

Ryjenko I.N., Cand. of Technical Sciences, Associate Prof.
Kyrgyz-Russian Slavic University,
Kyrgyzstan

Conference participant,
National championship in scientific analytics,
Open European and Asian research analytics
championship

Modern systems of cloud computer technologies offer great opportunities to create management systems of various business processes. Formalization of the management processes will allow to increase the quality of created information systems.

Credit acts as a support of the modern economy, an integral part of economic development. Thanks to the credit the time for satisfaction of business and personal needs is reduced. Credit use different businesses, state governments, and individual citizens.

Credit extension is naturally associated with a return movement, it is impossible without the return lent cost [1].

In the research area of commercial risk are two aspects - two views: "In the public mind, and in a number of scientific publications, dominates two opposite views on the nature of risk. On the one hand, the risk comes in the form of possible failure, danger, material and other losses that can be as a result by the implementation of the worked-out solutions, on the other hand - the risk is identified with an estimated fortune, a good outcome" [2].

The quality of the credit risk management depends on the effectiveness of the management systems and internal control of the credit organization. Basel Committee considers the credit risk as the probability that arises in deciding by the management and the staff of the credit organizations of uncontrolled and unstructured decisions [3].

As the ultimate target of the credit risk management, define the profit function.

The main task of the quality of credit risk regulation is defined maintenance of acceptable profitability ratios with safety and liquidity indicators in management of asset and liabilities of the credit organizations, that is, the maximization of profits.

Using the above definition and systems of design of business processes, create a business process model of the credit risk management. In Fig. 1 is a business process,

CREDIT RISK MANAGEMENT

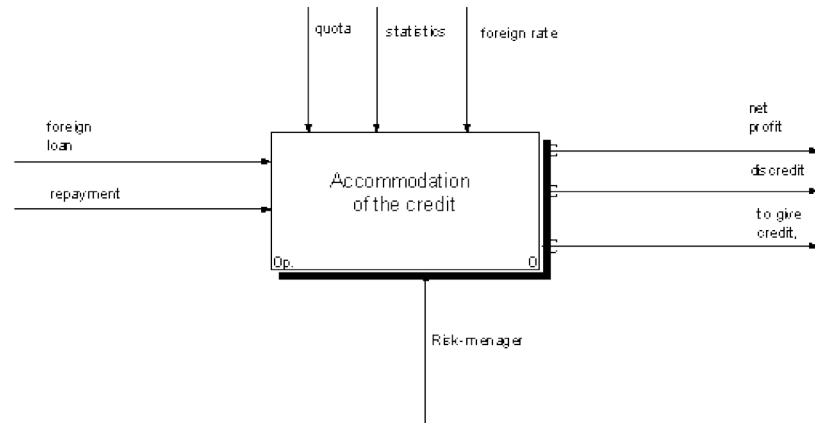


Fig. 1. Business process loan

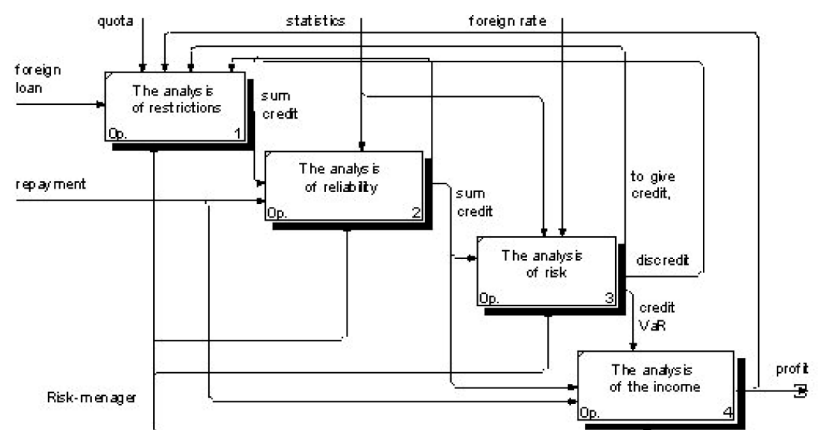


Fig. 2. Credit risk management

defining the inputs and outputs of the process of credit extension.

Using methods of decomposition and information management, we will receive business process model of the credit risk management in Fig. 2.

Perform the formalization of the business process of credit risk management. Suppose that, for any requirement of the credit there is an opportunity of receiving profit:

$$\forall F_M \exists P_M \in P : 0 \leq P \leq P_{\max} : F \notin \emptyset \quad (1)$$

where: F – value of the credit requirements (foreign loan),
 P – the expected return (profit),

M – the horizon of the credit extension (maturity).

$$\max P(F) \rightarrow SC \cdot CVaR : 0 \leq SC \leq F \quad (2)$$

where: SC – credit amount,
 $CVaR$ – assessment of credit risk (Credit VaR).

The credit amount is defined by limit and membership function received as a result of the credit risk analysis:

$$SC \rightarrow quota \& \mu(T) \quad (3)$$

where: $quota$ – limit for credit,
 $\mu(T)$ – membership function,
 T – term (to give credit or discredit).

VaR - is an estimate of the maximum potential loss on a financial instrument or portfolio over a given period of time in the event of adverse changes in market factors, calculated with a certain confidence interval.

At present, the risk management activities banks moving towards automation of customer service, forecasting, and quantitative assessment of risk. The use of agents in a distributed Internet and cloud computing technologies for risk management, allows us to consider hundreds of possible scenarios of market behavior and calculate the possible results of it. In addition to the functions of modeling such systems should support the administration and tracking of risk strategy. Timely, accurate and complete information is the basis for a quantitative assessment and monitoring of financial risks.

