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Theoretical and Practical Research in Economic Fields



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CONCEPT OF EVALUATION OF CREDITWORTHINESS OF ENTERPRISES IN CONDITIONS OF ECONOMIC CYCLE

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Abstract: *The economic content and components of creditworthiness of enterprises are substantiated. An in-depth critical analysis and structuring of the main tools and methods for assessing the creditworthiness of enterprises in the current conditions of transformation of the world market. The classification of the main factors influencing the formation of creditworthiness of enterprises and should be taken into account in the formation of strategic guidelines for each enterprise is proposed. The main criteria for assessing the creditworthiness of enterprises depending on the type and specificity of economic activity based on the analysis of credit risk models are substantiated. The concept of assessing the creditworthiness of enterprises in modern conditions of economic cyclicity, taking into account the characteristics of the industry, volume and specifics of activities. A method of assessing the creditworthiness of enterprises by type of economic activity using multidimensional discriminant analysis taking into account the influence of various factors, both internal and external environment, which, unlike existing ones, will quickly determine the financial condition and determine and take into account the impact of various factors. The developed concept of assessing the creditworthiness of enterprises through multidimensional discriminant analysis will ensure effective management decisions and optimize the financial condition.*

Keywords: concept; enterprise; creditworthiness; risk; profit; efficiency.

JEL Classification: C38; G32; F47.

Introduction

The key goal of the study is the formation of conceptual approaches to assessing the credential of enterprises in conditions of economic cyclicity. For enterprises of any industry and field of activity, it is quite relevant and necessary to obtain additional financing in the form of loans. The relevance of this research topic and the need to form a concept for assessing the creditworthiness of enterprises in a cyclical economy is caused by a number of factors such as: socio-economic instability; negative impact of global imbalances on the national economy; increased distrust of banking institutions as major creditors in the financial statements of companies and their creditworthiness; increase in the cost of credit resources; complication of the lending procedure; an increase in the share of bad debt in banks' portfolios. The need to form a concept for an adequate assessment of the creditworthiness of borrowers, in particular legal entities, as well as a high likelihood of bankruptcy of enterprises, which is mainly associated with a high level of debt and effective management of financial flows, taking into account risks, necessitates a revision of existing approaches and their improvement through the formation of an innovative assessment concept the credibility of enterprises in conditions of economic cyclicity. The transformation of the financial market of the country in accordance with international banking business standards prompts banking

institutions to use the newest methods for assessing creditworthiness, which provide financial substantiation of credit relations both for the creditor and for enterprises (borrowers).

1. Concept of Evaluation of Creditworthiness of Enterprises

The application of an adequate methodology for assessing creditworthiness using the latest tools of economic and mathematical modelling from the standpoint of the borrower allows for efficient management and use of attracted resources that are aimed at providing and improving the financial condition and long-term growth.

The introduction of a comprehensive and reliable methodology for assessing the creditworthiness of enterprises (borrowers) from the position of the creditor provides an opportunity to ensure effective risk management and reduce the level of credit risk, which is directly related to non-return or partial non-repayment of loans by economic entities. In order to improve the management of financial flows and reduce the credit risk of both the creditor and the borrower in terms of economic cyclicity, the selection of a valuation methodology that meets the set goals is a topical priority. In modern conditions, economic cyclicity is gaining increasing relevance issues related to ensuring financial stability, improving the credit rating and finding additional sources of financing for enterprises and organizations, regardless of the type of economic activity. The main arguments for this relevance are socio-economic instability and the constant need for additional sources of financing for enterprises in any sector of the economy, which is also confirmed by a multitude of research and development in this area. A critical analysis of the existing theoretical aspects of the features of assessing the creditworthiness of enterprises made it possible to determine the existence of many different approaches, methods and tools, which in their essence are identical and differ only in the field of application, which necessitates a more detailed study and formation of the concept of assessing the creditworthiness of enterprises in conditions of economic cyclicity. The variety of existing methods for assessing the creditworthiness of enterprises differs from each other in indicators and approaches to their calculation, which indicates the need for a comprehensive study and development of the concept of credit assessment. It should be noted that the variety of existing methods for assessing the creditworthiness of enterprises differs from each other in indicators and approaches to their calculation, which indicates the need for a comprehensive study and development of the concept of credit assessment. It is important to note that the main theoretical aspects of the creditworthiness of enterprises are considered in the scientific works of a group of scientists, such as: (Epifanov 2011: 217), (Lakhtionova 2005: 315), (Caplinska *et al.* 2020: 2546), (Helfert 2012: 436). Which consider this issue from the position that in order to guarantee the achievement of strategic goals, it is necessary to radically change the approach to managing their credit funds, strengthen control over their use and tighten the criteria for the formation of the company's creditworthiness, which in turn will contribute to further financing. However, it should be noted that the considered approach does not correspond to the realities of doing business and does not distinguish between the features of assessing the creditworthiness of enterprises in conditions of economic cyclicity, which requires more detailed and detailed study. Special attention to creditworthiness as a key factor in credit risk management is given in the scientific works of a group of scientists, such as: (Ilic *et al.* 2019: 7), (Tereshchenko 2012: 27), (Thompson and. Strickland 2000:165) (Pukala 2020: 35), (Vasyurenko and Podcesova 2011: 170), (Vitlinsky 2000: 40), which argue in the need to build a strategy for managing an enterprise's credit risks based on credit ratings. It should be noted that the system for constructing credit ratings as an individual enterprise, organization or country as a whole in modern conditions is quite relevant and used in practice, however, these ratings are not reliable if they are based only on static factors, which is not accepted in conditions of economic cyclicity. This approach does not take into account the peculiarities of the processes of transformation of the financial market and its key macroeconomic factors of influence, which requires further improvement and study. Particularly noteworthy are the studies of a group of scientists such as: (Ostafil 2009: 388), (Dinçer 2019: 186), (Larionova 2000: 4), (Litvinyuk 2014: 210), (Galasyuk 2001: 55), (Nam, 2020: 345), who in their works consider the assessment of financial results as an integral part of the management of financial flows of enterprises.

