

## TECHNIQUE OF COMPLEX ANALYSIS WHEN ASSESSING CREDITWORTHINESS

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**Abstract:** *The article describes the technique of complex analysis in assessing creditworthiness and its specifics. There has been worked out a complex analysis technique that allows for an accurate, reliable and comprehensive assessment of creditworthiness, and its advantages have been demonstrated. The technique of complex analysis of creditworthiness assessment represents the order of evaluation by dividing it into four groups using the scoring system based on the quantitative and qualitative indicators of the business entity.*

**Keywords:** *creditworthiness, complexity, complex analysis, qualitative indicators, quantitative indicators, creditworthiness groups, scoring system.*

### Introduction

By ensuring sustainable high growth rates in economic sectors the gross domestic product per capita will increase by 1.6 times in the next five years and by 2030, the income per capita will be over 4 thousand USD and this fact will create a foundation for entering the ranks of “countries with higher than average income” (Decree, 2022). The role of banks, which are considered the driving force of our economy, is crucially important in ensuring stable high growth rates of economic sectors. Currently economic entities meet the need for financial resources mainly at the expense of bank loans. It should be noted that efficient use of bank loans is significant for both economic entities and banks. A clear and correct assessment of the customer's creditworthiness in attracting bank loans is equally beneficial for both parties. Various techniques and methods are used to assess the creditworthiness of economic entities in our republic and in foreign practice. The final outcome of all techniques and methods is focused on accurate and reliable assessment of creditworthiness of economic entities. The complex analysis technique is considered the most reliable among these techniques and methods. Available analysis methods show various aspects of the financial and economic activity of the enterprise, but only a complex analysis allows a full assessment of the enterprise's creditworthiness. (Polyakov and Korovina, 2018). A complex economic analysis of financial activity is aimed at assessing financing issues, the financial (current and prospective) state of the enterprise and feasibility of using all financial resources (Shogiyosov, 2012). It is obvious that the complex analysis technique enables a complete and comprehensive assessment of the creditworthiness of the economic entity.

### Literature review.

Many scholars have conducted research on the theoretical, methodological and practical problems of the analysis of the creditworthiness of economic entities. However, the lack of a single procedure for comprehensive analysis in creditworthiness assessment necessitates further research of this topic.

Polyakov (2018) in his research paper focused on financial indicators while assessing creditworthiness, that is he proposed to use the coefficient method. Investigating non-financial indicators is important in assessing creditworthiness as well.

Turdieva (2020) in her research article emphasized that a comprehensive and accurate evaluation can be made in the assessment of creditworthiness through a complex analysis,

theoretically demonstrating the need to use financial and non-financial indicators.

From the point of view of Rakhimov (2019), it is more important to study more financial indicators for enterprises to return the loan on time and in full, i.e. creditworthiness.

Melnikov (2013) in his research paper studied the need to use information on all interrelated groups of companies when assessing the creditworthiness of an enterprise.

Daniela Feschijan (2008) in the research article supposes that when assessing creditworthiness it is recommended to determine the borrower's current creditworthiness and forecast trends using accounting information.

Summarizing the points presented in the above research papers, we believe that it is necessary to pay particular attention to the following points when assessing creditworthiness:

- studying quantitative indicators related to the creditworthiness of the enterprise;
- paying attention not only to financial aspects, but also to non-financial aspects;
- studying important quality indicators in the assessment of creditworthiness.

### Research methodology

Such research methods as logical thinking, monographic observation, comparison and grouping methods have been widely used to conduct the research and justify its results.

### Analysis and results

Analysis of the creditworthiness of an economic entity should be based on the principles of complexity, systematicity, objectivity, efficiency, prudence and accuracy. Complexity requires consideration of all units, links and aspects of the object under analysis and a thorough study of their interrelationships (Turdieva, 2020). It can be seen that the complex analysis technique enables to assess the ability to repay the loan (principal and percentage) on time and in full through a comprehensive analysis of all factors of the economic entity's activity.

The complex analysis technique of assessing the creditworthiness of economic entities evaluates using qualitative and quantitative indicators. This technique includes the analysis of the economic entity's industry peculiarities and product competitiveness, analysis of the economic potential of the enterprise, analysis of the financial situation, analysis of the enterprise's financial results, assessment of the enterprise's management and organization and business reputation, analysis of indicators related to the credit risk of the enterprise and the analysis of indicators related to cash flows.

**Table 1**

### Indicators of the complex analysis technique for assessing the creditworthiness of an economic entity<sup>i</sup>

Module	Quantitative and qualitative indicators of creditworthiness assessment of economic entities
Industry peculiarities and product competitiveness of the economic entity	The share of the enterprise in the market, the degree of innovation introduction in the activity of the enterprise; Product variety, high added value and high quality, well-established sales service and demand; Availability of a foreign competitor in the industry and region.
Analysis of the economic potential of the economic entity	Labour productivity; Depreciation rate of fixed assets; Return on assets ratio; Material productivity; Innovation-based product share; Competitive advantages of the enterprise.