Structure established by the bank limits of risk reflects its strategy and «appetite for risk». Limits on the level of risk is determined for specific counterparties, markets and instruments.

In the process of risk management for the financial market participant is a very important question, or may not be included in the risk situation? Different behavior, in this context, is characterized by risk appetite. In the decision of risk plays an important role informing the parties, his experience, skills, competencies. Willingness to take risks to a large extent also depends on the results of implementation of the previous decisions taken in the same conditions. The risk management process is dynamic enough and its effectiveness depends on the speed of response to changing market conditions, the economic situation in general, the financial condition of the commercial bank. Of particular importance in solving problems is risk manager intuition, which is the ability to find the right solution.

One of the traditional methods of assessing and managing risk is a statistical method. The basic tools of statistical analysis are - variance, standard deviation, coefficient of variation. The essence of this approach is to analyze statistical data for the greatest possible period of time, so you can compare the frequency of loss of the bank with the probability of their occurrence. This method can be applied to the evaluation of different types of risks the bank, both external and internal. The frequency of occurrence of an acceptable level of losses for the bank depends on the number of cases, the onset of a specific level of losses and the total

number of cases in the statistical sample.

The statistical method is to study the statistics of losses and profits that occurred when making similar decisions, to establish the magnitude and frequency of receipt of an economic impact, and then conduct a probabilistic analysis and forecast of the future market behavior.

Analysis of the financial condition of the borrower held by the manager based on fundamental analysis, and includes a detailed study of the operations of the borrower, the dynamics of its cash flows, the value of its future earnings. The main objective here is to assess the solvency of the borrower. In carrying out the analysis must be considered:

- the probability of default of the borrower;
- probability distribution of losses subject of default of the borrower.

For a reliable estimation of the probability of default, and other parameters required historical data for many years. With some frequency the world's largest credit rating agencies Standard & Poor's, Moody's Investors Service, Fitch Ratings, Thomson Bank-Watch and others publish statistical analyzes borrowers. For each rating group provides historical data frequency of default, default rate variation and the frequency of transitions from one rating category to another. Recent values form the so-called transition matrix of credit scoring.

We define a matrix of transition probabilities, the probability of default of the borrower correcting the assumption that, in any period, the probability of default is distributed from min (0) to the value adopted for the probability of the rating agency and is subject to normal distribution:

$$\max P(F) \rightarrow SC \cdot CVaR: 0 \leq SC \leq F \quad (4)$$

Where: $\forall K: K \in U \rightarrow \mu(T)$,

Ph - relative probability;

K - Transition probability;

U - The domain of the probability of default;

P - The probability of default of the borrower;

μ - Membership function;

T - A set of terms;

$i = 1 \dots n$ period (month, year, ...);

$j = 1 \dots n$.

Define the membership function of probability of default of the borrower:

$$\mu(T_1)_{i,j} = 1 - Ph_{i,j} / \max(Ph: K)_{i,j} \Leftrightarrow low\ value$$

$$\mu(T_2)_{i,j} = Ph_{i,j} / \max(Ph: K)_{i,j} \Leftrightarrow high\ value$$

$$\mu(T_3)_{i,j} = 1 - K_{i,j} / \max(Ph: K)_{i,j} \Leftrightarrow low\ value$$

$$\mu(T_4)_{i,j} = K_{i,j} / \max(Ph: K)_{i,j} \Leftrightarrow high\ value$$

As an assessment of the credit risk is determined by the expectation of losses depending on the relative probability of default by the formula:

$$M_{i,j} = ((1 + R_{i,j})Ph_{i,j} - R_{i,j}h_{i,j}(1 - Ph_{i,j}))S_j \quad (5)$$

where: R - the rate of interest;

S - The amount of the loan;

$h = m$ - a relative term (horizon of the loan).

Determine the relative probability of default of the borrower, provided the manager:

$$Ph_{\Delta_{i,j}} = f(Ph_{i,j}, K_{i,j}, \mu(T_{i+4})_{i,j}) \quad (6)$$

Next, the mathematical expectation of loss assessment manager:

$$M_{\Delta_{i,j}} = ((1 + R_{i,j})Ph_{\Delta_{i,j}} - R_{i,j}h_{i,j}(1 - Ph_{\Delta_{i,j}}))S_j \quad (7)$$

This makes it possible to determine the optimal placement of the credit limit, as the operation of intersection sets estimates of losses:

$$\min(h_{i,j}) \leq Ho_{i,j} \leq h_{i,j} = f(M_{i,j} \cap M_{\Delta_{i,j}}) \quad (8)$$

where: Ho - the optimal boundary of the loan period.

According to the analysis it can be concluded whether the loan. In the proposed model credit risk assessment produced significant differences, are as follows:

- determination of the probability of default of the borrower reflects the possibility of a default in any of the periods of the horizon of the loan;

- accounted for the variation frequency of default and the frequency of transitions from one rating category to another when evaluating potential losses;

- The choice of the optimal period of the loan.

References:

1. Money, Credit, Banks: ed. Lavrushina O.M. M: Finance and Statistics, 2004. - 464s.
2. Algin A.P. Brink of economic risk. M.: Knowledge, 1991.
3. Principles for the management of interest rate risk. Basel Committee. www.bis.org
4. Managing Interest Rate Risk in the Banking Book. www.oenb.at