This approach is more modern and allows one to assess the aggregate financial flows of an enterprise taking into account internal factors, but takes into account macroeconomic factors, which in modern conditions is an important element in the concept of assessing the creditworthiness of enterprises. It should be noted that this approach needs to be improved by including in the assessment concept, both internal factors of the enterprise that affect financial flows, and external ones, which have an important role and influence on the quality of the formation of creditworthiness indicators. Paying due attention to the scientific experience of domestic and foreign scientists, it is necessary to note that there is a need to develop a concept of credit assessment of enterprises in the context of economic cyclicity using the tools of multidimensional discriminant analysis. For the formation of conceptual approaches to assessing the creditworthiness of enterprises in conditions of economic cyclicity, various research

methods were applied. To form the theoretical aspects of assessing the creditworthiness of enterprises, a critical analysis of the theory of the economics of enterprise management was carried out, taking into account the modern features of economic cycles. To develop the main approaches to the formation of the concept of assessing the creditworthiness of enterprises, both general scientific and special methods of cognition were used: analysis and synthesis - to classify existing scientific approaches and views on determining the solvency and creditworthiness; logical generalization - in the process of forming the key factors of the company's creditworthiness in modern conditions of economic cyclicity. To determine the concept of assessing the creditworthiness of enterprises in an economic cyclical environment, a systematic approach to the classification of existing risk assessment models was used. The main results of the theoretical generalization made it possible to develop the main criteria for assessing the creditworthiness of enterprises, depending on the type of economic activity, based on models of credit risk analysis, taking into account modern trends in economic cyclicity. With the help of economic and statistical analysis, the dynamics of the loan portfolio of banks depending on the risk category and the category of debtors is considered. The main results of the presented analysis made it possible to form methodological approaches to the integral assessment of the financial condition of a debtor of a legal entity based on aggregated financial indicators.

The structured main stages of the process of assessing the creditworthiness of enterprises on the basis of multidimensional discriminant analysis tools depending on the types of economic activity. To implement practical recommendations for improving the process of assessing the creditworthiness of enterprises in the context of economic cyclicity, the tools of multidimensional discriminant analysis were used to assess the integral indicator of the financial condition of enterprises by sectors of the economy. The developed criteria for assessing creditworthiness can be applied in practice, both for individual enterprises and for individual sectors of the economy, when determining the integral indicator of the financial condition and possible risks. The information base of the study was statistical data of annual balances of enterprises broken down by sectors of the economy, as well as by individual banking institutions, scientific works of domestic and foreign scientists and economists. Financing the real sector of the economy has a very important impact on the country's economic growth. Without the financing and support of additional financial resources of enterprises of any sphere of activity, it will be impossible to effectively function and ensure competitiveness in the field of the corresponding sphere of the economy. For a more thorough study of theoretical aspects and the definition of components of the creditworthiness of enterprises in terms of economic cycles, it is appropriate to consider the interpretation of the economic content of the concepts of "creditworthiness" and "solvency". The ability of the borrower to timely and within the established time frame to recover received loans and interest thereon is a key indicator that determines its creditworthiness and increases creditor credibility and increases the chances of obtaining additional sources of financing for the development of the company and the industry as a whole. The ability of the borrower to meet its obligations is determined by its solvency and creditworthiness. A generalization of theoretical approaches of foreign and domestic scientists allows us to state that the concept of "solvency" is more general and characterizes not only the creditworthiness of the enterprise, but its financial stability. Hence, it is appropriate to state that the solvency of an enterprise is the financial and economic state of the enterprise, which is characterized by the ability to meet liabilities in a timely manner and in full by all terms, volumes and amounts. Unlike solvency, the creditworthiness of an enterprise is narrower and concerns only lending and the possibility of timely execution of credit obligations under terms of loans provided within the specified period. Modern methods and instruments for assessing the borrower's creditworthiness used by creditors-banks are quite diverse and take into account different factors and factors of their formation according to their specifications. Classification of the main factors that affect the formation of creditworthiness of enterprises are presented in Fig. 1

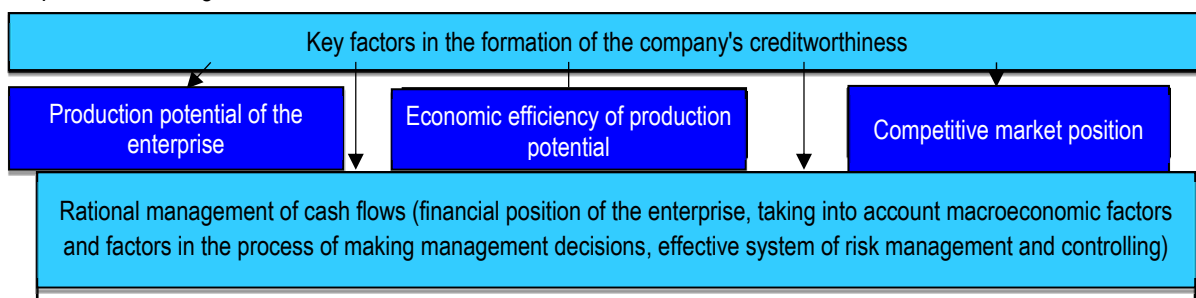


Figure 1. Key factors in the formation of the company's creditworthiness

Credibility is directly related to the financial and economic condition of the enterprise and a set of characteristics that reveal its availability of financial resources that are necessary for rational functioning, the

efficiency of the use of both assets and liabilities, financial and economic links with other economic entities, solvency and financial sustainability and promising growth. The key and strategic direction of any bank as a creditor to determine credit risk is the assessment of the borrower's creditworthiness. To develop the concept of assessing the creditworthiness of enterprises by types of economic activity in terms of economic cyclicity, it is necessary to classify the existing approaches, which are presented in Table 1

Table 1. The concept of assessing the creditworthiness of enterprises in terms of economic cycles, depending on the category of models

Category of models for assessing the creditworthiness of an enterprise	
Classification	Comprehensive
Rating (ball) assessments based on a structural indicator system	Model 5C
Forecast models of viability (models E. Altman, K. Beerman, G. Springleit, R. Lis, R. J. Tahfler, IDEA, and others), which are based on the analysis of cash flows of the enterprise.	CAMPARI
	MEMO RISK
	PARSER
Multivariate discriminant analysis	4FC system
CART	PARTS

Source: Made by the author on the basis of (Angilella, Mazzù 2019), (Brigham, Houston 2009)

Classification models make it possible to differentiate borrowers according to the relevant features: (1) Category of the borrower, which is determined by calculating the aggregated financial indicators and determining their ranks in accordance with the model; (2) Probability of bankruptcy based on forecasting aggregated and structural financial indicators of the enterprise. Comprehensive models for assessing the creditworthiness of enterprises by types of economic activity in conditions of economic cyclicity allow to conduct a rating (point) assessment on the basis of calculation of structural and aggregated financial indicators, and their subsequent transfer to the points in accordance with the model and parameters of the model that is being used.

