Kyiv National University of Trade and Economics
Banking department

FINAL QUALIFYING PAPER
on the topic:

Measurement of credit risk

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INTRODUCTION

Credit operations are the main source of income for domestic banks. Their high yields are accompanied by increased risk, so they remain the most risky part of the banking business. Consequently, banks are forced to constantly improve the strategy and tactics of their lending activities, and the right choice of the concept of credit risk management will allow the bank to survive and develop in the chosen direction. To construct a system and develop a management mechanism, a prudent definition of credit risk as an object of management, as well as the structuring of factors that cause a change in its level, is a prerequisite.

In the conditions of constructing a market model of the economy, all the spheres of banking activity are inherent in the risks, and especially this concerns the most profitable sphere - lending activity. Credit risks occupy a dominant position in the system of bank risks, therefore, the growth of the needs of economic entities in lending requires banking institutions to effectively manage them - in a timely manner to identify, prevent and minimize.

Thus, determining the level of riskiness of lending activities is one of the priority strategic tasks of the banking institution, which further determines its competitiveness and stable development. Given this research, the essence of credit risk and management methods is extremely urgent.

The issues of credit risk management and determination of its essence were studied by such Ukrainian scientists as: O. Vovchak, V. Vitlinsky, V. Galasyuk, A. Epiphanov, V. Mishchenko, L. Primostka, I. Salo, L. Sloboda. Worthy of note are the work of Russian economists: A. Brichkin, D. Yendovitsky, P. Kovalev, O. Lavrushin, A. Sukhova.

Summarizing and analyzing the works published on such a topic led to the conclusion that the issues of methodological approaches to credit risk management were not developed sufficiently in scientific, organizational and practical aspects.

Actuality is due to the fact that in today's crisis, domestic banks face the problem of non-payment under loan agreements, which leads to an increase in credit

risk and the creation of conditions for the occurrence of default in the event of negative developments.

The scientific relevance is to study the theoretical, practical and methodological aspects of the development and improvement of the methodology for measuring credit risk taking into account the recommendations of the Basel Committee on Banking Supervision by Ukrainian banks in a market economy conditions.

The practical value of the results is obtained to deepen the scientific substantiation of methodological approaches to evaluation of the system of measuring of credit risk. The main provisions of the work can be used as a methodological basis for the development of the bank's credit risk management system.

The purpose of the diploma paper is to study the system of measurement and management of credit risk JSC «Raiffeisen Bank Aval» and to determine the directions of its improvement with the subsequent forecast analysis of their effectiveness.

The purpose of the final qualifying paper is:

- Analyze the nature of credit risk, identify current methods of measuring credit risk, and analyze the measurement of credit risk in accordance with Basel Recommendations;
- Determine the normative legal framework for measuring the credit risk by domestic banks, conduct a general assessment of the measurement and management system for credit risk in JSC «Raiffeisen Bank Aval», identify shortcomings in the credit risk measurement system of JSC «Raiffeisen Bank Aval»;
- Determine areas for improvement of the methodological framework for measuring credit risk in domestic banks, identify directions for developing a system for measuring and managing credit risk in JSC «Raiffeisen Bank Aval», investigate promising credit risks through stress simulation, and calculate economic capital based on a reasonable measurement of credit risk.

The object of the research is a general analysis of the system of measurement, management and control of credit risk of JSC «Raiffeisen Bank Aval».

The subject of the research in the qualifying paper is the enterprise JSC «Raiffeisen Bank Aval».

The information base of the research is international and Ukrainian legal acts, data published on the websites of ministries of Ukraine, foreign enterprises and international statistical committees, textbooks, manuals and scientific works of scientists, methodical materials, publications of periodicals, materials provided by the enterprise JSC «Raiffeisen Bank Aval».

To write the diploma paper, methods such as descriptive, statistical, comparative method, elements of retrospective and perspective analysis, elements of extrapolation, intuitive method and others were used.

Publication. Some results of the research were stated in the scientific article “Credit risk assessment by Ukrainian banks in modern economic conditions”//Стратегії розвитку фінансового ринку України: зб. наук. ст. студ. денної форм навчання / відп. ред. Н.П. Шульга. – К.: Київ. нац. торг. - екон. ун-т, 2018. -366с. (P.319-325).

Research structure. This final qualifying paper consists of introduction, three parts, conclusions and references (97 titles). Total number of pages is 110, including references- 10 pages.

PART 1
CREDIT RISK ESSENCE AND METHODS OF ITS MEASUREMENT

1.1 The essence of credit risk and its place in the system of bank risks

Each banking institution faces a variety of risks in its business process, which can both positively and negatively affect the results of its work. Most scholars view risk as an objectivelysubjective category of activity, which is associated with the inevitable choice in conditions of uncertainty and conflict situations, reflects the measure of the expected result, and acts as a positive and a negative phenomenon [75, p. 176].

In his research, L. A. Bondarenko uses six approaches to the definition of "banking risk", namely:

• how the likelihood of a deviation from the expected result;

• threat of loss;

• the probability of receiving both losses and profits;

• uncertainty in predicting the outcome;

• situational characteristics of the bank, reflecting the uncertainty of its outcome;

• bank activity related to overcoming uncertainty [10, p. 23].

Often, when considering the "risk" category, the first four approaches are applied, but they apply only to the concept of "bank risks". The fifth approach defines the risk as a situational characteristic of the bank's activities, emphasizing the specifics of such activity. That is, this approach is consistent with the fact that the risk arises only as a result of the activity of a certain entity.

Sixth approach defines risk as the action, but not just action entity and the indirect effect on the entity, revealed by the onset of uncertainty.

The risks that arise in the banking business are due to the objective, inherent in the economic, in particular, the banking system, factors - uncertainty, lack of

necessary information to ensure the assessment and adoption of bank decisions, conflict situations [51, p. 13].

In modern conditions, banking institutions can offer their clients a variety of banking products and services, among which a special place is borrowing. Since credit operations bring the banks the highest revenues (2/3 of all bank revenues), the result of a lending operation depends largely on how well the methods and conditions are met [7, p. 72].

By performing a mediation function between temporarily free funds and investment needs, commercial banks can, in order to activate lending, act in two directions - in the securities market and in the credit market, accumulating savings for the population [38, p. 119].

Credit activity as an economic category is a combination of economic relations between the creditor and the borrower in relation to the turning-point value movement.

In the process of lending, the main share of net profit from which the funds of a commercial bank are formed. At the same time, with the structure and quality of the loan portfolio, the main risk associated with the bank in the process of operating activities is related - credit risk.

Since lending is the main source of income for a bank and, from non-repayment, it suffers a loss, then credit risk should be considered as one of the main banking risks. At the same time, in modern conditions, it becomes more multifaceted and more complex, which stimulates banking institutions to pay more attention to the level and efficiency of its minimization systems. Credit risk is a priority and occupies a special place among other banking risks [71, p. 128].

This type of risk arises every time since the banking institution, and in the present circumstances, another credit institution (credit union, etc.), provides (loans) money, undertakes the obligation to provide them, invests them or otherwise risks them.

It should also be noted that the concept of credit risk is related not only to the lending activity of a banking institution, but also to other operations having a credit

character (securities transactions, guarantee operations, leasing, factoring, forfaiting) [34, p. 74].

The main reasons for the emergence of credit risk in banking can be: transformation processes in the economic system; the uncertainty of goals and criteria and the need to take into account multivariateness in the evaluation process, decision-making; insufficiency, incompleteness, inexhaustibility of information, its concealment; ambiguity of estimates of the forecast of the development of the socio - economic system, banking institution, competitive environment; changing market conditions, tastes and preferences of consumers, etc. [28, p. 239].

The object of credit risk is the lending activity of the banking institution, as well as predicting the results and conditions for implementation of which is not possible in the future.

A subject of credit risk is a specific person or team with competence in making managerial decisions and interested in management results.

The source of the emergence of credit risk are factors that cause uncertainty in the conduct of credit operations [47, p. 107]. The classification of factors of credit risks of banking institutions is shown in the table 1.1.

Table 1.1

Classification of factors of credit risks

Group of factors	Type of factors
1. External factors to the bank and environment counterparties:	- legislative and regulatory; - general economics; - political; - force majeure.
2. Internal Banking Credit Risk Factors:	- strategic; - organizational; - managerial; - information.
3. Factors, inherent in the activities of the borrower:	- characteristics of the borrower; - description of the loan agreement; - the level of servicing a credit debt by the borrower.

Source: [71, p. 191]

Depending on the impact of credit risk factors, a banking institution can both experience financial losses and obtain unexpected income. However, as practice shows, credit risk is often negative and leads to losses to the bank, to lower solvency and loss of reputation among clients. Possible causes and negative effects of the factors of credit risks are shown in Fig. 1.1.

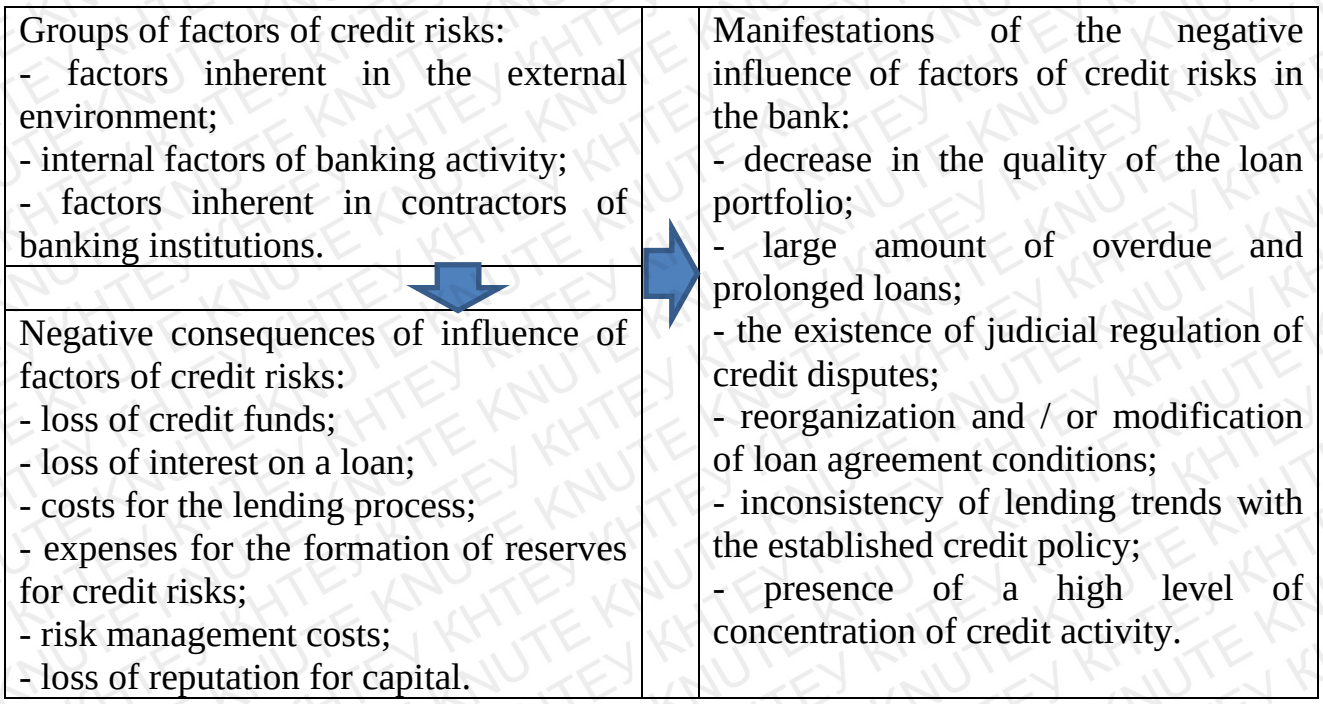

Fig. 1.1. Possible causes and negative effects of the factors of credit risks. [81, p. 95]

The size of financial losses as a result of non-repayment by the borrower of the principal debt and non-payment of interest on him determines the magnitude of credit risk [34, p. 79].