<sup>i</sup> Developed by the author based on the research.

Analysis of the enterprise's financial position	Availability of own working assets; Solvency ratio; Financial stability ratio; Financial self-sufficiency ratio; Balance liquidity; Turnover of working assets.
Analysis of financial results of the enterprise	Implementation of the plan of net proceeds of product sales; Profit margin; Return on assets; Net profit margin; Cost-to-income ratio.
Management and organizational chart of the enterprise, assessment of business reputation	The ability to influence the founders on the company's activities; Availability of an entity supporting the enterprise; Management ability and organization skills of the executive of the enterprise and management staff; Staff turnover rate; Efficient arrangement of the enterprise activity in terms of organizational and structural composition; The enterprise's position in the field and industry, market reputation and brand recognition.
Credit risk indicators of the enterprise	Credit history of the enterprise (timely and full repayment of loans received); Loan collateral (provided with highly liquid assets, stability of the guarantor's financial situation, degree of full coverage of the loan by the insurance policy); The reality of the project (compliance with the requirements of the bank's lending policy and availability of reasonable information, possibility of implementing the project, adequate competent personnel in the enterprise, favourable natural conditions, availability of sufficient infrastructure and communal utilities).
Analysis of indicators related to cash flows	Uniformity of income and expenditure of funds in terms of seasonality and cycles; Profitability of net proceeds of sales; Net cash flow adequacy ratio; Due date (maturity), in days; Cash coverage ratio.

We believe that it is necessary to perform an assessment based on the scoring system in reliance upon the nature of each indicator with the aim of adjusting the complex analysis technique of assessing the borrower's creditworthiness with the necessary requirements of the lender. If there are quantitative indicators available, they are scored based on the interval, and qualitative indicators are scored based on their essence.

Qualitative-quantitative indicators are the indicators that cannot be determined visually, but which are essential for the given situation and can be implemented with the help of perception and understanding, as well as are useful for decision-making. It is obvious that the assessment of quality indicators requires a reasonable approach of an expert.

Table 2

**Complex analysis technique for assessing creditworthiness  
of economic entities<sup>ii</sup>**

Indicators	Status of Indicators and Interval Range	Scores
<b>Industry-based peculiarities and product competitiveness of the economic entity</b>		
Market share of the enterprise	The enterprise is one of the market leaders	3
	The enterprise's market share is average	2
	The enterprise's market share is low	1
The degree of introduction of innovations into the enterprise	The volume of production of innovation-based products is high	3
	The volume of production of innovation-based products is average	2
	The volume of production of innovation-based products is low	1
The level of competitiveness of the products	Product variety, high added value and high quality, well-established sales service and high demand	3
	The variety of goods, the quality is average, the sales service is well established, demand is available	2
	The variety of goods is low, the quality is high, the sales service is established, the demand is low	1
Presence of a foreign competitor in the industry and region	There are no foreign companies	3
	There are foreign companies competing with the borrower	2
	There are leading foreign companies in the competition	1
<b>Analysis of the economic potential of the economic entity</b>		
Labour productivity	High, above average in industry, has an upward trend	3
	Average, equal to average in industry, there is no upward trend	2
	Low, below average in industry, there downward trend	1
Depreciation rate of fixed assets ( $D_r$ )	$D_r < 20\%$	3
	$20\% < D_r < 50\%$	2
	$D_r > 50\%$	1
Return on assets ratio [5]	Above average in the industry	3
	Equal to average in industry	2
	Below average in industry	1
Material intensity of use ( $M_i$ )	$M_i > 2$	3
	$1 < M_i < 2$	2
	$M_i < 1$	1
<b>Analysis of financial position of the enterprise</b>		
Availability of own assets turnover (AOAT)	AOAT $>$ INV (inventories)	3
	AOAT available	2
	AOAT not available	1

<sup>ii</sup> Developed by the author based on the research.