Mathematical Expressions. To determine the amount of credit risk on assets on an individual basis, commercial banks use the formula:

$$CR_{iH\partial} = \max\{0; PDx[EAD - (\sum_{i=1}^J (CV \cdot k) i + RC)]\}, \quad 2.1$$

which is argued as follows:

$$CR_{iH\partial} = PD_{iH\partial} * LGD_{iH\partial} * EAD_{iH\partial}. \quad 2.2$$

$$LGD_{iH\partial} = 1 - Ri_{H\partial}. \quad 2.3$$

$$RR_{iH\partial} = \frac{\sum_{i=1}^j (CV * k) * i + RC}{EAD_{iH\partial}} \quad 2.4$$

For identifying the value of credit risk in the case of active operations by banking institutions and assessing the creditworthiness of enterprises, the calculation of the integral indicator of the financial status of the borrower - a legal entity with the weighing of aggregated and structural financial ratios using a multi-factor discriminant model is carried out:

$$Z = a_1 K_1 + a_2 K_2 + a_3 K_3 + a_4 K_4 + a_5 K_5 + a_n K_n - a_0 \quad 2.5$$

where, $CR_{iH\partial}$ - the amount of credit risk on an asset on an individual basis;

$PD_{iH\partial}$ - coefficient of default probability of the debtor / counterparty for the asset;

$RR_{iH\partial}$ - a coefficient that reflects the level of return on the debt on an asset due to the implementation of security and other receivables of the debtor; $EAD_{iH\partial}$ - exposure at risk under the debtor's asset at the date of valuation;

CV_i - the value of the i-th provision of the debtor, which is considered for the calculation of credit risk (in the presence of several types of collateral for a single asset by the debtor). In the event that the collateral provided for the asset is not in accordance with the list, the principles and eligibility criteria determined by the National Bank of Ukraine must be accepted for the calculation of the CV, equal to "0", or none at all; k_i - the liquidity ratio of the nth type of security, which is determined by the banking institutions in accordance with the requirements of the National Bank of Ukraine.

Each Bank uses a lower (lower) value of the liquidity ratio of the security on the basis of a specified amount of security costs; RC - other receipts, in particular, insurance indemnity, financial guarantee, realization of debtor / guarantor's property, except for pledged. The amount of credit calculated to determine the amount of credit risk is determined on the basis of the judgment of the bank, but it cannot exceed 5% of the amount of debt, not covered by the collateral value (subject to adjustments to the liquidity ratio). From the formulas (1) - (4), it should be noted that the total amount of credit risk for each banking institution (the amount of borrower's debt to the bank, EAD – exposure at risk on the valuation date) becomes a net credit risk (CR - the amount of credit risk for an individual asset), the amount of which is subject to reservation at the expense of the bank. In terms of economic cycles, the determination of the net credit risk of a debtor's asset is related to the complexity of assessing the probability of default of the debtor and the value of the collateral, taking into account liquidity, which has a significant impact on the conclusion of contracts and compliance with all regulatory requirements of the National Bank of Ukraine.

Z - Integral indicator of financial condition of the borrower-legal entity taking into account aggregated financial ratios; $K_1, K_2 \dots K_n$ - aggregated financial ratios, determined on the basis of financial reporting data of the borrower - legal entity; $a_1, a_2 \dots a_n$ - key parameters of a discriminant model, determined by taking into account the importance of financial ratios and their significant impact, which are updated annually by the National Bank of Ukraine; a_0 - a_0 is a free member of a discriminant model, the value of which is updated annually by the National Bank of Ukraine by making changes and additions to the methodology of credit risk assessment.

To determine the magnitude of credit risk, the concept of assessing the creditworthiness of enterprises by main types of economic activity is presented based on the processing of financial statements and the calculation of the integral indicator of the financial state with the weighing of aggregated financial ratios using the tools of multifactorial discriminatory analysis. Group of companies by types of economic activity:

(1) Agriculture, forestry and fisheries:

$$Z = 2,305 + 0,707 * X_5 + 0,588 * X_8 + 0,421 * X_{10} + 0,615 * X_{11} + 0,502 * X_{12} + 0,634 * X_{13} \quad 2.6$$

where, X_5 - Turnover of enterprise stocks; X_8 - Turnover of accounts payable; X_{10} - Maneuverability of working capital; X_{11} - Coverage of debt with net income; X_{12} - Coverage of debt to profits for depreciation and taxation; X_{13} - The share of non-operational elements of the balance sheet of the enterprise.

(2) Extractive industry and quarry development, manufacturing industry, construction:

$$Z = 1,670 + 0,375 * X_2 + 0,333 * X_{11} + 0,313 * X_{13} + 0,436 * X_{14} + 0,352 * X_{15} + 0,261 * X_{16} \quad 2.7$$

where, X_2 - Total liquidity; X_{11} - Debt covering with net income; X_{13} - The share of non-operational elements of the balance of the enterprise; X_{14} - Turnover of current assets; X_{15} - Coverage of financial expenses by profit before taxation and depreciation; X_{16} - Profitability before taxation.

(3) Wholesale and retail trade: repair of motor vehicles:

$$Z = 1,939 + 0,480 * X_2 + 0,556 * X_6 + 0,650 * X_8 + 0,282 * X_{17} + 0,202 * X_{18} \quad 2.8$$

where, X_2 - Total liquidity; X_6 - Coverage of debt by gross product; X_8 - Turnover of accounts payable; X_{17} - Coverage of financial expenses by gross profit; X_{18} - Indicators of indebtedness.

(4) Financial and insurance activities, real estate operations:

$$Z = 1,291 + 0,476 * X_1 + 0,602 * X_2 + 0,501 * X_3 + 0,381 * X_4 \quad 2.9$$

where, X_1 - Share of capital in the balance sheet of the enterprise; X_2 - Total liquidity; X_3 - Coverage of debt by profit before tax; X_4 - Operating profitability of assets.

(5) Other types of economic activity of enterprises:

$$Z = 1,719 + 0,648 * X_5 + 0,662 * X_6 + 0,476 * X_7 + 0,468 * X_9 \quad 2.10$$

where, X_5 - turnover of stocks of the enterprise; X_6 - Coverage of debt by gross product; X_7 - Coverage of financial expenses by operating profit; X_9 - Turnover of accounts receivable.

Bringing the indicators to the annual measurement is carried out by the method of sliding annual amount:

$$(I_{t-1} - I_{t-1}^p) \quad 2.11$$

where, I_t^p - the value of the indicator for the reporting period of the current year; I_{t-1} - the value of the indicator for the previous year; I_{t-1}^p - the value of the indicator for the reporting period of the previous year;

If the presented figures cannot be calculated due to the lack of relevant data for previous years, then the following applies:

$$I_t^p = \frac{4}{K}$$

2.1

where, K – serial number of the last reporting quarter, (Lettau 2001:819).