One of the areas for developing effective management measures for credit risks is their classification. In the scientific literature there are various approaches to the classification of credit risks. Their complex classification is given in Table. 1.2.

The method of reducing credit risks is to adhere to the well-known principles of lending, which ensure the return of a bank loan. Economic science, according to the principles of lending understands the rules of conduct of the bank and the borrower in the process of credit operations [19, p. 34].

Table 1.2

Classification of credit risks of commercial banks

Classification criteria	Credit risks type
By financial implications	The consequence of which is financial losses
	The consequence is a lack of financial gain
	The consequence of which is financial income
By the field of origin	External (systematic)
	Internal (non-systematic)
By the participants of the loan agreement	Regarding to the borrower
	Regarding to the insurer
	Regarding to the guarantor
	For security
By the level of occurrence	Individual
	Portfolio
By the term of lending	In case of short-term lending
	In case of long-term lending
By the possibility of forecasting	Predictable
	It is difficult or impossible to predict
By type of credit operations	In case of lending
	In transactions with bills
	In case of leasing operations
	In case of factoring operations
	In case of using letters of credit
By the status of the borrower	When lending corporate clients
	When lending to individuals
	When lending to legal entities
	When lend to insiders
	Interbank
By way of exposure to risk	Eliminated by the bank
	Eliminated by an insurance company
	Eliminated by the guarantor
	Distributed between banks
By credit process	For direct loan issuance
	In non-traditional lending operations
By probability of realization	Realized
	Potential

Source: [13, p. 124]

The main principles of bank lending include: security, target nature, payment, timeliness, return.

The principle of providing a loan means the presence of a client legally registered documents that guarantee the timely repayment of the loan. Such documents may include: a contract of pledge, a contract of guarantee, a contract of guarantee, etc. [41, p. 234]. This principle is intended to protect the commercial bank from losses due to insolvency of the borrower. The method of provision of credit is provided for in a loan agreement [31, p. 198].

The principle of payment expresses not only the return of the borrower of credit resources received from the bank, but also payment of the right to use them.

The principle of timeliness implies the transfer by the creditor of free funds to the borrower for use at a specified time. This term should be agreed upon by the parties at the time of entering into credit relations. The timeliness follows from the purpose of the loan. At the same time, it itself is a prerequisite for the formation of such credit relations, as well as for the deployment of such future prerequisites, as the definition of payment for the loan and the procedure for repaying the loan [2, p. 129].

The principle of repayment of a loan is a basic principle of credit relations and means that the loan must necessarily be returned by the borrower to the bank in the term specified in the loan agreement [31, p. 199].

Thus, having determined the factors, influence, classification of credit risk, as well as having analyzed the principles of lending, the realization of which will minimize the effect of this type of risk on banking, it is advisable to determine its economic essence. Thus, in the economic literature there is no generally accepted definition of "credit risk". Yes, V.V. Vitlinsky, under the credit risk, understands the probability of occurrence of unwanted events in the course of a financial transaction, which will consist in the fact that the counterparty of the bank will not be able to fulfill its obligations under the loan agreement, and thus can not use the existing methods of collateral [13, p. 29].

I.T. Balabanov, Ye.F. Zhukova, M.N. Totsky, J. Sincki under the credit risk proposes to consider the risk of non-payment by the debtor of the principal amount of

debt and interest owned or assigned to the creditor [4, p. 202; 5, p. 208; 74; 68, p. 428]. T. Osipenko defines credit risk as a risk of financial losses associated with counterparty defaults, that is, with his reluctance or failure to timely and fully discharge his obligations to the bank [42]. AI Olshansky gives the following definition of credit risk: "credit risk - the risk creditor bank, which is associated with the borrower's outstanding debt and interest on issued loans" [39, p. 34]. M.E. Yudenich in his dissertation in the broad sense defines credit risk as a possibility of losses in connection with failure of contracting parties to fulfill the terms of the contract, and in the narrow one - the possibility of losses of the bank as a result of failure by the borrower to assume obligations arising from the process of conducting credit agreements with the bank [82, p. 7].

A.O. Yepifanov, I.V. Bold define credit risk as the possibility that in the future, at some point in time, the value of bank assets will decrease due to non-return (incomplete or untimely return) of these assets [20, p. 39].

In world practice, credit risk is considered as a probability of a negative change in the value of assets (loan portfolio) as a result of the inability of counterparties (borrowers) to fulfill their obligations, in particular, on the payment of interest and the principal amount of the loan in accordance with the terms and conditions of the loan agreement.

As we see, most authors focus their attention on the objective factors of the borrower's failure to fulfill obligations assumed by the credit institution. However, in the mechanism of organization of credit relations between the borrower and the creditor there is also a subjective element of the behavior of economic agents, which affects the effectiveness of credit activity in general [16, p. 23].

In the widest sense, credit risk is the uncertainty about the full and timely fulfillment by the borrower of its obligations under the terms of a loan agreement, that is, the non-return (in whole or in part) of the principal amount of the debt and interest thereon in establishing the term of the agreement.

Summarizing the aforementioned approaches, in our opinion, credit risk is the risk of failure by the counterparty to take on an obligation under the agreement as a

result of the implementation of negative unwanted events, which will lead to a decrease in the value of banking assets.

Consequently, credit risk as an economic category represents the probability of a complete or partial loss of the value of assets by the banking institution as a result of the inability of borrowers to fulfill their obligations or lack of income due to the influence of various factors. Using the concept of credit risk, it is necessary to distinguish between the terms "individual credit risk" and "portfolio credit risk", since they use different methods of analysis and management. An expanded classification of this risk contributes to a better understanding of its economic content and its subsequent management.

Therefore, minimization of credit risk not only does not allow losses from credit activity, but also prevents problems with liquidity and solvency of a commercial bank, which determines the relevance of this problem in banking activities.

1.2 Modern methods of measuring credit risk

The essence of credit risk lies in the fact that the borrower may not return credit funds in violation of the terms of the loan agreement. In this case, the credit risk becomes realized. A situation in which a borrower is unable or unwilling to pay its debts in accordance with predefined conditions is called a default by the borrower. Such term is used in scientific and practical circles of economically developed countries.

In case of default, the bank will receive a loss from non-repayment of credit funds. However, the magnitude of this loss in many cases does not correspond to the full amount of the Client's debt. According to Basel II, EL is estimated losses equal to the EAD (exposure under default), the loss ratio of the loss in default case (LGD) and the actual default probability (PD - probability of default) [84, p. 58-63]. This equation reflects formula (1.1):

$$EL = EAD \times LGD \times PD \qquad (1.1)$$

In equation (1), the EAD depends on the actual amount of the credit limit for the borrower and shows the maximum possible loss of the bank in case of default. However, the amount of losses may be less than the EAD due to the presence of factors that offset the loss of the bank (security, insurance, etc.). The impact of these factors on the forecasted loss indicator is determined by the LGD, which is given as a percentage (from 0 to 100%).

The EAD and LGD levels are known well before the loan is issued - there is a loan limit requested by the borrower, as well as an estimated market value and the type of security object. On the other hand, PD reflects the probability of an event that may occur in the future. Therefore, estimating the probability of default requires the use of a comprehensive methodology for analyzing and forecasting default.

To determine the probability of default, a rating system is used, special models of default forecasting are developed. The total number of methods for assessing the probability of default is shown in Figure 1.2.

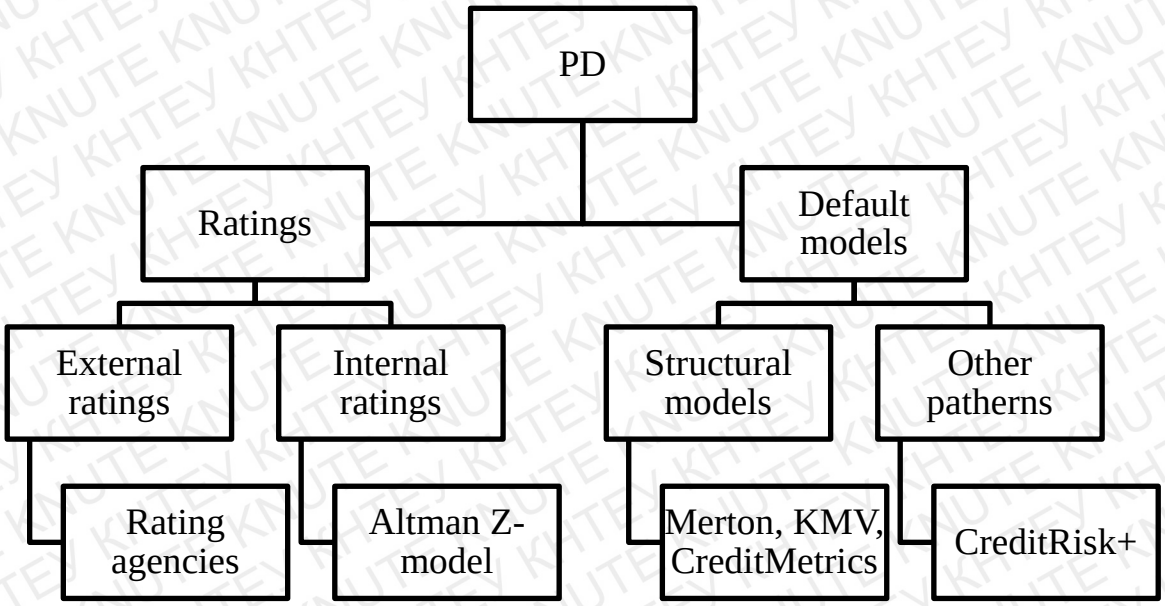

Fig. 1.2. Methods of estimating the probability of default

Made by the author by [83,85,87]

Credit ratings are introduced to increase the visibility of the default probability indicator. In general, they simply reflect that the borrower assigned to this rating has a probability of default within a certain range. For example, AAA rating of the rating agency Standard & Poor's corresponds to the probability of default in the next year at the level of 0.0002, the rating of the USC - 0.04 [83, p. 5-6].

The concept of external (external) and internal (internal) ratings was introduced by Basel II. External ratings are assigned by rating agencies (the most famous are Standard & Poor's, Moody's and Fitch Ratings). The greatest use of external ratings has been in the United States and the United Kingdom. The reason for this is that in these countries a highly developed stock market. The main companies are public, so they can be analyzed by external agencies.

Internal ratings provide for an assessment of the probability of default by the borrower's bank employees. Such techniques have developed in Europe thanks to the extensive experience of assessing credit risks by local banks. It should be noted that domestic risks are also used in the United States, as small and medium-sized enterprises are very expensive to obtain external ratings.