Coverage ratio [5]( $R_c$ )	$R_c > 2$	3
	$1 < R_c < 2$	2
	$R_c < 1$	1
Financial self-sufficiency ratio [5]( $R_f$ )	$R_f > 0,6$	3
	$0,3 < R_f < 0,6$	2
	$R_f < 0,3$	1
Turnover of inventories ( $T_{inv}$ )	$T_{inv} > 8$	3
	$4 < T_{inv} < 8$	2
	$T_{inv} < 4$	1
<b>Analysis of financial results of the enterprise</b>		
Return on sales ( $R_s$ )	$R_s > 40\%$	3
	IR (inflation rate) $< R_s < 40\%$	2
	$R_s < IR$	1
Return on assets [5]( $R_a$ )	$R_a > 20\%$	3
	IR (inflation rate) $< R_a < 20\%$	2
	$R_a < IR$	1
Net profit margin ( $M_{np}$ )	$M_{np} > 20\%$	3
	IR (inflation rate) $< M_{np} < 20\%$	2
	$M_{np} < IR$	1
Cost-to-income ratio [5]( $CI_r$ )	$CI_r < 0,75$	3
	$0,75 < CI_r < 1$	2
	$CI_r > 1$	1
<b>Management and organizational chart of the enterprise, assessment of business reputation</b>		
Availability of an entity supporting the enterprise	More than 2 entities supporting the enterprise	3
	Up to 2 entities supporting the enterprise	2
	One entity supporting the enterprise	1
Management ability and organization skills of the executive of the enterprise and management staff	Excellent management ability and organization skills	3
	Average management ability and organization skills	2
	Low management ability and organization skills	1
Staff turnover rate [5]( $S_{tr}$ )	$S_{tr} < 0,5$	3
	$0,5 < S_{tr} < 1$	2
	$S_{tr} > 1$	1
The enterprise's position in the field and industry, market reputation and brand recognition	The enterprise is leading in the field and industry, a high reputation in the market, as well as a well-known brand	3
	The enterprise's position in the field and industry is average, it has its own reputation in the market, and its brand is familiar to customers	2
	The enterprise's position in the field and industry is not significant, the brand is not familiar to customers	1
<b>Indicators related to credit risk of the enterprise</b>		
Credit history of the enterprise (timely and full repayment of loans received)	For more than 3 years, banks, including the loans received from the bank-customers, have repaid loans (principal and percentage) in due time and in full	3

	Within 3 year-period, the banks, including the loans received from the bank-customers customer, have repaid the loans (principal and interest) in due time and in full	2
	Within 3 year-period, the banks, including the loans received from the bank-customers customer, have repaid the loans (principal and interest) late or partially	1
Loan collateral (provided with highly liquid assets, stability of the guarantor's financial situation, degree of full coverage of the loan by the insurance policy)	Loan collateral is of a modern nature, highly liquid, sufficient, ownership belongs to the enterprise. The guarantor's financial situation is absolutely stable. The insurance policy has fully covered the loan and has been taken for the full term.	3
	Loan collateral is quite new, liquid, sufficient, ownership belongs to the enterprise. The guarantor's financial situation is stable. The insurance policy has covered 50% of the loan and has been received for 50% of the term.	2
	Loan collateral is more than 50% obsolete, illiquid, insufficient, ownership does not belong to the enterprise. The guarantor's financial situation is unstable. The insurance policy has covered less than 25% of the loan and has been received for 25% of the term.	1
The reality of the project (compliance with the requirements of the bank's lending policy and availability of reasonable information, possibility of implementing the project, adequate competent personnel in the enterprise, favourable natural conditions, availability of sufficient infrastructure and communal utilities)	It meets the requirements of the bank's credit policy and has reliable sources of information. It is possible to implement the project: the positive financial result of the enterprise and the amount of cash flow are adequate to pay the loan amount (principal and interest). The business plan of the project is economically and practically based. The enterprise has enough competent employees. There are favourable natural conditions, sufficient infrastructure and communal utilities.	3
	It meets the requirements of the bank's credit policy and has sufficient sources of information. There is a serious risk involved in the implementation of the project. The positive financial result of the enterprise and the amount of cash flow are adequate to pay the loan amount (principal and interest). The number of competent employees in the enterprise is insufficient. There are favourable natural conditions and sufficient infrastructure. There will be an interruption in the provision of communal utilities.	2
	Does not fully meet the requirements of the bank's credit policy and does not have sufficient sources of information. There is a serious risk involved in the implementation of the project. The positive financial result of the enterprise and the amount of	1

	cash flow sufficient to pay the loan amount (principal and interest) depends on the risk. The number of competent employees in the enterprise is insufficient. There are no favourable natural conditions and sufficient infrastructure. There will be an interruption in the provision of communal utilities.	
<b>Analysis of indicators related to cash flows</b>		
Uniformity of income and expenditure of funds in terms of seasonality and cycles	Business activity is not seasonal, cash flow income is the same across cycles	3
	Business activity is seasonal in nature or requires 90 days for working assets turnover	2
	Business activity is seasonal, cash flow income is not uniform across cycles, or working assets turnover takes more than 90 days	1
Net cash flow adequacy ratio ( $R_{ncfa}$ )	$R_{ncfa} > 1$	3
	$0,5 < R_{ncfa} < 1$	2
	$R_{ncfa} < 0,5$	1
Due date (maturity), in days ( $D_d$ )	$D_d < 30$ days	3
	$30 \text{ days} < D_d < 90 \text{ days}$	2
	$D_d > 90$ days	1
Cash coverage ratio	$R_{ncfa} > 1$	3
	$0,5 < R_{ncfa} < 1$	2
	$R_{ncfa} < 0,5$	1

In the complex analysis technique of assessing the creditworthiness of the borrower, the indicators specified above, are divided into classes and intervals by creditworthiness levels and scores.