2. Application Functionality

The indicated ratings (scores) are calculated by multiplying the value of the indicator by its share in the rating and the integral indicator based on which management decisions are made regarding the creditworthiness of the enterprise. These models of assessing the creditworthiness of enterprises in terms of economic cycles, allow shortening the time for analysis of applications for loans, business plans and the deadline for the management decision on granting a loan.

A key disadvantage of these models of credit assessment of enterprises is that they all rely only on a number of factors that offset a number of equally important ones. The classification of the main criteria for assessing the creditworthiness of enterprises, depending on the type of economic activity, based on models of credit risk analysis is presented in Table 2.

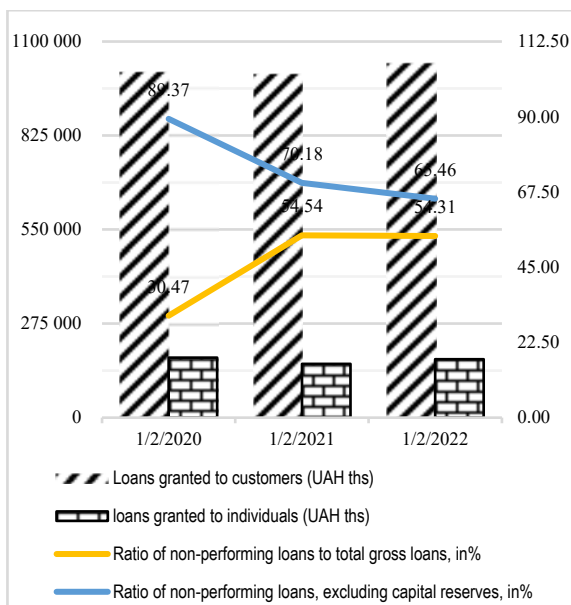
Table 2. Classification of the main criteria for assessing the creditworthiness of enterprises depending on the type of economic activity based on models of credit risk analysis

Models of analysis and credit risk assessment						
Criteria for evaluation	Model 5C	CAMPARI	MEMO RISK	PARSER	4FC system	PARTS
Reputation	+	+	+	+	+	+
Quality management	+	+	+	+	+	+
Industry specifics	-	-	+	-	-	+
Terms of business	-	-	+	-	-	-
Loan provision	+	+	+	+	+	+
Possibility of realization of collateral	+	+	+	+	+	+
Control	-	-	+	-	-	-
Financial position	-	-	+	-	+	+
Adequacy of enterprise capital	-	-	+	-	+	+
Exposure of cash flows and credit needs	+	+	-	-	-	-
Possibility to repay the loan	+	+	+	+	-	+
Justification of the purpose and amount of the loan	+	+	-	+	+	-
The term of the loan	-	-	-	-	-	+
Reimbursement for credit risk	-	-	+	+	-	-

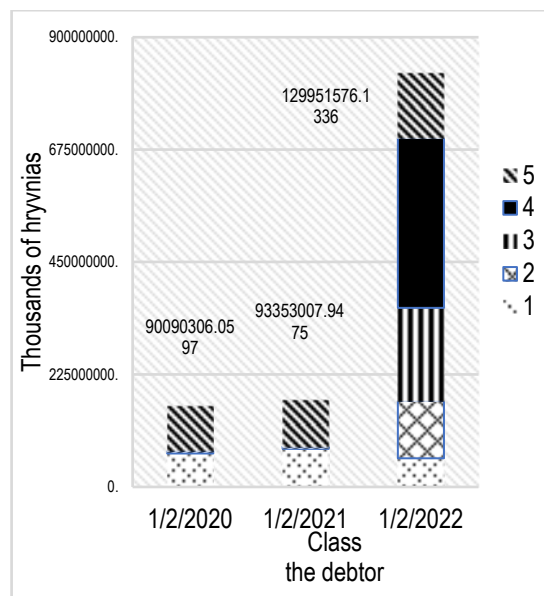
Source: Made by the author on the basis of (Steven 2014); (Malekipirbazari & Aksakalli 2015).

In terms of economic cycles, the concept of assessing the creditworthiness of borrowers (both individuals and legal entities) is based on the integrated and integrated application of quantitative and qualitative indicators to maximize the reliability and correctness of the results obtained, on the basis of which management decisions are made regarding lending and the level of credit risk (Zhu *et al.* 2019). Since the assessment of the borrower's creditworthiness (both physical and legal) by the bank as a creditor is a strategic direction that provides for the determination of the level of credit risk by using different techniques to ensure financial stability. In modern conditions, ensuring solvency and creditworthiness of enterprises is important, which leads to the search and development of new approaches and concepts of management and methods for evaluating financial status and creditworthiness using multi-factor discriminant analysis. Carrying out analysis and estimating the size of credit risks by banks as the key lenders of the real sector of the country's economy should be carried out in accordance with the basic principles of the risk management system, which should include: identification of the main sources of risks; definition of the basic properties of different types of risks and their classification, taking into account the interrelationships between their types; creation of a model based on discriminant analysis using economic and mathematical modeling (Litvinyuk 2016).

A) Distribution of granted loans - to individuals, depending on the categories of risk and classes of debtors

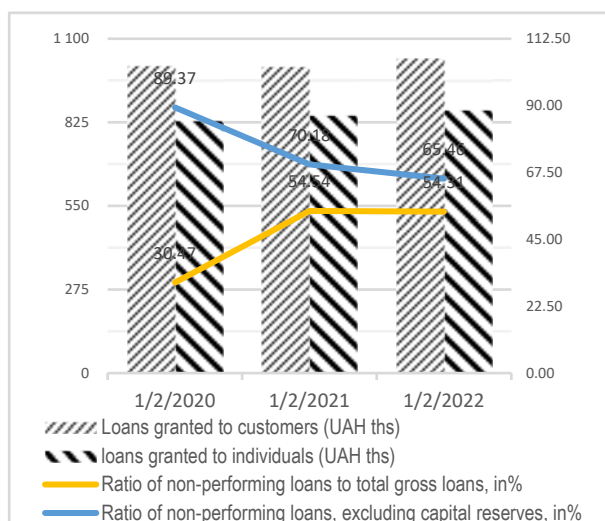


(1) Distribution of loans granted to individuals

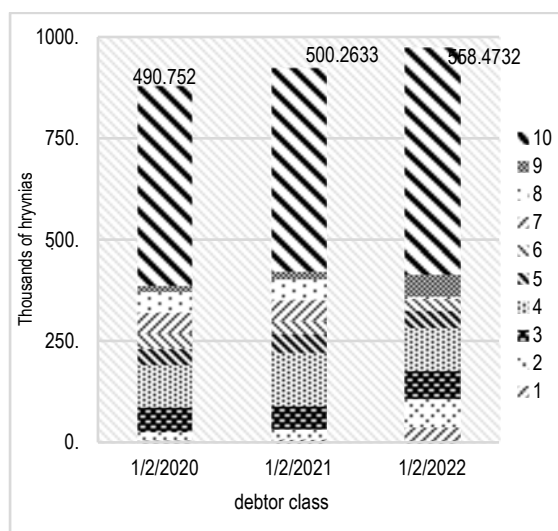


(2) Distribution of categories of credit risk by classes of debtors

B) Distribution of loans granted to legal entities depending on the categories of risk and classes of debtors



(3) Distribution of loans granted to legal entities



(4) Distribution of categories of credit risk by classes of debtors

Source: Made by the author on the basis of (National Bank of Ukraine 2019).