Most of the internal ratings of the banks are one way or another based on the Z-model of Edward Altman, published by the scientist in 1968. This model contains the resulting (integral) indicator of the borrower's creditworthiness (Z). It is determined on the basis of several financial coefficients (R_i) weighted by weighting factors (α_i) [85, p. 65-87]. The general form of the Altman model is expressed by (1.2):

$$Z = a_1 \cdot R_1 + a_2 \cdot R_2 + a_3 \cdot R_3 + ... + a_n \cdot R_n - a_0 \qquad (1.2)$$

The financial ratios in this model are determined according to their economic impact on the activity of the enterprise, taking into account the industry and its organizational form. The weighting factors are established on the basis of discriminatory statistical analysis of historical financial statements of similar companies (enterprises of the same industry), some of which have been defaulted in the past. As a result, it can be determined that for firms in one industry (such as heavy

industry), the most significant impact on the likelihood of default will be the capitalization ratio (Equity / Balance currency), and for other (eg distributors) marginality EBITDA (EBITDA / Net Income) After calculating the integral index Z, it is converted to the default probability value using special matrices. In some cases, qualitative parameters (audit presence, management quality, market outlook, etc.) are somewhat corrective in the process of transfer of indicator Z to the level of default probability.

The number of pairs of factors in the Altman model may vary. Altman himself and many of his followers offered a range of possible features for different industries and types of businesses. However, it should be noted that the ideal Altman functionality does not exist and can not be, since in each country and at each historical stage there is a specific nature of the activities of enterprises. As a result, the functions of the Altman model are constantly being improved and modified, but the basic logic of the model remains unchanged and commonly used.

The Altman model relates to statistical models of credit risk assessment, since in the process of determining the probability of default, it requires the study of statistical data. Today, statistical models of credit risk assessment are the most used. This model implements the so-called F-IRB approach (base internal rating-based approach) under Basel II. That is, using banks of the Altman model can usually build their own empirical function of Altman to determine the probability of default of their borrowers. However, the methodology of this function must be agreed with the regulator. In addition, F-IRB banks should use regulator techniques to determine LGD [84, p. 97-133].

It is Altman's model that laid the basis for defining the probability of default under Resolution No. 23 of the National Bank of Ukraine. In this case, the methodology of the model is fully developed by the NBU and is actually submitted to banks for execution [86]. National Bank takes all function parameters Altman (financial ratios) and determines the weight coefficients for different activities. That approach can be called the NBU is only partially relevant for the F-IRB Basel II

because it does not allow banks to develop and improve its own methodology assessment model the probability of default of the borrower.

Structural models are based on the assumption that an enterprise's default occurs when the value of the assets of an enterprise falls below the book value of its debts. In this case, it is considered that the firm is not able to pay on its obligations. One of the most effective structural models for estimating the probability of default is the model of agency Moody's, called KMV.

To assess the probability of default, the model KMV uses the data of the financial statements of the enterprise, as well as information on the market value of its equity [28, p. 5-8]. The model believes that the firm achieves default when the market value of its assets is equal to the book value of its liabilities. The default value of assets in the KMV model is called the "default point". An illustration of the main parameters of the KMV model is shown in Figure 1.3.

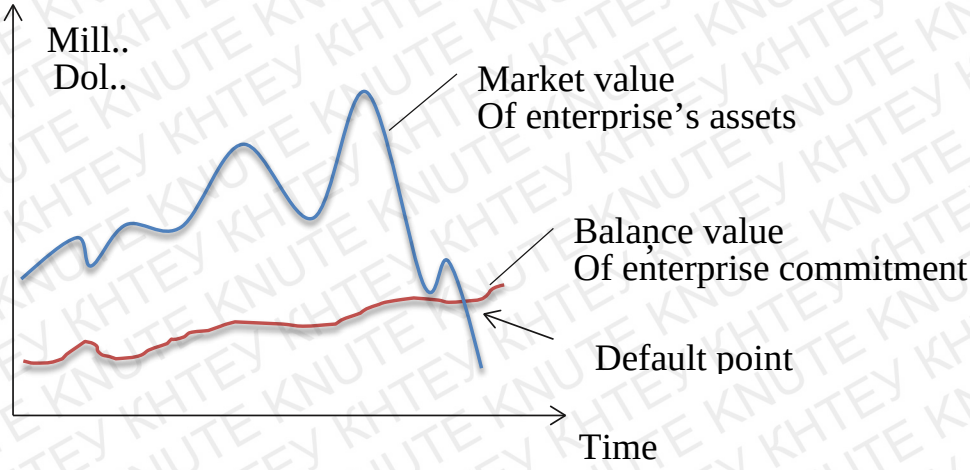

Fig. 1.3. Illustration of the main parameters of the model Moody's KMV

Source: [83]

The final model of the model is the expected default rate - EDFTM (expected default frequency). This indicator is a registered trademark of Moody's. It shows the probability of default by the borrower over the next year. To determine EDF it is necessary to calculate the so-called "distance to default", which reflects the distance from the market value of the borrower's assets to its default position. This distance is expressed in the number of standard deviations of the market value of assets [83, p. 8-10].

In fact, the number of standard deviations reflects the risk that the market value curve of assets will change its direction and reach a default point. For a distance to default (DD), the market value of assets (V_0), default (B) and volatility of assets (σ_v) influence the KMV model. The basic equation of the KMV model reflects formula (1.3):

$$DD = \frac{V_0 - B}{\sigma_v * V_0} \qquad (1.3)$$

The market value of an enterprise's assets is determined on the basis of the market value of the equity of this enterprise using the model of a simple call-option. The default point is based on the previously determined market value of the assets of the enterprise and the carrying amount of the liabilities determined from the financial statements. Moreover, in case of necessity to estimate the probability of default of the borrower within one year, it is necessary to take only obligations that must be or may be repaid during this year. Volatility of assets is determined on the basis of studying the dynamics of market value of assets of an enterprise using the option function. Usually a slightly modified formula of the Black-Scholes model is used to determine both the market value of assets and the volatility of assets. [83, p. 11-12]

After defining the distance to default, the likelihood of default over the next year is determined using the special Moody's matrix. This matrix was developed as a result of the analysis of a large financial reporting company database, some of which were defaulted. Each DD parameter corresponds to a certain value of the probability of default. [83, p. 11-14]

The biggest advantage of KMV model prediction accuracy is high probability of default, since it is based on the analysis of market data on the basis of balance of financial reporting. Unlike the standard Altman model, KMV additionally takes into account the market value of an enterprise's assets. The KMV model is empirically tested and used by a large number of banks under license. The problem with this model lies in the fact that its use is very labor-intensive only for public companies whose shares are traded on the market. Therefore, the use of the model for Ukrainian banks at this stage is irrational.

Another example of the default probability model is CreditRisk +, a methodology developed by Credit Suisse. This model, unlike the previous two, is used for the comprehensive assessment and management of the bank's loan portfolio risk. It uses actuarial methods based on probability theory similar to those used by insurance companies [87, p. 3-5].

This model is intended to determine the probabilistic distribution of total losses of a bank's loan portfolio in the event of default. For its definition, the value of risk underlying (VaR) is calculated. The CreditRisk + model has more in common with market risk management techniques that are also based on VaR. Its ultimate goal is to maximize diversification of the loan portfolio to reduce its probability of default, as well as to determine the size of the bank's economic capital required to cover a possible default [87, p. 24-27].

The advantage of the CreditRisk + model is its comprehensive approach to credit portfolio management. Input data for this model can serve both external and internal ratings of individual borrowers, which makes this model rather elastic. However, the problem with the model is its high complexity, which requires highly skilled personnel and significant investments in methodology and software. As a result, the use of this model by Ukrainian banks in the near future will be unprofitable.

The analysis of structural models and CreditRisk + model allows to confirm the complexity of their use in the conditions of the Ukrainian economy. Structural models require a developed stock market and a large number of public companies. The CreditRisk + model requires significant investment in methodology, software and personnel training. Therefore, we believe that in the medium term, the Altman Z-model will remain the most acceptable for Ukraine. However, in order to improve the credit risk management system adopted by the National Bank of Ukraine, the approach to using the Z-model, in our opinion, should be expanded.

It is the transition to fully implementing the principles of the F-IRB approach to Basel II, which is relevant for Ukrainian banks today. At the same time, at a transitional stage it is expedient to grant licenses for the use of its own methodology

for estimating the probability of default in order to prevent manipulations with the magnitude of the risk of default and, as a consequence, reserves. In the future, it is necessary to allow the transition of the most successful banks to the use of the extended approach to internal ratings A-IRB.

Additional consideration is also required for the analysis of the correlation between the default probability of the borrower (PD) and the percentage of lost assets in the event of default (LGD). Recent events show that during the crisis period, the correlation between these indicators is increasing. That is, with increasing the probability of default of the borrower in a crisis period is more likely to reduce the cost of its provision as a result of falling demand in the market. For example, in the real estate market of Ukraine during the crisis period there is a tendency to decrease prices if they are measured in foreign currency. In this case, if the property is collateralized by a foreign currency loan, then the LGD is increasing. The correlation between PD and LGD reflects the impact of systematic credit risk, which requires additional study.

1.3 Credit risk measurement under Basel recommendations (PD, LGD)

Bank risk management system is thoroughly theoretically developed and widely implemented in Ukrainian banking practice on the basis of international standards [88-92]. At the same time, the general view on the banking risk management system combines the following positions:

1) the risk is an integral part of banking activity, which ensures the direction of the risk management process to ensure that the bank receives remuneration for taking risks;

2) depending on the relationship between risks and revenues, risks are divided into two groups: a) quantifiable risks (financial risks); b) non-quantifiable risks (non-financial risks);

3) distinguish the main categories of bank risks: credit; liquidity; interest rate changes; market; monetary; operational and technological; reputation; legal; strategic;

4) quantitative risk assessment methods should be based on the criterion of the economic value of capital and the need to maintain capital at the level that is necessary for risk reimbursement.

All of them are an integral part of the Basel Committee's regulations and recommendations, one of the main tasks of which is harmonization of the world practice of banking business regulation, aimed at leveling out the differences between national practices [94, p. 8].

At present, the National Bank of Ukraine tends to use a significant number of elements [88-92] of the first and second Basel Concordat. And it is possible to assume that a number of provisions of the third concordat can also be used in Ukraine, taking into account state intentions prior to the country's integration into the European Union. Let's consider their essence in more detail.

The Basel Accords represent a general set of reform tools. Their goal is to improve the ability of banks to mitigate economic and financial impacts, regardless of their origin, to improve risk management and general organization principles, to increase transparency and openness of banks.

Basel I in the wording of 1988 contained the following basic postulates: the capital of the bank consists of the main and additional; banks need to identify and form an amount of capital that would be sufficient to cover credit risk; at any time, the ratio between the bank's capital and its assets taken on the basis of the credit risk factor should not be less than 8%.

Simplicity and accessibility of methods and approaches have led to the fact that Basel I was implemented in almost 130 countries of the world, and the banking system of Ukraine is still guided by these principles. At the same time, the significant growth of the dependence of national banking systems on the impact of external world factors, the rapid movement of significant cash flows to different countries, the diversification of lending services, the uncontrolled movement of capital between

individual structural units of integrated financial intermediaries and the emergence of new types of risks led to the fact that the Basel II Agreement has ceased respond to changes that have occurred in the nature of economic relations.

In accordance with these changes, Ukraine in 2016 must finally move to the principles of Basel II. It transforms the capital assessment into a more risk-sensitive process and promotes better risk management practices in banks.

