

THE WAYS TO IMPROVE CREDIT RISKS ASSESSMENT METHODS

Valeri Mosiashvili¹, Liana Kanchaveli² and Medea Chelidze³

¹Professor, Georgian National University SEU , Dean of Business and Technology faculty, Tbilisi, Georgia

²Professor, Georgian Technical University Department of Control Systems, Tbilisi, Georgia

³Professor, Georgian Technical University Department of Financial and Banking Technologies, Tbilisi, Georgia

DOI: 10.46609/IJSSER.2022.v07i11.016 URL: <https://doi.org/10.46609/IJSSER.2022.v07i11.016>

Received: 8 November 2022 / Accepted: 29 November 2022 / Published: 2 December 2022

ABSTRACT

This article discusses the most widely used credit risk assessment methods in the world banking sector, theory and practice, such as - Operational Risk Capital (ORC), Standard Operating Risk Assessment Method, TSA, VAR, Risk Method Risk Assessment Method Shortfall. As proven by best practice, these methods do enable the identification of credit risks in the banking sector, the implementation of preventive measures and minimization, but require further updating and refinement.

Adequate, modified and sophisticated credit risk assessment methods for the banking sector are discussed in our article, which addresses the shortcomings of existing risk assessment methods and provides the author's visions / position for their improvement.

Given the Application-Scoring Method of Credit Risk Assessment, a new authorial version of the Georgian banking sector, in particular the Fraud-Scoring System for Potential Borrowers, Behavioral-Scoring - a type of check that allows predicting the future solvency of the client. Consider some "Behavioral" factors, such as how a client will use credit, whether he or she will pay taxes in the appropriate amount and on time, will use the credit card limit immediately if he / she uses the money in installments, and much more. We also discussed - one of the "most inconvenient types of borrowing" of the borrower - Collection-scoring, which is quite important for the development of arrangements for working with overdue clients.

For a better understanding of the theoretical side of credit risk assessment methods, mathematical modeling of the scoring method is given, and through them the practical examples of such well-known researchers as e.g. E. Altman and R. Tafler.

Keywords: Liquidity, Banking risk, Risk management, Credit risk, Financial risk, Operational risk.

INTRODUCTION

Risk assessment covers all aspects. Even variants whose probability is theoretically less expected will be calculated. It is generally accepted in business that qualitative analysis consists of identifying the cause of a risk, identifying its sources and subsequent stages or works that may reduce it or reduce it to zero altogether.

Early risk assessment is considered to be the most important for any entrepreneur or investor. Experienced businessmen will say without a doubt that this figure reflects how successful their project will be.

METHODS

In the process of working on the scientific paper, we used a combination of methods such as the principle of historical and logical unity, systemic approach, methods of induction and deduction, methods of statistical and economic-mathematical analysis. For the purpose of this paper, we also used a **problem-based research method** that describes coefficients calculated by different methods that actually show whether progress has been made in calculating new indicators.

RESULTS

1. Banking risks are in themselves the probability of unfavorable completion of operations performed by credit institutions or unforeseen situations. Credit risk is defined as the risk that the debtor will incur a loss to the bank as a result of non-performance or non-performance of financial obligations in accordance with the terms of the contract. This is why managing this aspect is considered to be one of the most important tasks of the banking system and the economic life of the country as a whole;
2. The main task of risk management is to support its profitability, security and liquidity ratio in the process of managing the bank's assets and liabilities, that is to minimize bank losses;

3. Risk management process in itself - includes risk assessment, determination of their probable magnitudes and consequences, development and implementation of measures to eliminate or minimize related losses;
4. The credit risk of the bank can be minimized, in this regard it is a traditional and better way - to get valuable property, liquid assets as collateral. In the event of collateral impairment, insurance is the most effective model for minimizing credit risk;
5. Various models and methods of credit risk assessment are developed, such as: Mathematical modeling of the scoring method, models: "Operational Risk Capital - ORC", "TSA", "Value at Risk - VaR", "Shortfall at risk - SaR", methods: E. Altman, r. Taffler, r. Lisi, which are considered to be the most effective and weighted risk assessment tools as a whole, enable the development of balanced management decisions, minimizing the risk of credit organizations, and reducing the share of problem loans.