Figure 2. Distribution of loans granted by Ukrainian banks depending on the risk category and debtor class

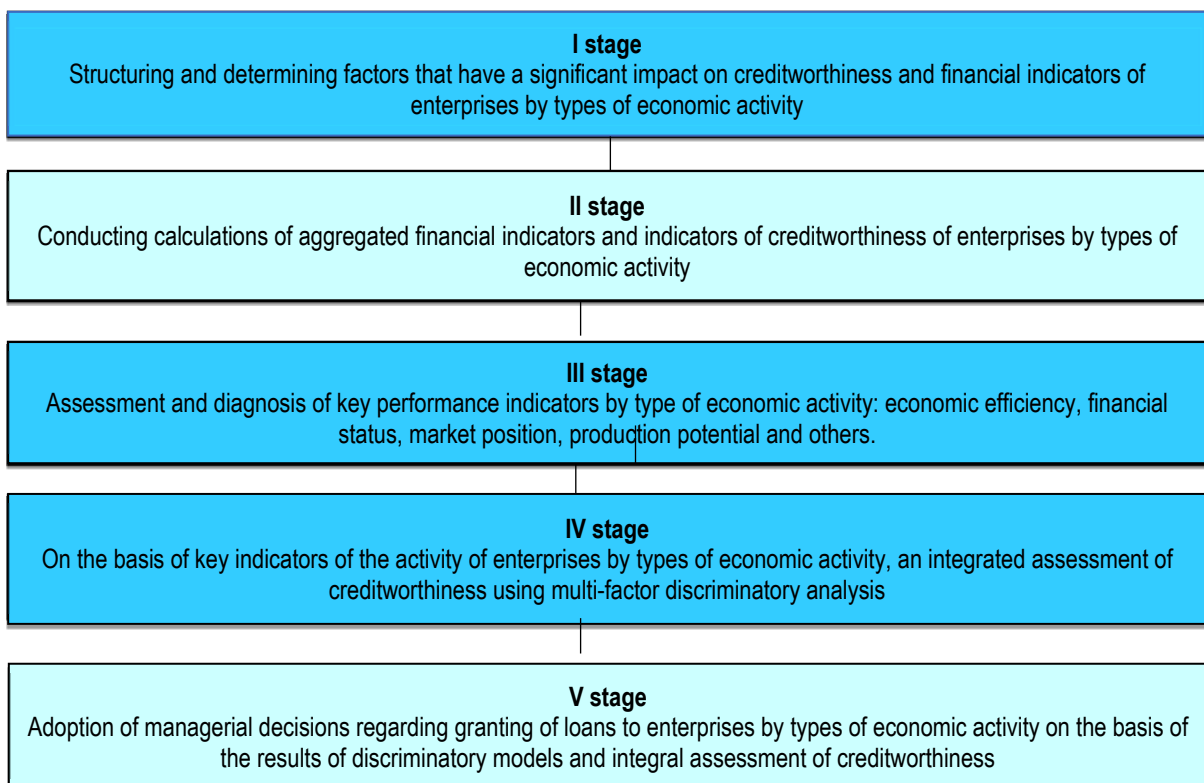
In accordance with the "Regulation on determination by banks of Ukraine of the amount of credit risk under active banking operations" approved by the National Bank of Ukraine Board Resolution № 351 dated June 30, 2016, the calculation of the amount of credit risk determines the value of each of the components of credit risk, depending on the type of debtor/counterparty, type of asset, security type, debt currency, and asset assessment method. For the purpose of organizing an effective credit policy, each bank implements its methodology and procedure for evaluating borrowers' creditworthiness, which must take into account all key indicators set by the Regulations of the National Bank of Ukraine with the justification and determination of the priority indicators in the assessment of creditworthiness that are necessary for the formation of provisions for the recovery of possible losses from implementation of risks.

To form a unified concept for assessing the creditworthiness of enterprises in terms of economic cyclicity, it is appropriate to carry out an analysis of the debt on loans granted by Ukrainian banks and the distribution of credit risk by classes of debtors, which is presented in Figure 2. As of 01.01.2016 compared with 01.01.2018 the volumes of loans granted by Ukrainian banks increased, however, the ratio of non-performing loans to total loans

in% increased significantly from 30.47% to 54.31%, which is evidenced by the fact that commercial banks of Ukraine have problems with identifying and assessing credit risks within their active operations.

Using multi-factor discriminant analysis to assess creditworthiness involves the construction of a model for calculating the integral indicator of the financial condition of the borrower and its calculation for a particular company, depending on the industry and kind of economic activity, which provides adequate financial diagnostics in conditions of economic cyclicity. To develop an actual concept for assessing the creditworthiness of enterprises in terms of economic cycles, it is appropriate to use a multifactorial discriminatory model for the diagnosis of financial condition of enterprises. Which allows us to assess the integral indicator of the financial state in order to determine the magnitude of credit risk and account in the process of making managerial decisions. The volumes of loans granted to enterprises by type of economic activity by currency and maturity indicate that more promising areas of the economy of the country, which have the largest share of loans granted, are enterprises: wholesale and retail trade, processing industry, agriculture and forestry, construction and real estate management, mining industry and electricity supply.

It should be noted that the socio-economic instability and cyclicity of the country's economy leads to a shortage of funds and the need for additional financing by attracting loans from the term of 1 year, but it is evident in the long run that enterprises of the specified types of economic activity lack the liquid assets and assets to increase volumes production in order to improve the financial state and ensure economic growth (Dytchenko 2015: 832). The above points out the need to improve and develop an effective concept for assessing the creditworthiness of enterprises in terms of economic cycles using multi-factor discriminatory analysis. To carry out an integrated assessment of the creditworthiness of enterprises by types of economic activity, it is appropriate to identify the stages that are shown in Figure 3.