Prior to the adoption of Basel II, the main requirements did not fully reflect the actual risks caused by non-fulfillment of obligations of individual borrowers. Thus, in many cases, banks were forced to hold the same capital both for high-quality borrowers and for low-quality ones. This led to an increase in the riskiness of their activities.

Basel II consists of three parts and contains the basic requirements that are more sensitive to risks, because they are focused on a detailed credit rating. (Table 1.3)

Table 1.3

Structure of the Basel II Agreement

Basel II		
Part I existed in the previous version	Added Part II - "Supervisory Process"	Added Part III – "Market discipline"
Contains both standard and innovative methods for evaluating market operational and credit risks	Urges banks to establish effective risk management systems in order to achieve the adequacy of their capital	Contains requirements for the publication of information that allows market participants to have access to general information about the bank's risks

Source: [94]

The latter can be calculated from one of two options at the discretion of the public oversight body: option 1, using the risk weighting per division, is lower than the credit weighting of the central government, or option 2, using the risk weighting (tab. 1.4), established on the basis of the external rating of the bank.

Table 1.4

Risk weights for Basel I and Basel II

Credit types	Basel II					Basel I
	AAA:AA-	A+:A-	BBB+:BBB-	BB+:B-	lower B-	
The coefficient of weighting the country's sovereign debt risk	0	20	50	100	150	0, 10, 20, 50, 100
Risk weighting ratio, set for the bank option 1	20	50	100	100	150	20 or 100
Risk weighting ratio set for mortgage bonds option 1	10	20	50	50	100	
	AAA:AA-	A+:A-	BBB+:BB-	Lower B+	No rating	
Loans to corporate clients	20	50	100	150	100	100
	AAA:AA-	A+:A-	BBB+:BBB-	BB+: BB-	lower B+	
Tranches of sequester assets	20	50	100	350	Deductions from capital	50

Source: [94]

The Basel II approach encourages banks to work with clients with a low probability of bankruptcy, since capital requirements are also lower, as illustrated in Fig. 1.4.

Another difference is that there is the first time there is a separation of operational risk. In previous guidance, operational risk was classified as "other risks". As defined in Basel II, banks can choose between three different methods for determining the basic operating risk: Basic Indicator Approach (BIA), Standardized Approach (SA), and Leading Measurement Approach (AMA).

When applying BIA, the basic tariff is determined on the basis of the average total income of the bank for the last three years, which is an indicator of operational risk. SA requires that this indicator be divided into eight business areas and multiplied by the value of the directions of activity in the range from 12 to 18% [94, p. 26].

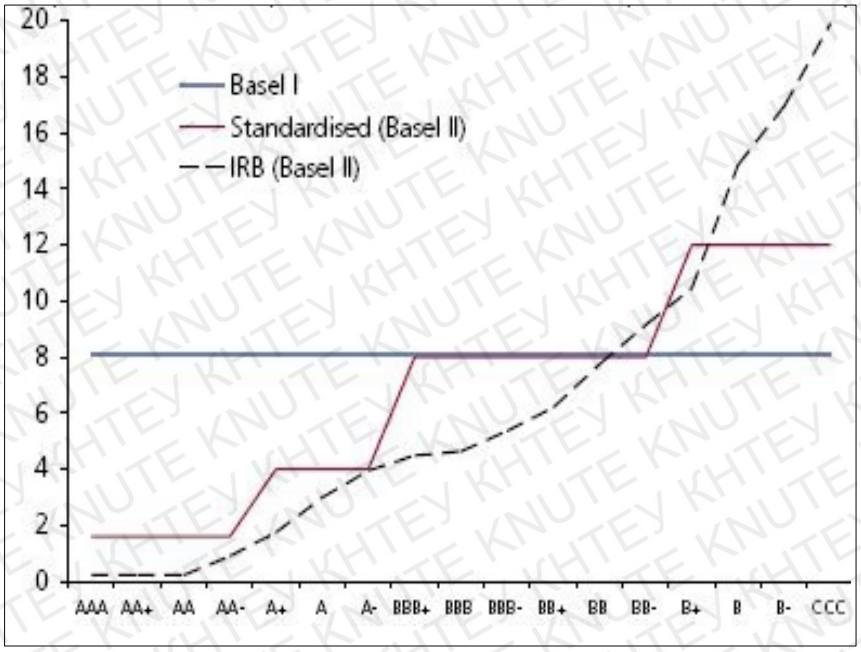

Fig. 1.4. Dependence of capital requirements on approach to risk assessment
Source: [96]

In contrast to AMA, the bank can calculate the basic requirements for operational risks using an internal model. This method requires the prior approval of the FFSA. Another option offered is the partial use of the AMA, that is, the bank may use AMA to calculate the basic fare for only part of the bank.

Basel II also adds requirements of Part III of the agreement, according to which banks have to publish all relevant information annually or every six months, depending on the bank. Information should include capital structure, capital adequacy and market, credit and operational risk information, as well as risk management procedures. In the case of banking groups, disclosure requirements apply to the group leader. In addition, banks are not required to disclose legally protected or confidential information. However, they are obliged to publish more general information about facts that they can not disclose.

Although the number of rating systems provided for approval varies, the most common methods are expert systems, modeling and credit score systems [94, p. 31]. The latter uses quantitative and qualitative data to provide the borrower with a certain number of points that reflect his creditworthiness.

The most popular statistical tools are discriminatory analysis and model of probability [94, p. 31]. The system of credit points is mainly used for small and medium enterprises. Expert systems are used to assess the credit risks of large corporate borrowers. Finally, simulation methods are used for specialized lending and project finance. In practice, these three methods are also used in the complex [94, p. 31].

Basel II is developed by the regulators of the industrialized countries, and therefore, in our opinion, it is important to consider whether the recommended practice is for young or less developed countries (Table 1.5).

Table 1.5

A comparative analysis of the main differences between Basel I and Basel II

Comparison criteria	**Basel I**	**Basel II**
Banking Supervision Orientation	Unilaterally aimed at matching capital	3 components: Minimum Capital Requirement, Banking Supervision Activities, Market Discipline
Criterion for determining capital requirements	Depending on credit and market risks	Depending on credit, market and operational risks
Methods for determining capital requirements	The only way to determine the need for capital	More methods for determining capital requirements depending on individual risks
Risk weight and dependence of the amount of capital requirements on credit risk	Depend on the type of client and do not depend on the actual passable risk	Depend on the client's type of risk, which, in standardized methods, comes from the external rating, and in IRB methods (integrated customer rating) from the internal customer rating established by the bank
The size of the recognized security	Minimum	Significantly expanded

Continuation of Table 1.5

Possibility of introducing own models of risk measurement for calculation of capital requirement	Only in terms of marketing risk	For credit and operational risks
Conditions for motivation to improve risk management practices	Missing / weak motivation	High motivation is that lower capital requirements
Expenditures for administrative calculation of capital requirements	Lower	Significantly higher costs

Source: [94]

In addition, the Basle II rules allow banks to choose their own risk assessment methodology in relation to their activities. If a bank decides to use credit risk calculations, more complex methods, in particular their own, may apply an individual approach to risk assessment for individual clients through different means of collateral. This makes it possible to reduce the demand for capital, which is interdependent from the matching of capital, which each bank must adhere to. This requires a complex approach to risk management in banks.

Now, we will define the peculiarities of the introduction of Basel III (Table 1.6) in the member countries of the Basel Committee, which are recommended to apply to banking activities in Ukraine.

Table 1.6

The timing of the introduction of Basel III in the member countries of the Basel Committee

Indicator	2013	2014	2015	2016	2017	2018	2019
Tier 1 capital base / RWA,%	3.5	4.0	4.5	4.5	4.5	4.5	4.5
Buffer capital / RWA,%			0,625	1,25	1,875	2,5	2.5
Countercyclical capital,%				0,625	1.25	1.875	2.5
Share capital + buffer,%	3,5	4,0	4,5	5,125	5,75	6,375	7,0
Capital adequacy + buffer,%	8,0	8,0	8,0	8,625	9,25	9,875	10,5

Source: [95]

Basel III has changed the requirements for the calculation of capital by financial groups by raising the minimum requirements for capital adequacy of the first tier. The calculation of this standard is influenced by the availability of assets in low sovereign rating countries, which Ukraine also owns. That is, the more risky the country is for investments, the higher the risk factor, for which all assets located in the country are weighed. In order to comply with the Basel III standard of sufficiency, the European bank needs to formulate capital for an amount equivalent to the size of the assets of a Ukrainian subsidiary multiplied by the minimum level of capital adequacy.

According to the study Pricewaterhouse Coopers (PwC), due to these requirements, European financial institutions need in the coming years to lose assets of 3.4 trillion. euro. In this case, Basel III notes that the debt of all borrowers in one country should be evaluated using the risk factor one step lower than the sovereign rating of the country, with the exception of sovereign debts and central bank debt [96]. That is, according to the Moody's "Ca" rating, which corresponds to a partial default, commercial banks can only have a rating "C" - the lowest rating corresponding to bankruptcy. Standard & Poor's and Fitch lowered Ukraine's rating in foreign currency to SS and, accordingly, banks in the rating not higher than "C" - as a rule, insolvent companies.

NBU in 2012 insisted that Ukraine fulfills 25 of 30 requirements prescribed in the guidelines of Basel III [96]. "The standard of the minimum capitalization level set by the NBU at 10%, is even more stringent than is required by Basel III» (8%). At the same time, most financial institutions report on capitalization rates much higher than the minimum.

Implementation of other standards is more likely to be an exception for the banking sector in Ukraine. For the most part of Basel III were sold by banks with foreign capital, the parent companies are required by Ukrainian subsidiaries according to their standards.

Basel gives credit institutions the incentive to deeply analyze their risks, apply more sensitive valuation models (the risk profile of financial institutions can differ seriously, they can not be measured only on formal grounds).

Increasing capitalization requirements will lead to the exit from the market of weak players and the consolidation of assets by strategic investors, for whom the banking business is the main one.

And although the changes introduced in the "International Convergence of Capital Definition and Capital Standards: New Approaches" are not, in our opinion, fundamental, but their introduction is innovative in the following ways:

- changing approaches to financial management and risk management through increased risk management standards, the degree of integration of financial management and the risks of banking institutions;

- providing a stable base and necessary reserves to confront all kinds of risks and crises;

- the prudence of forming a more complete, consolidated picture of business for shareholders and management.

PART 2
METHODOLOGICAL BASES OF MEASUREMENT AND FORECASTS OF CREDIT RISK AT JSC «RAIFFEISEN BANK AVAL»

2.1 Regulatory legal framework for measuring credit risk in Ukrainian banks

One of the reasons for insolvency of Ukrainian banks and their withdrawal from the market is the presence of a large volume of their problem loans. Often, banks during the granting of loans overestimated the financial capabilities of borrowers, resulting in not always providing true information about problem assets, did not formulate in full reserves for the return of losses from low-quality credit operations.

During 2014-2018, more than 100 banking institutions were withdrawn from the market, the assets of operating banks for the first quarter of 2018 also undergo changes (esp. in USD equivalent) , primarily due to the reduction of borrowed funds from customers and loans granted to them, devaluation of the hryvnia, political and economic situation in the country (Table 2.1.).

Table 2.1.