DISCUSSION

There are many methodologies, tools and approaches today to study this factor, but the basic part remains virtually unchanged and consists of the following steps:

- Identification of possible risk zone;
- Identifying and assessing the risk associated with the firm's subsequent activities;
- Calculation of negative outcomes;
- Reflecting the benefits in eliminating the risk and its consequences.

Quantitative risk assessment is available at all listed stages. Calculation with further numerical representation allows not only to see the probability of occurrence of one of the circumstances in a percentage ratio, but also to expand the picture as a whole. After summarizing the analysis, a risk quality assessment is performed, which is the final stage and allows to determine the appropriateness of the project as a whole or the decision to be taken.

Risk assessment is completely divided into three main schools (Tsaava, 2020: 2018):

- Statistical methods;
- Analytics;
- Method of expert evaluations.

1. Each of them has many of its own directions, technologies and approaches. It is worth noting that the assessment of each risk through the specified methods has its specifics and, consequently, the final results. One type - to predict management decision-making, the other - to identify the degree of risk when a firm buys securities, and so on. Is directed (https://www.nbg.gov.ge/uploads/legalacts/fts/likvidobis_gadafarva.pdf [Last seen 23.10.2020]).

Only setting a specific goal and task allows you to choose one method or take a number of actions. There are many expert firms in the market today that offer their services in different price categories.

In order for risks to take place they need to be assessed (measured). Consider the classification of financial risk assessment methods of the enterprise, identify their advantages and disadvantages, which are presented in the table below (Table 1.). All methods can be divided into two large groups.

Table 1. Divide the financial risk assessment methods of the enterprise into two large groups

	Advantages	Disadvantages
Quantitative Methods	Objectivity of financial risk assessment, creating a model of change based on statistical data of this or that risk.	The difficulty of numerically formalizing the qualitative financial risks of the enterprise.
Qualitative Methods	Ability to assess qualitative risks.	Subjectivity of financial assessment of enterprise risks, result of expert assessments.

Thus, let us consider in more detail the quantitative methods of financial risk assessment:

Operational risk assessment methods. Operational risks are one of the types of financial risk. Consider an **operational risk** assessment method for a banking sector company. According to the basic method of operational risk assessment of the financial organization (Operational Risk Capital, ORC), the reserve is calculated, which should be allocated annually to cover the given risk. So, for example, in the banking sector 15% of the risk is assumed, ie banks have to make a reserve of 15% of the average annual gross income for the last three years each year.

The formula for calculating the operational risk for the bank will be as follows:

$$ORC = \alpha \times GL,$$

Where: ORC - is an operational risk;

α - is the coefficient set by the Basel Committee;

GL - is the average total income for each type of bank activity.

A) Standardized Methodology for Operational Risk Assessment TSA:

A complication of the **BIA** method is the **TSA** method, which calculates the bank according to the operational risks arising in different functional areas of activity. To assess operational risks, it is necessary to identify the directions in which they may arise, and the nature of the impacts on financial activities. Consider the Bank's operational risk assessments as an example (Table 2.).

As a result, the total amount of deposits will be equal to the total amount of deposits according to each allocated function of the bank:

$$ORC = \sum \alpha x GL,$$

It should be noted that, as a rule, operating risks are considered for companies in the banking sector, and not for industrial or entrepreneurial companies. The point is, most operational risks are the result of human mistakes.

Table 2. Example of Bank Operating Risk Functional Assessment

Bank functional Business	Depreciation ratio
1. Corporate Finance (Implementation of Banking Services in the Capital Market for Clients, Public Bodies, Enterprises)	18%
2. Trading and selling (stock market transactions, buying and selling of securities)	18%
3. Banking services for individuals (services for individuals, providing loans and credits, consulting, etc.)	12%
4. Banking services for legal entities	15%
5. Payments and transfers (making payments according to accounts)	18%
6. Agency Services	15%
7. Asset management (management of securities, cash and real estate)	12%
8. Brokerage activities	12%

1. **Liquidity risk assessment methodology.** The next type of financial risk is liquidity risk, which shows the inability of an enterprise / company to repay its obligations to creditors and borrowers in a timely manner. This ability is also called enterprise solvency. Unlike creditworthiness, solvency provides the ability to repay debt not only at the expense of cash and fast liquid assets, but also at the expense of medium and low liquid assets (<https://www.sabanko.com/wigni> [Last seen 04.10.2020]).

