data of bank customers who received loans, their credit history and terms of a loan agreement (term, amount, interest rate, the amount of collateral).

User interface is a dialog component of the system, and it covers all aspects of user interaction and decision making support system (the system gives user the ability to view initial data and results of the system working).

The module of data input of decision making support system is used to input data of the potential borrower necessary to solve the problem.

The module of data output displays an error message (for example, if the income of potential borrower doesn't allow him to take credit), or the results of calculations on the screen. The result for our problem is the answer: creditworthy or not creditworthy.

The module check BP, CH (basic parameters and credit history) is used for screening of incorrect input data on the bank basic requirements; determine the limit of the borrower, and the analysis of credit history.
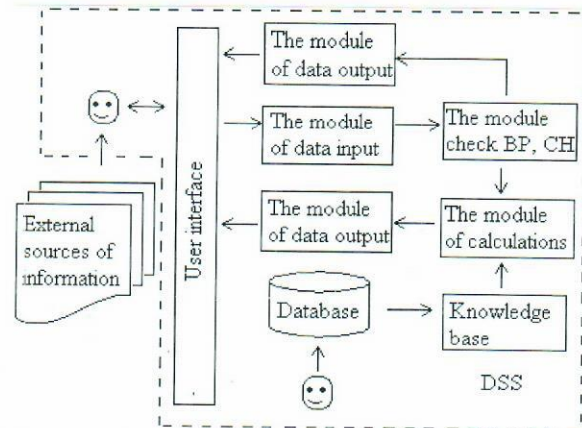

Fig. 1. Decision making support system

The module of calculations carries out all necessary operations for reception of the decision of a problem.

On the basis of fuzzy logic in the knowledge base generated rules on the basis of which will be adjudicated on the creditworthiness of a borrower.

External sources of information for the decision making support system are required client information (credit application, statement of earnings and other documents), credit history (obtained from various credit bureaus like The National Credit Bureau, The Republic Credit Bureau etc.) and others.

Using the decision making support system processing credit applications for real estate loans will be as follows (Fig. 2) [2].

The client applying for a credit fills out a loan application that includes the initial data on the required loan: the purpose, loan value, type and loan terms, prospective collateral (everything is discussed at a preliminary consultation).

The employee of a Lending Department using decision making support system carries out analysis of creditworthiness of the borrower. The system gives the answer: creditworthy or not creditworthy. If received answer is negative then further consideration of this loan application is impossible. Otherwise, expert of Security Service checks the borrower on presence of stop factors (a previous conviction, bringing to criminal liability, unreliable information granting etc.).

In case of a Security Service affirmative reply, the legal department will prepare the conclusion on legal cleanliness of pledge.

If there are some deviations from standard conditions of the credit then loan application is placed for consideration credit committee. The credit committee considers possibility of crediting with some deviations. If approval of Credit Committee is received the bank gives the final consent to give out the credit.
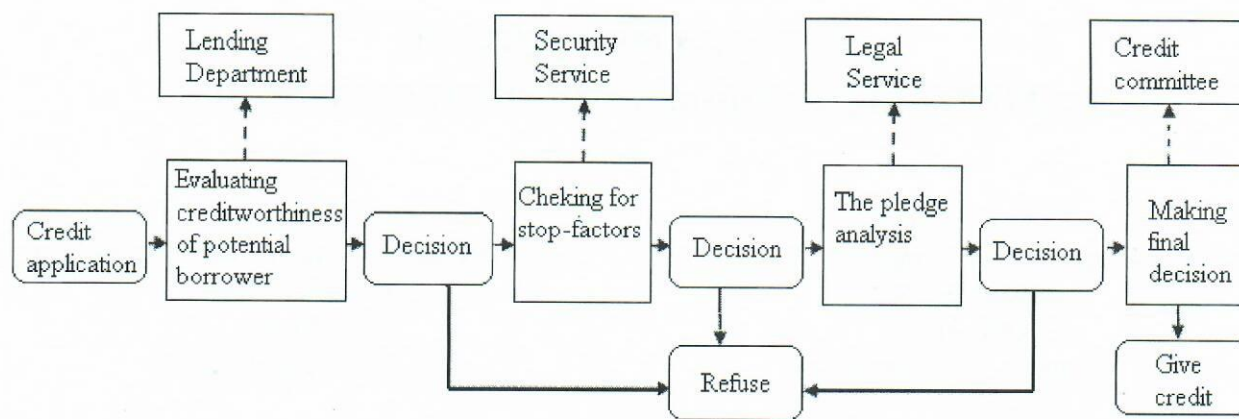
Fig. 2. The process of credit applications considering using the decision making support system

2. Fuzzy logic application

Authors suggest the decision of the problem of borrower credit rating on the basis of the fuzzy qualifier construction.

The classification problem, in this case, is in reference of the borrower which is characterised by a number of informative signs $X = (x_1, x_2, ..., x_n)$ (table 1), to one of above described classes $\{d_1, d_2\}$ (creditworthy /not creditworthy).

Classification reflects the following: $X = (x_1, x_2, ..., x_n) \rightarrow y \{d_1, d_2\}$ also it is made on sample basis available in the database [3].

Thus, the fuzzy logic conclusion for our problem will be reduced to the following algorithm: creation of the fuzzy knowledge base; calculation of a degree of object rating to classes; a choice of a class with the maximum degree of an accessory.

At adjustment of the fuzzy knowledge base for a problem of borrowers' classification we define membership functions parameters of entrance variable terms and weight factors of rules. They minimise a deviation between desirable and valid behaviour of the fuzzy qualifier on training sample.

After carrying out the adjustment of the fuzzy knowledge base fuzzy qualifier quality rises. Each subsequent client with satisfactory accuracy can be referred to one of classes.

3. Conclusion

This article discusses the possibility of developing and using decision making support system for assessing borrowers' creditworthiness on the basis of fuzzy logic for the consideration of loan applications for real estate loans.

It is known that the processing of loan applications took a long time due to complexity (in the process of analysis involved many departments of the bank) and to increase lending to banks should promptly review and issue a large number of credits, while not forgetting about the quality of its loan portfolio. This problem can be solved by the decision making support system, which will facilitate and accelerate the process of reviewing the application, and also reduce the impact of the subjective factor on the decision.

The decision of the problem of borrower credit rating on the basis of the fuzzy qualifier construction is considered. Russian banks have accumulated enough information about real estate loans, in Russia created the credit bureau, where all information under the current credits and repayment loans is stored. All of these can serve as a basis for analyzing the creditworthiness of potential borrowers.

References

1. Lavrushin O. I. "Bank management", Vol 2, Sorting and Searching. KRONUS, Moscow, 2009.

2. Shtovba S. D. "Designing of Fuzzy Systems with MATLAB", Moscow, Goryachaya liniya, Telekom, 2007.

3. Khalilova Y. R., Smetanina O. N. "Fuzzy logic models in bank crediting system". In Proc. Of the Workshop on Computer Science and Information Technologies (CSIT'09), Vol. 2. Crete, Greece, pp. 189–191.