Main indicators of activity of Ukrainian banks during 2014-2017, including first quarter of 2018, (UAH, millions)

№	Indicator	01.01. 2014	01.01. 2015	01.01. 2016	01.01. 2017	01.01. 2018
1	Number of operating banks	180	163	117	96	82
2	Assets of banks	1278095	1316852	1254390	1256299	1293141
3	Total assets (not adjusted for active operations reserve)	1408688	1520817	1571753	1737272	1837516
4	Loans are granted	911402	1006358	965090	1005923	1057591

Continuation of Table 2.1

	Of these, loans are granted to entity	698777	802582	805620	847092	882149
5	Loans are granted to individuals	167773	179040	150960	157385	173849

Made by the author by [12]

Analyzing the quality of the bank's loan portfolio only during the first part of 2018, where the number of operating banks decreased by 14 units, we observe a rather unattractive picture, namely: the share of overdue debts in the total amount of loans as of 01.01.2018 has increased compared to the previous period, by 3,3 percentage points, and compared with 2016, credit indebtedness increased by almost 5% (information presents as expert opinions). Consequently, the amount of formed reserves for active banking operations is also constantly increasing, even though banks hide such information (Fig. 2.1).

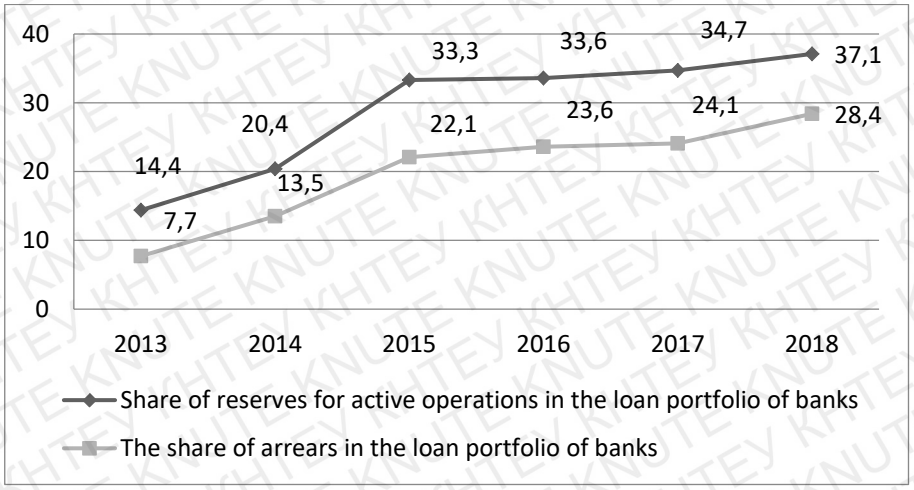

Fig. 2.1. Dynamics of the share of provisions for active operations and the share of overdue debts in the loan portfolio of banks during 2013-2018 (on 01.01.2018)

Made by the author by [12]

From 01.01.2013, banking institutions for the purpose of reimbursement of possible losses under active operations formed reserves in accordance with the Regulation approved by the NBU Resolution No. 23 dated January 25, 2012. This

Regulation has taken into account the main requirements of international financial reporting standards and recommendations of the Basel Committee on Banking Supervision, however definition of the borrower's class was based on the fact of fulfilling its obligations.

In order to ensure full and timely assessment by banks of the amount of credit risk that will contribute to the correct calculation of their capital and, ultimately, increase the financial stability of the banking sector, the National Bank of Ukraine by the Resolution of the Board of the NBU No 351 dated June 30, 2016 approved a new Provision on the definition of banks Ukraine size of credit risk under active banking operations.

It is precisely in this Provision for calculating the size of credit risk that the Basel Committee on Banking Supervision recommended by the formula uses three components: PD – probability of default, LGD – loss given default) and EAD – exposure at default.

We affirm that the development and the need for banks to introduce the said Regulation from 01.01. 2017, because based on the NBU data presented in the Financial Stability Report, the results of the stress testing of the twenty largest banks of Ukraine showed that the quality of the loan portfolio of banks in 2015 was at the lowest historical level: the share of loans 4 category (default probability 51-99%) and 5 category (default) in their loan portfolios amounted to 53%.

Here is an interpretation of the most important categories of the Regulation on the definition by banks of Ukraine of the size of credit risk in active banking operations:

- Probability of default (PD) - the likelihood of a default over a particular time horizon. It provides an estimate of the likelihood that a borrower will be unable to meet its debt obligations.

- LGD – component (coefficient) for calculating the amount of credit risk, reflecting the level of losses (losses) as a result of default of the debtor / counterparty;

- EAD – component of calculating the amount of credit risk corresponding to debt for an asset that is at risk of default of the debtor / counterparty;

- asset / liability - book value of the asset (principal debt to the bank and accrued income recognized by the bank in accordance with the regulatory act of the NBU on accounting, taking into account passive balances (if any)) / financial liabilities / accrued income from operations, for which there is no principal debt without taking into account the amount of the formed reserve; valuation of securities at fair value through profit or loss; discount and / or bonus.

- credit risk (CR) – the size of the expected loss (EL) on the asset as a result of default of the debtor / counterparty.

Banks, based on the new NBU Regulation, will develop internal regulations for each type of financial assets, a group of financial assets, receivables from the bank's economic activities and financial liabilities.

In the present work, we will focus only on analysis of the information provided in the Regulation on the determination of banks by Ukraine in terms of the amount of credit risk in the most active banking operations - credit.

In determining the credit risk of assets, banks will adhere to certain principles:

1) advantages of the essence of the bank's active operations over their form;

2) the timeliness and completeness of credit risk detection, based on full information about the client and his business;

3) the adequacy of the assessment of the size of the credit risk taking into account the cash flows of the borrower, confirmed by financial and statistical reporting;

4) the bank uses various ways to reduce credit risk;

5) taking into account the Bank's own experience in assessing credit risk by applying the judgment of the management staff / collegial body of the bank.

The formula for calculating the amount of credit risk on assets on an individual basis is as follows:

$$CRind = max\{0; PDx\,[\,EAD - \sum_{i=1}^{j} (CV\ x\ k)i + RC)]\} \qquad (2.1)$$

Formula (2.1) is based on the following formula:

$$CRind = PDind \text{ x } LGDind \text{ x } EADind \qquad (2.2.)$$

where: CRind – the amount of credit risk on an asset on an individual basis; Pdind – coefficient of default probability of the debtor / counterparty for the asset, determined by the bank in accordance with the requirements of this Regulation:

$$LGDind = 1 - RRind \qquad (2.3)$$

where: Rrind – a coefficient that reflects the level of return on the debt over the asset due to the implementation of security and other income, $RRind = (\sum_{i=1}^{j}(CV\ x\ k) * i + RC)/EAD\ ind$ – exposure at risk of an asset at the valuation date; Cvi – value of the i-th type of collateral taken to calculate credit risk (in the case of several types of collateral for one asset). If the provision does not or does not correspond to the list, criteria and principles of admissibility determined by the Regulations, then the calculation takes the value of CV equal to "0"; ki – liquidity ratio of the i-th type of security determined by the bank in accordance with Appendix 6 to this Regulation. The Bank, based on the judgment about the amount of expenses for the implementation of the security, applies below (less) the value of the liquidity ratio of the security; RC – other receipts, in particular, insurance indemnity, financial guarantee, realization of property of the debtor / property guarantor, except for pledged.

The new Regulation provides for 10 classes of a debtor-legal entity (except for a bank and a budget institution). The class of a debtor-legal entity is determined on the basis of its financial status with the help of an integral indicator:

$$Z = \beta 0 + \sum_{i=1}^{n} \beta\ iXi \qquad (2.4)$$

where: Z - integral index; xi - indicators, determined on the basis of financial ratios, calculated on the basis of the financial statements of the debtor of the legal person, taking into account the ranges set by the National Bank for each financial indicator; βi - coefficients of the logistic model, which are determined taking into account the weight of the indicators; β0 is a free member of a logistic model whose value is actualized by the National Bank.

When calculating the integral indicator, models are taken into account which depend on the type of economic activity of a legal entity determined on the basis of a legal entity, the decoding of the 2000 form data forms No. 2 (2nd, 2-ms) (Table 2.2). The financial ratios for legal entities-borrowers (large, medium and small enterprises) and the establishment of a class for them by the integral indicator are calculated by the banking institutions using the respective tables in the annexes of the Regulation.

Table 2.2

Models for calculating the integral indicator of a debtor-legal entity for a large or medium-sized enterprise (for example, section A is taken)

Group economic activity types	Pathern	Financial coefficient (Ki)	The range of financial indicators	Minimum range value (Ki min), %	Maximum range value(Ki max), %	Indicator (Xi)	
Agriculture, Forestry and Fisheries: Section A	Z = 2,767 + 0,309 * X11 + 0,821 * X15 + 0,577 * X1 + 0,504 * X10 + 0,291 * X16	K11	1	less than 18,2		X11	-1,157
			2	18,2	36,6		-0,143
			3	36,6	98,3		0,195
			4	more than 98,3			1,205
		K15	1	less than 0,1		X15	0,495
			2	1	5,4		0,332
			3	5,4	10		0,195
			4	10	36,5		-0,195
			5	more than 36,5			-1,062
		K1	1	less than 17,4		X1	1,079
			2	17,4	35,4		0,492
			3	35,4	88,5		0,555
			4	more than 88,5			-1,474
		K10	1	less than 162,8		X10	-0,492
			2	162,8	206,8		0,335
			3	206,8	976,7		0,37
			4	more than 976,7			1,619
		K16	1	less than 0,8		X16	-1,108
			2	0,8	7,6		-0,15
			3	7,6	45,8		0,231
			4	more than 45,8			0,684

Made by the author by [50]

The class of legal entities will depend on the following key factors:

1) the timely payment of the debt by the debtor: the debt is past due from 31 to 60 days - the bank determines the class is not better than 5; from 61 to 90 days - no better than 8; from 91 and more days - no better than 10;

2) the identity of the debtor to a group of legal entities under the joint control of a group of related counterparties;

3) indications showing a high credit risk of the debtor / counterparty;

4) requirements for recognition / termination of recognition by the bank of default of the debtor / counterparty;

5) availability of information on the debtor's credit history in the bank.

The Regulation contains additional, rather rigid, factors for determining the borrower's class (Sections XVII; XVIII), which will enable both parties to be responsible to conclude a loan agreement.

The value of the coefficient of probability of default of the debtor-legal entity will be determined in accordance with Table 2.3

Table 2.3.

Ranges of values of the PD coefficient of a debtor-legal entity

№	Debtor class - legal entity	Range of values of coefficients
1	1	0,005-0,009
2	2	0,01-0,019
3	3	0,02-0,03
4	4	0,04-0,06
5	5	0,07-0,10
6	6	0,11-0,17
7	7	0,18-0,32
8	8	0,33-0,59
9	9	0,60-0,99
10	10	1,0

Made by the author by [50]

The bank, in determining the coefficient of default probability of the debtor-individual / individual entrepreneur, the bank-debtor and the debtor-budgetary institution, will assess their financial status by quantitative and qualitative indicators

of solvency and timely payment of the debt (Sections V, VI; VII Regulations). Five classes of financial condition of these borrowers have been established, and there are specific requirements for debtor banks and debtors-budgetary institutions.