To assess liquidity risk, enterprise liquidity ratios are required: the current liquidity ratio and the instantaneous liquidity ratio should be estimated and compared with the baseline norms (Table 3).

The analysis of different liquidity ratios shows the ability of an enterprise to cover its liabilities through the following three different types of assets: fast-liquid, medium-liquid and low-liquid assets (Table 3).

Table 3. Formulas for calculating enterprise liquidity ratios

Coefficients	Calculation formula	Normative
Current liquidity ratio	Working Assets / Current Liabilities	>2
Absolute liquidity ratio	Cash + short-term financial investments / short-term liabilities	. 0,2
Instant liquidity ratio	Current Assets - Inventories / Current Liabilities	0,7 – 1,0

Market Risk Assessment Methodology - VAR. The next type of financial risk is market risk, which in itself is a negative change in the value of the assets of the enterprise / company as a result of changes in various external factors (industry, macroeconomics and microeconomics). The following methods can be used for quantitative assessment of market risk (Mosiashvili, 2020: 314):

- Method VAR (Value at Risk);
- Shortfall method (Shortfall at Risk).

A) Risk assessment method VAR:

The VAR (Value at Risk) method is used to assess market risk, which allows the probability and magnitude of losses in the event of a negative change in the value of the company in the stock market. The calculation formula is as follows:

$$\text{VAR} = V \times y \times \sigma$$

Where: V - is the current value of the shares of the company / enterprise;

Y - is a quantum of normal distribution of company / enterprise stock returns;

σ - is the change in the return on the shares of the company / enterprise, expressing the risk factor.

B) Risk Assessment Method Shortfall:

Market Risk Assessment Method Shortfall (analogue: Expected Shortfall, VaR Average value at risk, Conditional VaR) is more conservative than the VAR method. The risk assessment formula is as follows:

$$\text{Shortfall}_\alpha = E(X \mid X > \text{VAR}_\alpha(X)),$$

Where: α - is the selected level of risk. For example, the value may be 0.99; 0.95.

The Shortfall method allows you to better repel "heavy tails" in the distribution of stock returns.

Credit risk assessment methods and minimization techniques. The following types of transactions are primarily carriers of credit risk:

- Direct and indirect lending;
- Buying and selling assets without prior payment from the counterparty;
- Transactions by third parties without guarantee of payments.

Credit risks include the likelihood of a debtor deteriorating. This is not only about the deterioration of the financial situation.

No less important factors are: the reduction of the company's position in the region, the unwillingness of the industry, the deterioration of the business reputation, etc. That is, everything that can cause a person to have problems in paying funds. But not being able to repay the debt is not the only loss a bank can lose.

Credit risk can also be indirect (for example, if certain actions require an increase in the amount of securities, issuer bills or credit reserves). In the process of determining credit risks, attention is paid to several factors (Tsaava, 2020: 231; Beridze, 2009: 193):

- Risk of default;
- The probability that the borrower will be in a state of default after a certain period of time;

- Credit rating;
- Assessing the reliability of various securities;
- Credit migration;
- Likelihood of changing the credit rating of the debtor, transaction, counterparty, issuer;
- Credit risk below the amount;
- The level of losses that the bank may lose in the event of a default.

Practice shows that absolutely any transaction, which is based on the entry of the parties in the relationship between the creditor and the borrower, the emergence of debt obligations carries with it a certain share of risk.

There is a concept of so-called "risky investments" - in this case, credit risk is minimal and conditionally equal to zero. But even in such a situation it still exists, so it must be taken into account.

It is necessary to study in detail the credit history submitted by the borrower, his field of activity and all available information. Self-assessment of credit risks should be carried out by qualified specialists, because this is an area where even a small mistake can lead to the greatest loss.

Enterprise credit risk assessment methods. Credit risk assessment methods include the following economic models and methods of risk diagnosis:

A). Credit risk assessment application - scoring method:

1. The most important and most common method of credit risk assessment is the **Application** method, a method of checking the solvency of the client. If you get an insufficient number of points according to this method of evaluation, then it will be very difficult for you to get a loan. As an option you can offer other lending options - higher interest rates or less loan amount (https://www.nbg.gov.ge/uploads/publications/legal_regulation/regulations.pdf [Last seen 22.10.2020]);
2. The next step in the assessment is to determine the potential borrower 's propensity to commit adultery. It is evaluated by the **Fraud-Scoring** system. The criteria used to calculate this parameter are the commercial secrets of each bank. **Behavioral-scoring** - is a type of check that allows the client to predict future solvency. This system of analysis also allows to identify some "behavioral" factors, such as: how the client will use the

loan, whether he will pay in full and on time, will use the credit card limit immediately if he uses the money in installments and much more (Kovzanadze, 2014: 38).