Source: Made by the author on the basis of (Blasques *et al.* 2019); (Steven 2014).

Figure 3. Stages of assessing the creditworthiness of enterprises by types of economic activity

In conditions of economic cyclicity, banking institutions independently determine the list of factors that should be taken into account when assessing the size of credit risk, set their thresholds and weightings for calculating the generalized criterion of the level of riskiness of the corresponding credit transaction. At the same time, it is very important to take into account and correct the formation of a system of factors that may indicate the emergence of a problem debt so that it is sufficiently representative and allows obtaining a reliable result, and the process of their assessment in calculating the amount of credit risk was not labor-intensive. Assessment of the borrower's creditworthiness - the enterprise by the type of economic activity is a priority component when making

a decision on granting a loan and managing the credit risk of a creditor. Which allows to protect the credit transaction from threats that are associated with the impact of both external and internal factors that have a significant impact on the possibility of repaying a loan and paying interest for using it.

Based on the above, it should be noted that the most adequate and important tool for economic cyclicity is the inclusion in the concept of creditworthiness of a number of factors characterizing the sectorial, organizational and market aspects of the borrower's activities and are significant enough to ensure the effective and stable functioning of the borrower - the enterprise by types of economic activity.

For the effectiveness of financial diagnostics of the enterprise, it is appropriate to consider the dynamics of the main indicators of lending by types of economic activity of enterprises, currencies and terms, which are presented in Figure 4.

In order to interpret the key findings of the concept of assessing the creditworthiness of enterprises by types of economic activity, using multi-factor discriminant analysis, it is appropriate to consider the methodology for calculating aggregated financial ratios based on which the analysis and definition of the integral indicator of the financial state is carried out.

The financial indicators in table 4 and the data on turnover on accounts, the credit history of enterprises, reputation, sphere of activity, liquidity, financial flows, receipts and debts, the life of the enterprise, control over the current activities of the client and others are included in the special tables by which they are calculated the total amount of points and is determined by the debtor class. The value of X_i depends on the values $K_1, K_2...K_n$ (aggregated financial ratios determined on the basis of financial reporting data of the debtor-legal entity for a large, medium or small enterprise (Chai *et al.* 2019). When calculating the aggregate financial indicators of KI on the basis of quarterly reporting, seasonal adjustment and bringing figures of the form of financial statements to the annual measurement is carried out (Nam 2020).

Figure 4. Amounts of loans granted to enterprises by types of economic activity by currencies and maturity date as at 01.01.2019

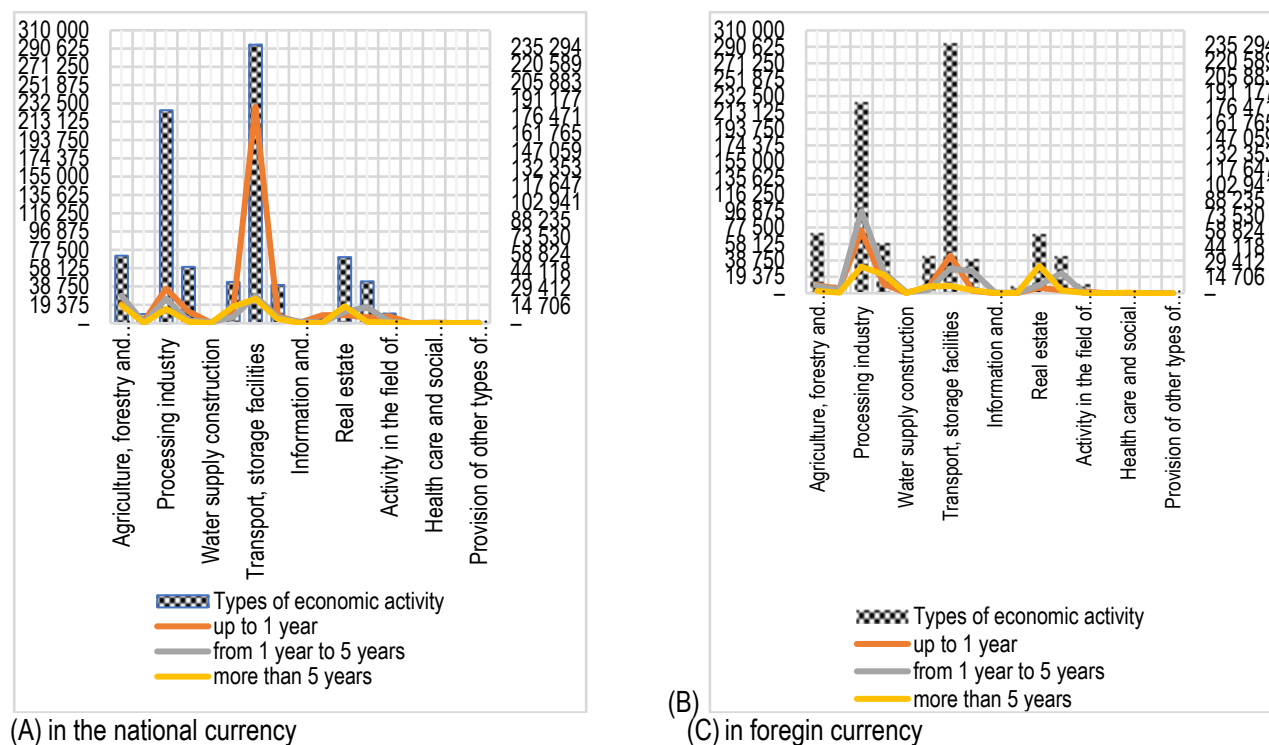


Table 4. The concept of assessing the creditworthiness of enterprises by types of economic activity with the specification of the method of calculation of aggregated financial ratios

Aggregated financial indicators (K_i)	Method of calculation financial indicators
Share of capital in the balance sheet of the enterprise (K_1)	Equity / Balance Sheet (asset)
Total liquidity(K_2)	Current assets / Current liabilities
Coverage of debt with profit before tax (K_3)	Financial result before tax / Liabilities
Operating profitability of assets (K_4)	Financial result before tax / Balance (asset)
Company inventory turnover(K_5)	Stocks / Cost of sold products
Coverage of debt by gross product(K_6)	Gross Profit / Liabilities
Coverage of financial expenses by oper. profit (K_7)	Financial result / Net financial expenses
Turnover of Accounts Payable (K_8)	Current payables / Cost of sold products
Turnover of accounts receivable (K_9)	Current Accounts Receivable / Net income from sales of products
Maneuverability of working capital (K_{10})	Current assets without liabilities / Balance (asset)
Net Debt Coverage(K_{11})	Liabilities / Net income from sales of products
Coverage of debt to profits for depreciation and taxation (K_{12})	Financial result before tax and depreciation / Liabilities
The share of non-operational elements of the enterprise balance (K_{13})	Non-operational assets / Balance sheet (asset)
Turnover of current assets (K_{14})	Current assets / Net realizable sales
Coverage of financial expenses by profit before tax and depreciation (K_{15})	Financial result of operating activities before taxation / Financial expenses
Profitability before tax (K_{16})	Financial result before tax / Net income from sales
Coverage of financial expenses by gross profit (K_{17})	Gross profit (loss) / Financial expenses
Debt Indicators (K_{18})	Short-term and long-term liabilities / Balance (asset)

Source: Made by the author based on Platt 1991; Lettau 2001.