Loans to business entities and individuals in the amount of up to UAH 2 million will now be valued by banks on a portfolio basis (Section XI Provisions). Calculation of the size of credit risk on assets on a group (portfolio) basis is carried out according to the following formula:

$$CRgroup = \sum_{m=1}^{n} EADm \; x \; PDgroup \; x \; LGDgroup \qquad (2.5)$$

where: CRgroup - the size of credit risk for a group of financial assets; n - total number of loans in the group of financial assets; m is the serial number of a loan in a group of financial assets; EAD - Exposure at risk on the valuation date; PDgroup - coefficient of probability of default of debtors / counterparties, entered into a group of financial assets, determined by the bank in accordance with the requirements of this Regulation; LGDgroup - the ratio corresponding to the level of losses for a group of financial assets in the event of default.

The Regulation also improves the requirements for the list of credit operations and the conditions for its acceptance (Section X of the Regulation).

Therefore, it is quite right to assert of the department of financial stability director of the NBU Vitaliy Vavryshchuk: "The introduction of a new provision will make it impossible to lend banks financially insolvent enterprises … which was a common practice in the past".

2.2 General assessment of the credit risk measurement and management system in JSC «RAIFFEISEN BANK AVAL»

Quantitative analysis of the bank's credit risk is carried out using the method of financial ratios, statistical and expert methods.

The method of financial ratios is to calculate the relative indicators that characterize an enterprise from the point of view of its liquidity, profitability and financial stability, and compare it with the normative (criterial) values. At the same time, in the presence of advantages, this method has certain disadvantages. In particular, it is not always possible to draw a clear conclusion on how creditor is a borrower, since the values of some of its coefficients are normative, and the value of others is not.

However, the use of these models in domestic banking practice is unreasonable; therefore, it is worthwhile to construct similar classification models that will correspond to the realities of the domestic economy.

In recent years, two categories of models for assessing credit risk have become widespread. The first category is the structural models based on R. Merton's research. Accounts payable and capital under this approach are considered as claims that can be invoiced to the cost of the firm. In this case, the theory of pricing options is used to determine the fair price. The second category of models - reduced form models - is widely used in financial engineering.

Among the statistical methods of credit risk assessment it is expedient to distinguish the method of discriminatory analysis, which allows to split borrowers into classes. In particular, using this method, it is possible to construct classification models for forecasting the results of a loan agreement (fulfilled by the borrower or not). In the international banking practice, the most well-known of such models are the Z-model of Altman, the Fulmer model used to predict bankruptcy of the enterprise, and the model of supervision of loans by Chesser.

Statistical methods for assessing credit risk require a large array of data that may simply not be. Therefore, due to a lack or lack of information, for the most part, it is necessary to apply expert methods.

The essence of expert methods is to handle the judgments of experienced bankers regarding the probability of different values of losses or one or the other adverse (undesirable) event in the banking business. One of the obvious examples of credit risk assessment by expert methods is rating methods for assessing the borrower's creditworthiness, which are quite common in domestic banking practice. For this let`s investigate the composition of the loan portfolio of JSC «RAIFFEISEN BANK AVAL» (Table 2.4).

Table 2.4

Composition of loans in the loan portfolio of JSC «RAIFFEISEN BANK AVAL» for 2015-2017

№	Name of article	Value, ths. UAH			Deviation, 2015/2017, %
		2015	2016	2017	
1	Loans granted to legal entities	10821 000	124080000	149113000	38
2	Loans to individuals (credit cards)	16065000	21900000	22092000	38
3	Mortgage Loans to Individuals	3637000	3373000	5228000	44
4	Loans to individuals (consumer loans)	1072000	710000	171000	-84
5	Other loans granted to individuals	1307000	947000	1141000	-13
6	Provision for loan impairment	-18937000	-20616000	-21541000	14
7	Total loans minus reserves (ths. UAH)	113213000	133604000	159173000	41

Source: [17]

According to the data of the table. 2.4, during the investigated period, there was a clear tendency to increase the volume of lending to JSC «RAIFFEISEN

BANK AVAL». Thus, as of 2015, the volume of loans issued by the bank amounted to UAH 113 213 million, as of 2016 - UAH 133 604 million, as of 2017 - UAH 159 173 million.

In the structure of assets of JSC «RAIFFEISEN BANK AVAL», loans account for the largest share and provide more than half of all revenues. Credit operations are highly profitable, but at the same time, the growth of the share of credit investments in the total assets indicates an increase in the riskiness of the bank as a whole.

Throughout the investigated period there was an increase in lending by the banking institution, which is a positive phenomenon, since lending is the main source of profit for the bank. The largest increase in lending by the bank was observed as of December 31, 2017.

The dynamics of the loan portfolio of JSC «RAIFFEISEN BANK AVAL» for the period under study is shown in Fig. 2.2.

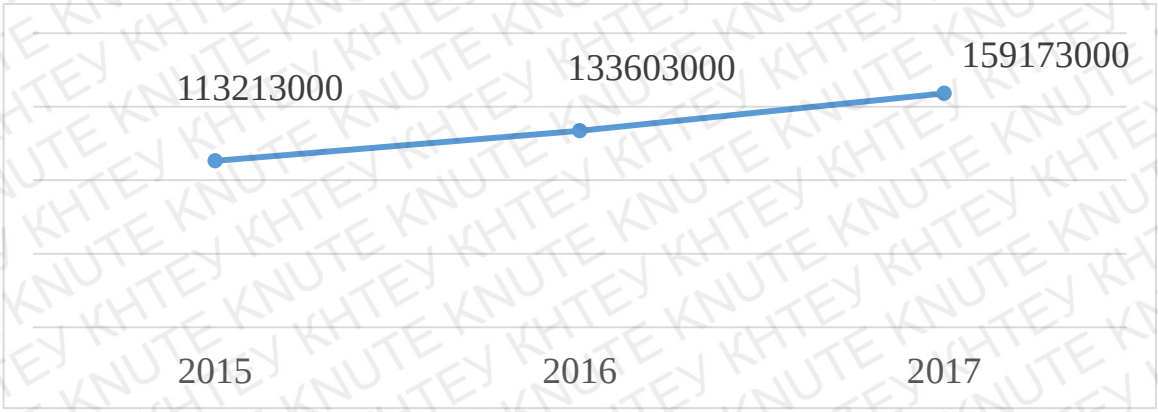

Fig. 2.2. Dynamics of the loan portfolio of JSC «RAIFFEISEN BANK AVAL» as of 2015-2017, [17]

Looking at the figure. 2.3 it can be seen that the largest share in the loan portfolio of the bank is borrowed by legal entities (84% of the total amount of loans granted), and the smallest - consumer loans to individuals (less than 1%). Such a high proportion of lending to legal entities by a banking institution indicates a satisfactory structure of the loan portfolio from the point of view of sectoral diversification.

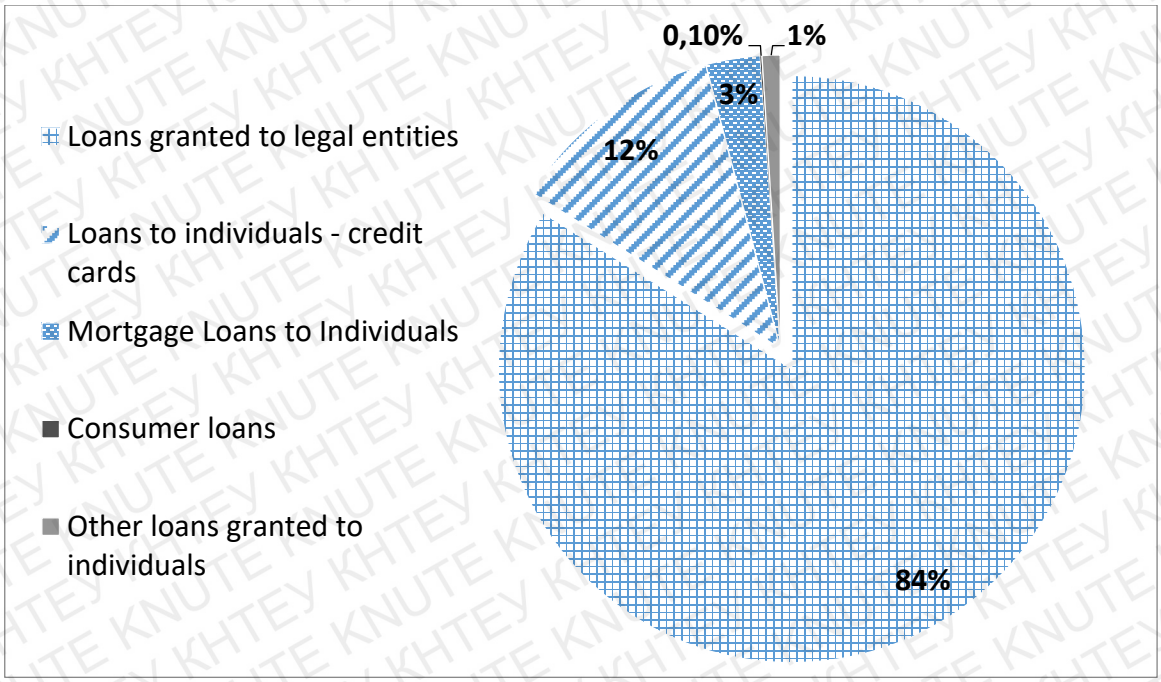

Fig. 2.3 The structure of the loan portfolio of JSC «RAIFFEISEN BANK AVAL» as of December 31, 2017. [17]

An analysis of the structure of loans by types of economic activity makes it possible to determine sectoral diversification of loans compared to the previous reporting date. To do this, the share of loans to the individual branches in general, based on short-term and long-term loans, as well as in dynamics, is calculated. Sectoral diversification of credit investments should contribute to the development of priority sectors of the economy.

Structural analysis is performed to determine the excessive concentration of credit operations in one segment, which increases the degree of credit risk. However, excessive diversification of the loan portfolio creates some difficulties in managing loan operations and may cause bank bankruptcy, so foreign commercial banks determine the limits of investment in a particular segment, that is, use the method of limitation.

Based on the data of the table 2.4 It can be concluded that, in general, in 2015, loans for all types of economic activity increased, and for agriculture in 2017 loans doubled, ie by 103% compared to 2015.

As a part of the trading of petroleum products, loans and advances to customers in the amount of UAH 40,603 million or 25,5% of the total loans and advances to customers were disclosed (in 2016 - UAH 42,510 million, or 26%) issued to companies engaged in wholesale and retail trade in gasoline, oil and petroleum products. These companies form a single supply system, so the credit risk for these loans is, according to management estimates, lower due to such a system.

As of December 31, 2017, the loans issued to these companies in Ukraine in the amount of UAH 39 533 million (in 2016 - UAH 42 016 million) were provided with oil, gas and petroleum products stocks, as well as corporate rights for shares (shares) in the share capital of borrowers and their guarantors with mortgage value of 39 671 million UAH (in 2016 - 38 628 million UAH). In January 2017, after the end of the reporting year, additional loans were secured in the form of stocks of oil and gas products worth UAH 852 million.

In the industrial production and chemical industry, loans and advances to customers were disclosed in the amount of UAH 17 246 million (in 2016 - UAH 12 628 million), issued to companies that are united in one structure, but which produce and market a variety of products in the markets Western, Central and Eastern Europe. Consumers of this product are companies that work in the food industry in the specified markets. As of December 31, 2017, loans issued to these clients were secured by property rights with a mortgage value of UAH 18,673 million (in 2016 - UAH 17,482 million).

The total amount of loans to the largest 10 clients of JSC «RAIFFEISEN BANK AVAL» (hereinafter - the Bank) as of December 31, 2017 amounted to UAH 32 548 million (December 31, 2016 - UAH 16 427 million), or 18% of the total value of the loan portfolio (as of December 31, 2016 - 11%). The provision for these loans is UAH 4 455 million (as of December 31, 2016 - UAH 2,544 million).