There is another, more inconvenient type of check-up - Borrower **Collection - Scoring**, which is very important for developing arrangements for working with overdue clients. It is required for adequate risk assessment of loan repayment and timely application of prophylactic impact measures.

As long as the credit scoring program is implemented, it can be seen that it will not be difficult to deceive the system - it is enough to give "correct" answers only from the point of view of the bank. But this is not the case, such an attempt can be successful only if the program is built in such a way that some data about you can not be verified immediately (Riagin, 2016: 137. Nikonov, 2019: 182).

Scoring-checking the cost-benefit ratio, the existence of previously unpaid loans, etc. are also carried out. Of course, the list of issues to be assessed by the system in different banks can be quite different, but surely in each of them you will be asked about additional sources of credit. Bank employees will be interested in whether you have additional sources of funding, whether you are the owner of a cottage, garage, plot of land, car (if any, then directly). The bank will also be interested in what you want the money for, whether you have applied for a loan before, how well you have fulfilled your obligations to the lending organizations. Points will also be added to each of these criteria (Teslia, 2017:209).

Although the **scoring program is quite high-tech, it still has some drawbacks**: banks use a fairly low scale for calculations, which is simply inaccessible to the average borrower by many indicators; Customer-specific data are not fully taken into account, for example, a small area and a low-quality engineering building (residential house) in the center of the capital can be assessed as acceptable real estate, and somewhere far from the river can be considered by the cottage system as a "settled village"; The normal existence of a scoring system presupposes the existence of a proper and appropriate infrastructure (Mosiashvili, 2020: 324).

But some shortcomings can not outweigh the positive aspects of using the scoring method of the most important and most common credit risk assessment: the system provides the most unbiased assessment, the impact of employees' personal impressions is minimized; Financial institutions using the scoring system offer their clients a more favorable interest rate as long as the risk of non-return is minimized; Skorong allows the bank to reduce the number of staff employed in processing applications; Decision making time is reduced to 15 - 20 minutes; In the event of a negative decision, a list of factors influencing the client to receive a low scoring rating will be issued - which will allow him / her to correct the mistakes made in the further appeal.

B). Mathematical modeling of the scoring method of credit risk assessment:

2. The tasks of operative assessment of the condition of the companies in the bank's loan portfolio during the financial crisis, as well as the objective approach to the decision to issue loans to new clients, become especially relevant (Basilia, 2018: 296).
3. In this regard, the **Scoring model** is a very effective tool for credit risk assessment and it facilitates the development of a balanced, balanced management decision. Accuracy and reliability of such models - allows you to minimize the risks of the credit organization, reducing the share of problem loans in its portfolio (<https://www.sabanko.com/wigni> [Last seen 04.10.2020]).

There are differing opinions today as to what can be understood by the term "scoring". Consider this concept from the point of view of mathematical modeling (Lavrushin, 2020: 401).

The task of minimizing credit risk is fundamental to the optimization of banking. To date, most banks continue to use the MS Excel package. This approach has many disadvantages: high probability of unauthorized penetration, lack of adaptability, increased time for decision making. Thus, at the moment, the **development and implementation of an automated scoring system is a topical task** (Carl, 2015: 108).

It should be noted some of the papers devoted to various types of credit scoring studies and issues related to the development and implementation of these systems. One of the easiest approaches to assess borrowers' solvency is to use a borrower survey and study of their credit history to calculate points or grades, which will characterize the probability of loan repayment. Given the above, the simplest scoring model can be developed:

$$S(X) = X_1W_1 + X_2W_2 + K + \dots + X_nW_n,$$

Where: X_1, X_2, K, X_n - are the parameters that are the characteristics of the borrower,

W_i - weighted coefficients are X_i attributes.