Listed in the multifactorial discriminant model of the value X_i are updated annually by the National Bank of Ukraine based on financial reporting data of debtors, legal entities. Each bank for updating the logistic model submits to the NBU the data on the classification of debtors-legal entities, as well as their financial statements in the form and within the time limits established by the National Bank of Ukraine. The concept of assessing the creditworthiness of enterprises depending on the type of economic activity with the use of multifactorial discriminatory analysis is proposed, it allows diagnosing the financial condition and determining the borrower's class, which will help to determine the amount of credit risk from the implementation of a credit transaction. Having stated the key results of multifactorial discriminatory analysis of the creditworthiness of enterprises by types of economic activity, it should be noted that according to the range of integral indicator of financial condition, all the enterprises on which the analysis was conducted are sufficiently creditworthy within the framework of their specificity of the industry and the magnitude of activity. Listed in the multifactorial discriminant model of the value X_i are updated annually by the National Bank of Ukraine based on financial reporting data of debtors, legal entities. Each bank for updating the logistic model submits to the National Bank of Ukraine the data on the classification of debtors-legal entities, as well as their financial statements in the form and within the time limits established by the National Bank of Ukraine. The concept of assessing the creditworthiness of enterprises depending on the type of economic activity with the use of multifactorial discriminatory analysis is proposed, it allows diagnosing the financial condition and determining the borrower's class, which will help to determine the amount of credit risk from the implementation of a credit transaction. Having stated the key results of multifactorial discriminatory analysis of the creditworthiness of enterprises by types of economic activity, it should be noted that according to the range of integral indicator of financial condition, all the enterprises on which the analysis was conducted are sufficiently creditworthy within the framework of their specificity of the industry and the magnitude of activity.

The proposed concept for assessing creditworthiness was applied in general to the enterprises of the branch depending on the type of economic activity for the period from 01.01.2014 to 01.01.2019, using these annual consolidated financial statements. From the key findings of the multifactorial discriminatory analysis, it should be noted that the enterprises of the main branches of the economy of the country are sufficiently creditworthy, and the validation of their classes is within the 4-2 classes, which is permissible in this concept of

evaluation. Nevertheless, each bank, as the key creditor of the real economy, can classify the borrower's class differently depending on the existing internal normative documents regarding the assessment of the amount of credit risk in active operations, taking into account the recommendations of the National Bank of Ukraine.

Table 5. Definition of the debtor class - enterprises depending on the type of economic activity and the value of the integral indicator of the financial state

Group of enterprises by type of economic activity	Ranges of values of the integral indicator of the financial condition of enterprises								
	Class of a debtor-legal entity								
	1	2	3	4	5	6	7	8	9
Agriculture, Forestry and Fisheries	≥	+5,2	+4,3	+3,4	+2,6	+1,7	+0,8	+0,02	-0,8
	<		+5,2	+4,3	+3,4	+2,6	+1,7	+0,8	+0,02
Mining and quarrying, manufacturing	≥	+3,3	+2,7	+2,1	+1,4	+0,8	+0,2	-0,4	-1,06
	<		+3,3	+2,7	+2,1	+1,4	+0,8	+0,2	-0,43
Wholesale and retail trade: repair of motor vehicles	≥	+3,7	+3,1	+2,4	+1,8	+1,2	+0,5	-0,07	-0,7
	<		+3,7	+3,1	+2,4	+1,8	+1,2	+0,5	-0,07
Financial, insurance activities, operations with real estate	≥	+3,1	+2,6	+2,2	+1,7	+1,3	+0,8	+0,3	-0,08
	<		+3,1	+2,6	+2,2	+1,7	+1,3	+0,8	+0,38
Other types of economic activity of enterprises	≥	+3,6	+3,0	+2,5	+1,9	+1,4	+0,8	+0,3	-0,21
	<		+3,6	+3,1	+2,5	+1,9	+1,4	+0,8	+0,33

Source: Made by the author on the basis of (National Bank of Ukraine 2019).

In conditions of uncertainty, the main priority of any organization and enterprise is to ensure financial stability and efficiency, taking into account all possible risks. Because, in conditions of economic cyclicity, the financial stability of the enterprise is ensured by effective management of financial flows and risks, and the lack of a unified approach and concept of evaluation will necessitate more detailed research and development of scientific and methodological approaches to assessing creditworthiness. Through critical analysis of scientific research and theoretical generalization, it is proved that the solvency of the enterprise is the financial and economic condition of the enterprise, which is characterized by the ability to timely and in full under all conditions, volumes and amounts to be liable for liabilities. In contrast to solvency, the creditworthiness of the enterprise is narrower and applies only to lending and the possibility of timely fulfillment of credit obligations under the terms of loans granted during this period.

The existing methodology for assessing the risks of enterprises in modern conditions is explained, the basic models of risk assessment are structured, which are the most popular, but do not fully meet modern conditions and need improvement in terms of branching factors in assessing the creditworthiness of the enterprise. It is substantiated that the formation of scientific and methodological approaches to the concept of assessing the creditworthiness of enterprises by type of economic activity in terms of economic cyclicity should be carried out in two stages: (1) Determining the value of aggregate financial indicators that characterize the financial condition of the borrower, to refer them to the relevant analytical groups depending on the group of economic activity of its industry and size; (2) Analysis of the financial condition of the borrower and assignment of the borrower (enterprise) to the appropriate class depending on the value of the integrated indicator of financial condition. To implement the selected stages, in contrast to existing approaches, the main tools of multifactor discriminant analysis are used, taking into account the type of economic activity of the enterprise, its industry and value. However, the defined tools of multifactor discriminant analysis taking into account the type of economic activity of the enterprise, its industry and value are not perfect and do not allow to reliably assess the creditworthiness taking into account the current realities of economic cyclicity. In this regard, in order to improve this methodology, for the distribution and structuring of borrowers-legal entities to the appropriate class, the main parameters are defined depending on the value of the integrated indicator Z, taking into account its ranges and values, depending on the type of economic activity, industry and size. Interpretation of key results of enterprise valuation based on the integrated indicator Z, taking into account its ranges and values, depending on the type of economic activity of the enterprise, industry and its size is implemented by building economic and mathematical models. The formed scientific and methodological approach to assessing the creditworthiness of enterprises in contrast to insuing allows to take into account time factors, the specifics of economic activity, both individual enterprises and the industry as a whole and is based on multidimensional discriminant analysis of aggregate financial indicators. This approach allowed to classify and determine the class by the values of the integrated indicator of the financial condition of enterprises Z by types of