Creditworthiness is determined using the geometric mean method.

$$K_j = \sqrt[n]{K_1 \times K_2 \times \dots \times K_n}, \quad (3.15)$$

Here N-number of indicators;  $K_1, K_2, \dots, K_n$  – indicators assessing creditworthiness.

The advantage of this method is that the assessment of creditworthiness using the geometric mean method, unlike other methods used in the assessment of creditworthiness, allows the simultaneous use of quantitative indicators that affect the assessment of the borrower's creditworthiness. Because the role of quality factors is also essential in the timely and complete repayment of loans by economic entities. Failure to use a scoring system for indicators assessing the borrower's creditworthiness is associated with limiting the possibility of reliable assessment, as the scoring system enables manipulation of quantitative and qualitative indicators. According to a number of studies, the credit scoring system enables to correctly determine the borrower's ability to fulfill his obligations by 60-80 percent (Rakhimov and Kalandarova, 2019).

**Table 3**

**Classification of groups of creditworthiness of the economic entity <sup>iii</sup>**

Group	Creditworthiness level	Score interval	Note
I	High	from 2,62 to 3	Customers of this category have a high level of creditworthiness. They repay the loan in due time and in full. Fully meets all the requirements of the bank.
II	Good	from 2 to 2,61	Customers of this category have the ability to repay the loan. Partially meets all the requirements of the bank.
II	Satisfactory	from 1,59 to 1,99	Customers in this category are not financially stable. Projects are really important due to a high credit risk and can be recommended only in case of high reliable collateral.
IV	Poor	from 1 to 1,58	Creditworthiness is almost not available at economic entities of this. This category of customers has a very high credit risk. Therefore, it is not recommended to extend loans to them.

We divided the creditworthiness of economic entities into four groups: high, good, satisfactory and poor. For this, initially, proceeding from 27 indicators, 81 points are scored when all indicators are at best, i.e. 3. If all indicators are equal to 2, it scores 54 points, so the range 54-81 demonstrates excellent results, and if all indicators are 1, it scores 27 points. It implies that the range 27-53 demonstrates good results, and the interval from 1 up to 26 proves poor performance. In reliance upon the considerations above, using the mean geometric method, if 33% indicators score 2 points, and the rest account for 3 points, the creditworthiness is considered high. If more than 33% of indicators account for 2 points creditworthiness can be assessed as good, if 33% of indicators are equal to 1 point, and the rest amount to 2 points – it is satisfactory level, and if more than 33% of indicators account for 1 point the creditworthiness can be assessed as poor.

Advantages of the complex analysis technique for assessing the creditworthiness of economic entities:

1. This technique has the ability to accurately, reliably and comprehensively assess the creditworthiness of enterprises.
2. In contrast to other assessment methods, when evaluating the creditworthiness of economic entities, qualitative indicators are taken into account simultaneously with the quantitative indicators using the scoring system.
3. The methods of calculating criteria for assessing the creditworthiness of economic entities have been improved, that is, the level of accuracy has been increased.
4. This technique has been created taking into account best foreign experience.

**Conclusion and proposals**

The coefficient method is used to assess the creditworthiness of enterprises in the practice of the banks of our republic. Herewith the primary focus is made on financial indicators. In the coefficient method it is not possible to fully disclose financial indicators with the coverage ratio, liquidity ratio and financial self-sufficiency ratios. In addition, the drawbacks of the calculation method of these coefficients indicate the high level of uncertainty of this method. Another drawback of this method is that the loan is allocated to the next period based on the data of the completed period. One of the crucially important tasks is to predict the

<sup>iii</sup> Developed by the author based on the research.



future activity in advance. Another aspect that banks are not paying attention to, but which is worth paying particular attention to, is quality indicators. Quality indicators represent one of the significant factors in timely and complete repayment of obligations of economic entities. Based on the statements specified above, we have developed a complex analysis technique for evaluating creditworthiness in reliance upon advanced foreign experience studied. This technique enables to minimize the credit risk through a comprehensive assessment of the creditworthiness of economic entities based on quantitative and qualitative indicators.

In conclusion it should be noted that complex analysis technique for assessing the creditworthiness of economic entities allows for a clear, reliable and comprehensive assessment of the ability to repay the loan in due time and in full.

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