These figures make it possible to calculate the $S(X)$ scores, according to which the borrower will be assigned to one of the X classes ("Benevolent"; "Unreliable") from which, therefore, the decision to grant a loan will be made.

Example:

Consider a numerical example in relation to the scoring tables of one of the conditional banks in Tbilisi. Visibility scores are calculated for the following 3 groups of borrowers: student, typical middle-class worker, and person with "above average" income (see Table 4).

Table 4. Conditional Bank Scoring Table Features:

Borrower Characteristics Group	Sign feature	Coefficient	Expert rating
1. Residential Place	<ul style="list-style-type: none"> • Rent • Municipal area • Owner 	1,42	0 5 10
1. Internship last 2. Work 3. on the place	<ul style="list-style-type: none"> • Less than one year • 1 - 5 years • More than 5 years 	0,63	0 5 10
3. Age	<ul style="list-style-type: none"> * From 50 years * Under 35 years * Over 5 years 	0,35	0 5 10
4. Family Condition	<ul style="list-style-type: none"> • Divorced / widowed • Single • Married 	0,92	0 5 10
5. Education	<ul style="list-style-type: none"> * Medium * Medium special * Higher 	0,94	0 5 10
6. Position level	<ul style="list-style-type: none"> • Employee • Intermediate level head • Head of the highest link 	0,4	0 5 10
7. Credit History	<ul style="list-style-type: none"> • Negative • No data • Positive 	2,64	0 5 10
8. Life experience in the region	<ul style="list-style-type: none"> • Less than one year • 1 - 5 years • More than 5 years 	1,06	0 5 10
9. Ratio /"Tax" / "Income"	<ul style="list-style-type: none"> • From 40 • 30 - 40 • 20 - 30 • Up to 20 	1,15	0 5 7 10

1) The bank has set a passing score equal to 60, ie if the borrower $S(X) < 60$, then it is considered "unreliable", if it is higher, then it is considered "reliable".

2) Student:

$$S(X) = 1,42 \times 10 + 0,63 \times 0 + 0,35 \times 5 + 5 \times 0,92 + 0,94 \times 0 + 0 + 5 \times 2,64 + 10 \times 1,06 + 0 = 44,35.$$

3) According to the calculations, the student falls into the category of "unreliable borrower".

4) Middle class worker:

$$S(X) = 0 + 0,63 \times 10 + 0,35 \times 10 + 0,92 \times 10 + 0,94 \times 5 + 0,4 \times 0 + 2,64 \times 10 + 1,06 \times 5 + 1,15 \times 5 = 61,15.$$

The calculation shows that the middle-class worker matches the established game.

Higher level worker:

$$5) S(X) = 1,42 \times 10 + 5 \times 0,63 + 5 \times 0,35 + 10 \times 0,92 + 0,94 \times 10 + 0 + 2,64 \times 10 + 1,06 \times 10 + 1,15 \times 10 = 85,20.$$

The calculation shows that the "top worker" is a "trustworthy" borrower for the bank, which is true.

However, it should be noted that the given system is even "moderately" demonstrable, but it does not always meet the reality, as there are a number of factors that are not taken into account in such a simple model. In this regard, many borrowers receive a negative response in lending (Shapkina, 2017: 207).

C) Credit risk assessment e. According to the Altman model:

E. Altman model provides an opportunity to assess the risk of bankruptcy of an enterprise / company or to reduce its creditworthiness based on the following discriminatory model:

$$Z = 1,2 \times K_1 + 1,4 \times K_2 + 3,3 \times K_3 + 0,6 \times K_4 + K_5,$$

Where: Z - is the total Altman's assessment of the creative risk of the enterprise / company;

K1 - is the sum of own working capital / assets;

K2 - is the net profit / sum of assets;

K3 - is the sum of profit before tax and interest / assets;

K4 - is the market value of the shares / borrowed capital;

K5 - is the sum of returns / assets.

To assess the credit risk of an enterprise, it is necessary to compare the credit risk score with the value of the Tafflerian risk criterion level in the table below (Table 5.):

Table 5. Risk level indicators E. Altmane criteria

E. Altmane criteria	Credit risk (Probability of bankruptcy):
1.8 and less	Very high risk
From 1.81 to 2.7	High risk
From 2.8 to 2.9	Moderate risk
More than 2.99	Low level of risk

It should be noted that the given model can be used only for enterprises that have ordinary shares in the stock market, which allows them to adequately calculate the K4 rate. Decreasing creditworthiness increases the company's total financial risk.