economic activity of its specifics and industries. Developed recommendations to improve the process of assessing the creditworthiness of enterprises in economic cyclicity can be used in practice in the formation of strategies for managing financial flows, both individual enterprises and the industry as a whole.

Conclusion

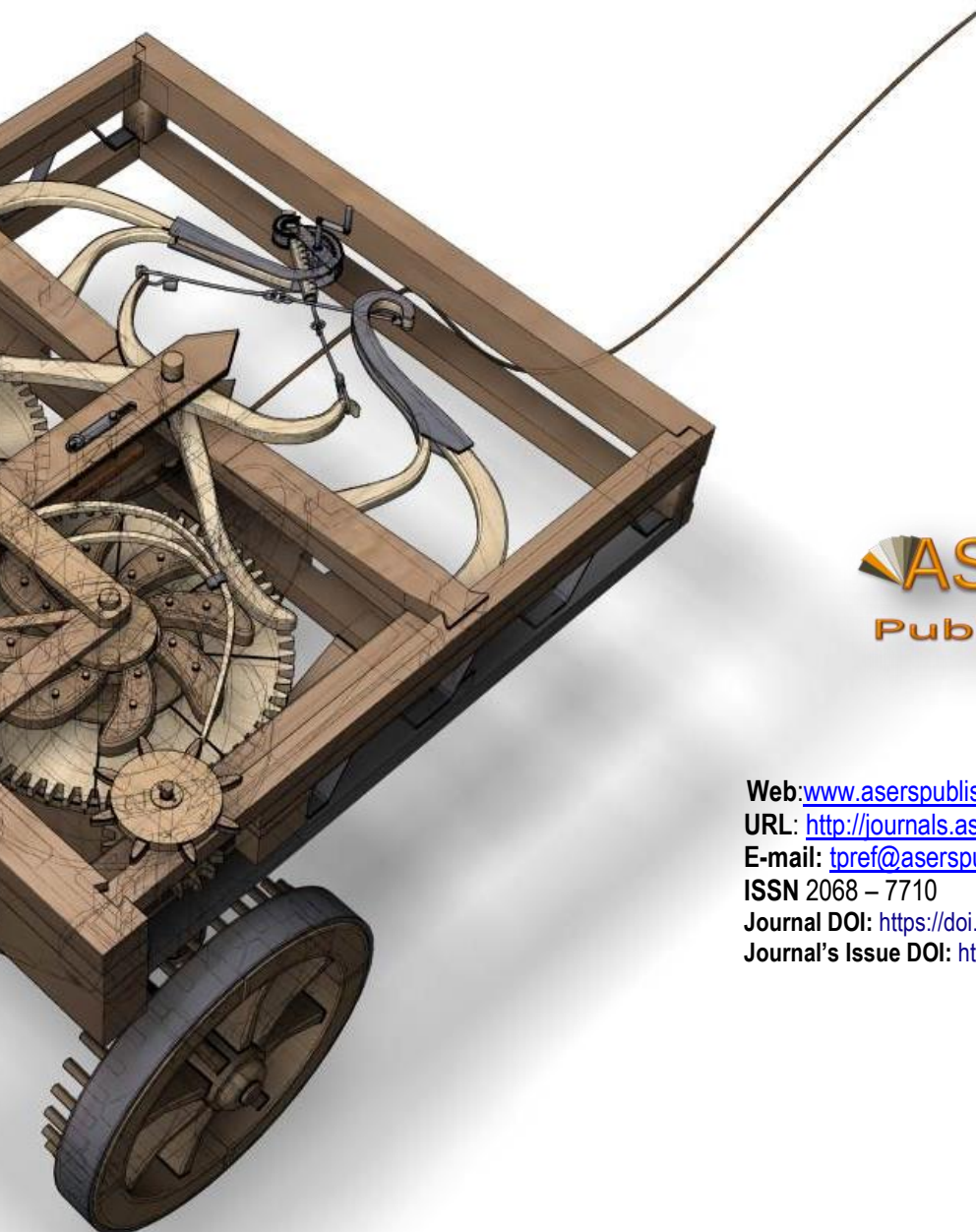
For the effective evaluation of the creditworthiness of the enterprises, the main tools and methods based on which analysis are structured; the classification of the main factors that have a significant impact on the formation of the creditworthiness of the enterprises and need to be taken into account in the process of making managerial decisions is proposed. Based on the analysis of credit risk models, the main criteria for evaluating the creditworthiness of enterprises depending on the types of economic activity were substantiated. It is stated that the partial or incomplete account of certain criteria is inadmissible and affects the creditor on the probability of loss of profit and non-repayment of credit funds. On the basis of the generalization of theoretical approaches and analysis of modern methods of credit assessment of enterprises, it is determined that the concept of credit assessment and the diagnosis of financial condition of enterprises is impossible without the use of tools of economic and mathematical modeling, which are the most effective and reliable tools in modern conditions. The analysis and presented the dynamics of the main indicators of loans granted by Ukrainian banks and the distribution by classes of debtors, which confirms the need to improve existing methods and tools for assessing the creditworthiness of enterprises in order to improve the quality of the loan portfolio of the bank and adequately determine the value of credit risk. The necessity of improvement of existing methods of credit assessment is proved based on the use of multifactorial discriminatory analysis for diagnosing the financial status of enterprises by types of economic activity. The multifactorial discriminator model for assessing the creditworthiness of enterprises depending on the type of economic activity and size using the recommendations of the NBU is substantiated. Based on multifactorial discriminatory analysis, an assessment of the creditworthiness of enterprises by types of economic activity for the period from 01.01.2014 to 01.01.2019 was carried out, which allows to state that the following groups of enterprises are sufficiently creditworthy. The practical application of the proposed concept of assessing the creditworthiness of enterprises by types of economic activity will improve the risk management system in the bank and increase the efficiency of making managerial decisions.

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