As of December 31, 2017, the Bank had 6 borrowers (as at 31 December 2016 - 1 borrower) with a total amount of loans granted to them, exceeding 10% of the net assets of the bank, or UAH 2,450 million (as of December 31, 2016). - 2,254 million hryvnia). The total amount of these loans amounted to UAH 25,414 million

(as of December 31, 2016 - UAH 4,077 million), and the amount of the established provision for these companies amounted to UAH 3,125 million (in 2016 - UAH 929 million).

As of December 31, 2017, mortgage loans in the amount of UAH 256 million (as of December 31, 2016 - UAH 175 million) were pledged as security for issued mortgage bonds.

As of December 31, 2017, loans issued to one hundred eleven legal entities of the Bank, in the total amount of UAH 49 231 million were pledged as collateral for the refinancing loan from the NBU (as of December 31, 2016, it was zero).

From Fig.2.4, we see that the largest share in the total volume of loans issued is the branch of trade in petroleum products - 22%, while the smallest is the sector of small and medium-sized businesses - 1%.

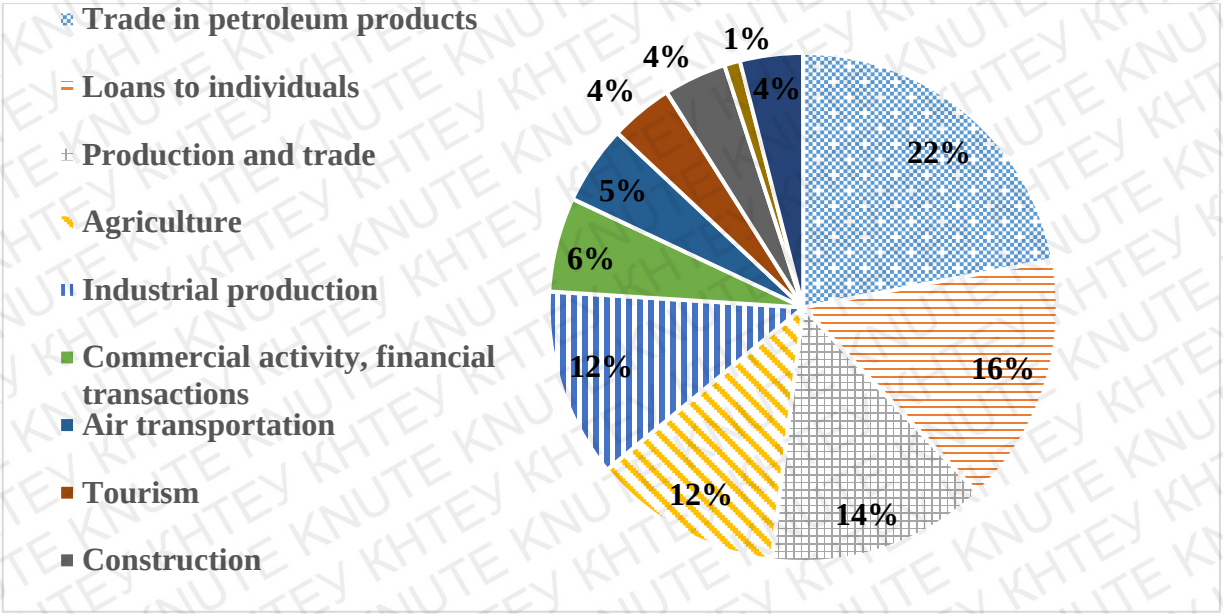

Fig. 2.4. Structure of loans by types of economic activity of JSC «RAIFFEISEN BANK AVAL», 2017, %, [17]

The bank's credit policy, based on the analysis of the sectoral structure of the loans granted and taking into account the mechanism of management of the bank's loan portfolio, should ensure a more even distribution of credit investments between the branches of the national economy, which will increase the diversification of loans and reduce credit risk.

As an active participant in the banking market, the Bank has a significant concentration of credit risk associated with other financial institutions. The total aggregate estimated amount of credit risk associated with financial institutions is UAH 49,735 million (UAH 50,908 million in 2016) and includes cash and cash equivalents, other banks' liabilities and the total amount before receipts from derivative financial instruments for operations such as swap, forward and spot.

Separate indicators of the Bank's activities for 2015-2017, namely, credit risk standards, can be seen in Table 2.5.

Table 2.5

Credit Risk Standards, 2015-2017, JSC «RAIFFEISEN BANK AVAL».

Standards	2015	2016	2017	Deviation		Normative indicators
				2016	2017	
Current liquidity,%	84,74	90,06	83,91	5,32	-6,15	Not less 40%
Maximum credit risk per one counterparty,%	12,19	10,32	20,23	-1,87	9,91	Not more 20%
Large credit risks,%	12,19	10,32	174,13	-1,87	163,81	Not more 800%
Maximum amount of loans, guarantees and guarantees given to the insider,%	3,86	4,18	1,83	0,32	-2,35	Not more 2%
Maximum aggregate amount of loans, guarantees and guarantees given to insiders,%	6,15	4,70	3,94	-1,45	-0,76	Not more 10%

Made by the author by [17]

The maximum exposure limit for a single counterparty is set to limit credit risk arising from the failure of individual contractors to meet their obligations, which is 20.23% in 2017, which is 9.91% more than in 2016. The standard of large credit risks is established in order to limit the concentration of credit risk by a separate counterparty or a group of related counterparties. It is within the permitted range and in 2017 it is 174.13%. The maximum size of loans, guarantees and sureties granted to one insider is established with the purpose of limiting the risk

that arises when dealing with insiders, which may lead to direct or indirect influence on the bank's activities. This norm in 2017 is equal to 1.83%, which does not exceed the optimal value.

The norm for the maximum aggregate amount of loans, guarantees and suretyship provided to insiders, is established to limit the aggregate amount of all risks to insiders. The maximum aggregate amount of loans, guarantees and guarantees issued to insiders is 3.94% in 2017, which is 6.06% lower than the normative value. Let’s determine the risk of a loan portfolio of the bank. For registration calculations it is advisable to make Table 2.6

Table 2.6

Risk of loan portfolio of JSC «RAIFFEISEN BANK AVAL», 2015-2017.

Indicators	2015	2016	2017	Deviation	
				Ths. UAH	%
Estimated amount of provision for credit risk coverage, ths. UAH	18 937 000	20 616 000	21 541 000	2 604 000	13,75
Balances of loans and loans, ths. UAH	113 213 000	133 604 000	159 173 000	45 960 000	40,60
Credit portfolio risk,%	16,73	15,43	13,53	X	X

Made by the author by [17]

According to tabl 2.8, the loan portfolio risk decreased in 2017 by 1.9% and amounted to 13.53% at the end of the year, indicating that the bank's credit policy has intensified.

Analyzing the data in Table 2.7, it has been determined that such lending operations as standard, under control, and hopeless in the dynamics for 2015-2017 have increased, while the growth of the first two is a positive trend that can not be said about the latter. It should be noted that for the years 2015-2017, the loan portfolio of 2016 was marked by more qualitative changes, since higher rates of growth were characterized by low risk loans - standard and under control, and vice versa, less risky such lending operations are substandard and questionable. It was

these changes that identified him as a portfolio with the best-formed structure. Instead, during 2017, bad and doubtful loans grew by as much as 77.3% and 41.2% respectively, while standard and under control were only 6.6% and 11.2% respectively.

Table 2.7

The structure of the loan portfolio of JSC «RAIFFEISEN BANK AVAL» by risk groups, mln.

Article	2015			2016			2017		
	mln. UAH	%	reserve	mln. UAH	%	reserve	mln. UAH	%	reserve
Standard	24 827,7	19,0	168,2	34 547,9	26,0	255,5	36 830,5	25,2	299,8
Under control	23 595,8	18,1	590,3	28 525,0	21,5	923,8	31 709,5	21,7	648,3
Substandard	67 860,3	52,0	6 071,9	55 831,5	42,0	7 228,4	57 048,5	39,0	7 878,7
Questionable	11 589,1	8,9	3 838,0	10 980,4	8,3	4 085,8	15 499,9	10,6	5 971,6
Hopeless	2 520,6	1,9	2 487,5	3 016,7	2,3	2 964,1	5 347,8	3,7	5 230,4
Total amount	130 393,5	100,0	13 156	132 901,5	100,0	15 457,6	146 436,1	100,0	20028,6

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But, taking into account that for every kind of credit operation an insurance reserve was formed, and besides, the reserves for doubtful and bad loans in 2017 grew almost in proportion to the growth of the loans itself, it can be concluded that the loan portfolio of JSC «RAIFFEISEN BANK AVAL» has the necessary degree of security, and therefore quality.

As for the share, its largest share for the period 2015-2017 is subprime loans - 52%, 42% and 39%, respectively. Following them are standard and under control, which fluctuate within 18,26%. The share of doubtful loans in the structure of the portfolio for 2015-2017 is an average of 9.2%. It is clear that the smallest share falls on bad loans. This situation is entirely justified, since it is important for a banking institution to maintain its financial position at an acceptable level by minimizing the risk of non-repayment of loans.

The main problem in creating a reserve for probable costs is the assessment of the potential consequences of the risk.

Consequently, we can conclude that the bank is functioning well, because all indicators are in admissible standards, and also the bank receives rather high profits. You can also say about a very manageable situation with regard to the risks taken by the bank when lending to customers. But despite the positive achievements over the period and the profit for 2017, JSC «RAIFFEISEN BANK AVAL» should diversify its lending operations in order to promote the development of priority sectors of the national economy; introduce new types of bank products for legal entities; introduce new types of banking products for individuals targeting the most vulnerable groups of the population; constantly attract customers through promotions and presentations, etc.

2.3 Deficiencies in the system of credit risk measurement in JSC «RAIFFEISEN BANK AVAL» and ways of their elimination

After analyzing the loan portfolio and credit risk indicators that JSC «RAIFFEISEN BANK AVAL» faces, it should be noted that the bank has the opportunity to change the structure of the loan portfolio in accordance with its strategy, market conditions and other factors that increase the risk of the loan portfolio as a whole.

As already noted, under the umbrella of the management of a loan portfolio and credit risk, a commercial bank is understood as a set of certain rules and principles of providing a system for managing a bank's loan portfolio in order to achieve the strategic goal and tactical objectives of its credit policy. In order to find possible directions for improving the management of credit risk, JSC «RAIFFEISEN BANK AVAL» will use the SWOT analysis for analysis.

SWOT-analysis is a process of establishing links between the features, threats, strengths and weaknesses that are most characteristic of a business entity, the results of which can be used later for the formulation and selection of a business entity's strategy. Based on the data of the official financial statements of the bank for 2015-2017, the years of SWOT analysis enabled us to identify the weak and

strong sides of the loan portfolio of JSC «RAIFFEISEN BANK AVAL», potential threats and opportunities of the internal and external environment and, accordingly, the justifiers of ways to improve the policy of credit management risk in general (Table 2.8).

Table 2.8.