D) Credit risk assessment r. According to R. Taffler model:

E) The following model of credit risk assessment of an enterprise / company is - R. Taffler model, whose calculation formula is as follows:

$$Z = 0,53 \times K_1 + 0,13 \times K_2 + 0,18 \times K_3 + 0,16 \times K_4 ,$$

Where: Z - is the total Tafflerian assessment of the creative risk of the enterprise / company;

K1 - enterprise profitability ratio (profit before tax / current liabilities);

K2 - working capital ratio (total current assets / liabilities);

K3 - Financial risk of the enterprise (long-term liabilities / total assets);

K4 - Liquidity ratio (Return on sales / total assets).

To assess the credit risk of an enterprise, it is necessary to compare the value of the obtained credit risk with the value of the criterion level of R.Tafflerian risk in the table below (Table 6.):

Table 6. Risk level indicators R. Tafflerian criteria

R. Tafflerian criteria	Credit risk (Probability of bankruptcy):
>0,3	Low level of risk
0,3 – 0,2	Moderate risk
< 0,2	High risk

F) Credit risk assessment according to R. Lisi model:

G) The economist R. Liss proposed a credit risk assessment model for UK enterprises, the calculation formula of which is as follows:

$$Z = 0,0063 \times K_1 + 0,092 \times K_2 + 0,057 \times K_3 + 0,0014 \times K_4 ,$$

Where: Z - is the credit risk assessment of the enterprise / company. Lysian total rate;

K1 - is the sum of working capital / assets;

K2 - is the sum of profit from sales / assets;

K3 - is the sum of retained earnings / assets;

K4 - is equity / borrowed capital.

To assess the credit risk of an enterprise, it is necessary to compare the obtained value of the indicator with the indicators of the criterion level of risk in the table below (Table 7.):

Table 7. Risk level indicators R. Lysian criteria

R. Lysian criteria	Credit risk (Probability of bankruptcy):
>0,037	Low level of risk
< 0,37	High level of risk

Bibliography

Basilia K., (2018). Sabanko saqme, gamomcemloba “Tbilisi”, Tbilisi.

Beridze R., (2009), Sabanko menejmenti, Tbilisi gamomcemloba universali.

Kovzanadze I., Kontridze G., (2014). Tanamedrove sabanqo saqme: teoria da praqtika. Tbilisi.

Mosiashvili V., Chelidze M., Abutidze G., (2020). Sabanko saqme, Tbilisi.

Tsaava G., Burdiashvili R., Mosiashvili V., (2020). Riskologia: finansuri riskebis strategiuli menejmenti, Tbilisi.

Carl L. Pritchard (Author), (2015). Risk Management, Fifth Edition: Concepts and Guidance, New York.

Шапкин А. С., Шапкин В. А., (2017) Теория риска и моделирование рискованных ситуаций. Москва.

Тесля П.Н., (2017). Финансовый менеджмент. Издательство: РИО. Москва.

Рягин Ю.И., (2016). Рискология. Учебник. Юрайт, Издательство Уральского Университета. Екатеринбург.

Никонов В., (2014). Управление рисками. Как больше зарабатывать и меньше терять. Москва.

Шапкин А.С., Шапкин В.А. (2012). Теория риска и моделирование рискованных ситуаций Москва.

Лаврушин О.И., Валенцева Н. И., Красавина Л.Н., (2020). Банковские риски. Москва.

<https://www.sabanko.com/wigni> [Last seen 10.10.2022];

https://www.nbg.gov.ge/uploads/publications/legal_regulation/regulations.pdf [Last seen 08.10.2022];

https://www.nbg.gov.ge/uploads/legalacts/fts/likvidobis_gadafarva.pdf [Last seen 08.10.2022];

<https://dergipark.org.tr/en/pub/kdeniz/issue/48671/573640> [Last seen 03.10.2022];

<https://bit.ly/3MH22C5> [Last seen 04.10.2022];

<https://www.ceeol.com/search/article-detail?id=813287> [Last seen 14.10.2022];

https://www.turiba.lv/storage/files/konference-xxiii-2022_1.pdf#page=95 [Last seen 04.10.2022];