SWOT analysis of the loan portfolio of JSC «RAIFFEISEN BANK AVAL»

Strengths (S)	Opportunities (O)
Growth of loan portfolio of the bank and lending to legal, physical; subscribers and individuals for current needs; short-term lending to other banks; interest income from credit operations; the volume of secured loans; volumes of loans, with highly liquid collateral. Negative dynamics of impaired loans. The predominance of the proportion of loans with a minimum, low and moderate risk. Reducing the risk profile of a loan portfolio and lending to legal entities. Compliance with the standards of additional indicators of riskiness of the loan portfolio.	Prospects for growth of the state economy, increase of business activity and purchasing power of individuals. An increase in the market share of lending to customers and other banks. Deepening cooperation with banks of the Organization for Economic Cooperation and Development. Improvement of risk management system. Deterioration of the financial condition of competitors. The presence of reliable regular customers.
Weakness (W)	Threats (T)
Abbreviations: mortgage and other lending to individuals; loans to individuals; volumes of lending to banks of OECD countries; profitability of the loan portfolio; coefficient of efficiency of management of the credit portfolio; long-term loans; share of lending to individuals in the loan portfolio. Growth: amounts and shares of unsecured loans in the bank's loan portfolio; shares of impaired loans to legal entities; share of bad debt. Instability of the loan portfolio in the private uneven change in the share of loans with different maturities. Exceeding the norm of the maximum amount of credit risk for 1 cartagent at the end of 2017	Inflation growth and the NBU discount rate. Decrease: business activity, solvency of the population, demand for credit resources, reputation of the bank due to the dissociation of shareholders or senior officials; the prices of loans from competitive banks. Liquidation of partner banks and debtor banks. The deteriorating situation in crisis regions. The emergence of crisis situations in the current-stable and prosperous regions. Deepening the economic crisis in the state. Unprofessional actions of managers and employees of credit departments Unrealistic forecasts.

Made by the author

Given the large number of banks that were recognized as insolvent state regulators in 2014 and violations of the financial stability of the banking system in

general, we consider it expedient to use a moderate credit strategy by the bank, that we analyzing.

With the growth of the amount and the proportion of impaired loans against the background of lowering the solvency of other banks, business entities and the population, a more risky loan portfolio can contribute to the development of crisis situations in the financial and business activities of JSC «RAIFFEISEN BANK AVAL» in the medium term.

Although interest income on long-term lending is generally lower for banking institutions, however, the availability of long-term loans in the bank's loan portfolio facilitates prospective financial planning of the bank's operation, since it allows you to more accurately calculate the forecast of payments for servicing such banks. And since JSC «RAIFFEISEN BANK AVAL» has a predominantly low-risk loan portfolio, in the context of lending, the availability of long-term loans creates some stability in the functioning of the bank. The unevenness of changing the share of bank loans with different maturities creates difficulties in financial planning of the bank's cash flows

By manipulating these data, the bank can change the structure of the loan portfolio in accordance with its strategy, market conditions and other factors that increase or decrease the risk of a loan portfolio. Therefore, when managing it, the bank should adhere to the economic principles, which account will allow to rationalize the management process at all stages of the credit strategy and direct the credit resources into the most effective projects. All principles of management of a loan portfolio can be divided into basic (target direction, optimism level of riskiness, profitability, complexity, hierarchy) and specific (are the rules for the implementation of lending, that is, the preservation and diversification of resources with the issuing of credit, selectivity, balance, priority).

The growth of short-term lending to other banks relates to the advantages of JSC «RAIFFEISEN BANK AVAL», as we consider it advisable to prevail in the loan portfolio of the bank to lend to other banks such lending. This is due both to the

crisis of non-payment of many other banks, and to the specifics of financial and economic activity of financial institutions

In fact, the process of managing a loan portfolio itself is a clearly organized sequence of stages, of which, for the most part, there are three - portfolio formation, risk assessment and adjustment. However, in order to detail the management process and identify possible areas for optimization and elimination of shortcomings, the following steps should be identified.

I. Formation of credit policy based on the current legislation on lending standards, strategies and tactics of the bank, which indicate sources of attraction of resources and directions of their investment. That is why high-quality policy advocates the primary goal of minimizing the risk of a loan portfolio, since it contains the goals and priorities of lending, methodological and guidance provision of the credit process, which raises the rationality of the decisions taken during the issuance of a loan, regulates the distribution of responsibilities among the personnel and allows to overcome the effective organizational structure of the bank. If its credit objectives are sufficiently clearly defined, then when analyzing the financial market, a credit path is created that can be reduced to capturing a larger market share or choosing new types of lending activity. According to the strategy, the formation of the asset portfolio (the determination and the ratio of the yield of each asset) and, on this basis, the loan portfolio is projected. At the same time, for the implementation of strategic goals, it is unnecessary that they were expressed in qualitative and quantitative parameters, had acceptable values, and also made it possible to evaluate the effectiveness of their application. The approximate strategy of risk management of the loan portfolio, which organizationally combines tactical and strategic objectives, and structurally and logically combines the stages of credit risk management, which allows to provide support at the optimal level of quality of the loan portfolio, illustrated in Fig. 2.5. Therefore, if the formed loan portfolio corresponds to the missions and strategies of the bank (aimed at a long-term and stable competitive position), it will carry out effective activity and develop as a financial institution and as a relevant institution.

Consequently, the management at this stage can be reduced to the quality of the forecast for the direction of the development of the financial market, which, on the basis of the identified factors, will enable us to identify possible lending risks and reduce the level of uncertainty, and, consequently, quickly change the structure of the loan portfolio in rebound to change operating environment. It should be noted that the majority of factors can be ignored by promising measures, in particular, the wisdom of well thought out and adequate conditions for the functioning of the bank credit policy, the implementation of continuous monitoring and analysis of the localization of risk.

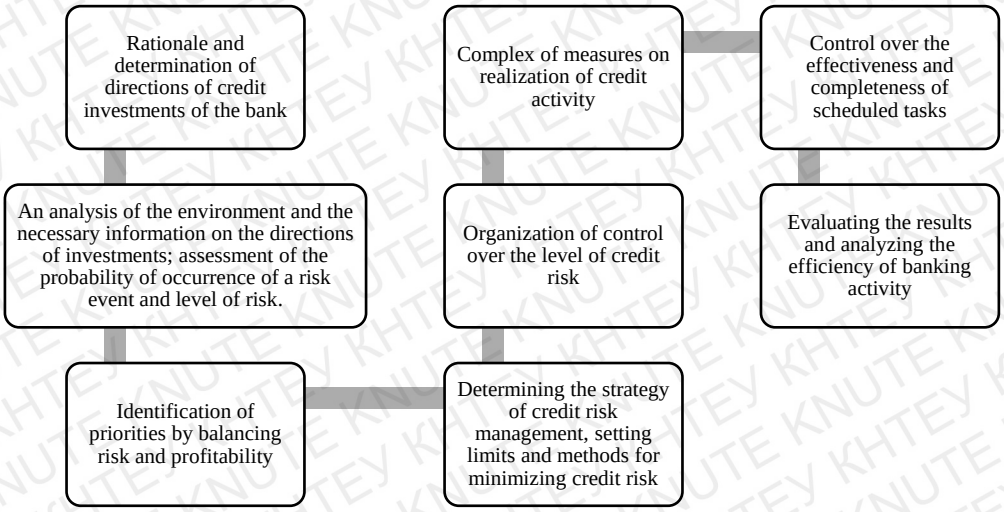

Fig. 2.5 Stages of management of a bank's loan portfolio, [38]

II. Direct formation of the loan portfolio in accordance with the strategic and tactical objectives of the credit policy, which is achieved by selecting applications of borrowers, allocating resources with allowance for limitation, identifying objects and subjects of lending, analyzing the state of the credit process, managing it, analyzing deviations from optimal values . At this stage, it should be taken into account that the high credit rating of the borrower is not always the basis for the inclusion of a loan in a portfolio, since such a decision must be reasonable and depend on the current portfolio structure. Thus, regardless of the inherent risk profile of individual loans, when they are merged into a loan portfolio, the credit risk may change, as there is a risk of exceeding standards or a violation of the

principle of diversification. Therefore, each loan issue (individual credit risk) should be compared with the acceptable level of risk of the loan portfolio as a whole. To do this, it is necessary to take into account the correlation between borrowers, which will simulate the effect of changing the creditworthiness of at least one of them on a loan portfolio.

Therefore, at this stage, it is advisable to design the loan portfolio, which will enable to assess credit risk parameters and predict potential losses from it, and determine the necessary level of reserves and capital. Modeling can happen in two ways, in particular on the basis of data on the probability of default - improving loan portfolio will be based on assessment ratings and credit products and borrowers on the basis of individual credit agreements. This method is useful in terms of economic stability.

The following method involves modeling through the distribution of possible losses, ie clustering and stress testing the portfolio for its division into homogeneous groups that will perform more efficiently optimize its structure.

At this stage, the choice of risk management methods for a loan portfolio is also appropriate, which should be investigated at three hierarchical levels - levels of individual credit, level of loan portfolio, bank levels.

III. The review of the portfolio involves analyzing its profitability, the quality of loans in the structure, assessing significant loan projects, finding withdrawals from credit policy, analysis of total risk. This is due to the need to select the best lending areas while minimizing the risk, taking into account the need for liquidity and the maximum return on lending to ensure the effective functioning of the bank. Such a compromise between the various indicators should be aimed at increasing its market value in terms of equity capital adequacy, which, on the one hand, limits credit risk and supports liquidity on the planned level, and on the other hand regulates the growth of the loan portfolio with the specified indicators of its quality.

IV. The assessment of the quality and effectiveness of the loan portfolio is aimed at analyzing the optimal ratio of profitability and risk of loans, realized through structuring - their division into groups in accordance with the risk, which

allows to determine the deviation of actual indicators from the expected standard values, to establish the level of credit risk to the capital and the bank's income and allows you to predict the quality of long-term loans.

Thus, in accordance with the bank's development strategy, an adequate portfolio is selected for it (depending on aggressive or conservative policy), the yield of which is compared with the yield of other assets for the purpose of redistribution of funds both in terms of lending and active operations. The outcome of this phase should be an assessment of the overall quality of lending activities of the bank, which, of course, depends on the quality of the formed loan portfolio.

V. Based on the previous stage, the bank's credit policy and loan portfolio structure are adjusted to reduce credit risk, which excludes unreliable branches from the priority areas of lending.

Thus, operational detection, analysis and impact on credit risk at each of these stages of management will enable the formation of a qualitative loan portfolio of the bank and ensure the achievement of the planned level of profitability from lending activities.

Consequently, the efficiency of banking activities, and therefore the profitability of a bank depends on the quality of the optimal loan portfolio, which, in modern conditions, means not maximizing profits due to risk investments, but rather a balanced credit policy, which involves choosing such options for lending from alternatively possible, which will allow to achieve the planned results at the least losses. However, in a context of limited transparency of counterparties' activities, in which the borrower is not aware of the current state of affairs in the functioning of banks, and the latter do not receive sufficient information on the state and possibilities of repayment of credit resources by borrowers, the development of a model which has allowed to determine effective strategies of investment of money loans in terms of uncertainty in the investment environment is useful.

The delayed European course of Ukraine's development, prospects of cooperation of our state with countries with developed market economy,

introduction of innovative structural reforms will promote deep cooperation of the domestic banking system with commercial banks.

As the share of loans with the highest risk in the loan portfolio of the bank is increasing, within the framework of this problem, we consider it necessary to divide such an indebtedness into a critical-problem and doubtful-problem. The system we are proposing for the adoption of decisions in the management of problem debts within the policy of managing a bank's loan portfolio is shown in Fig. 2.6

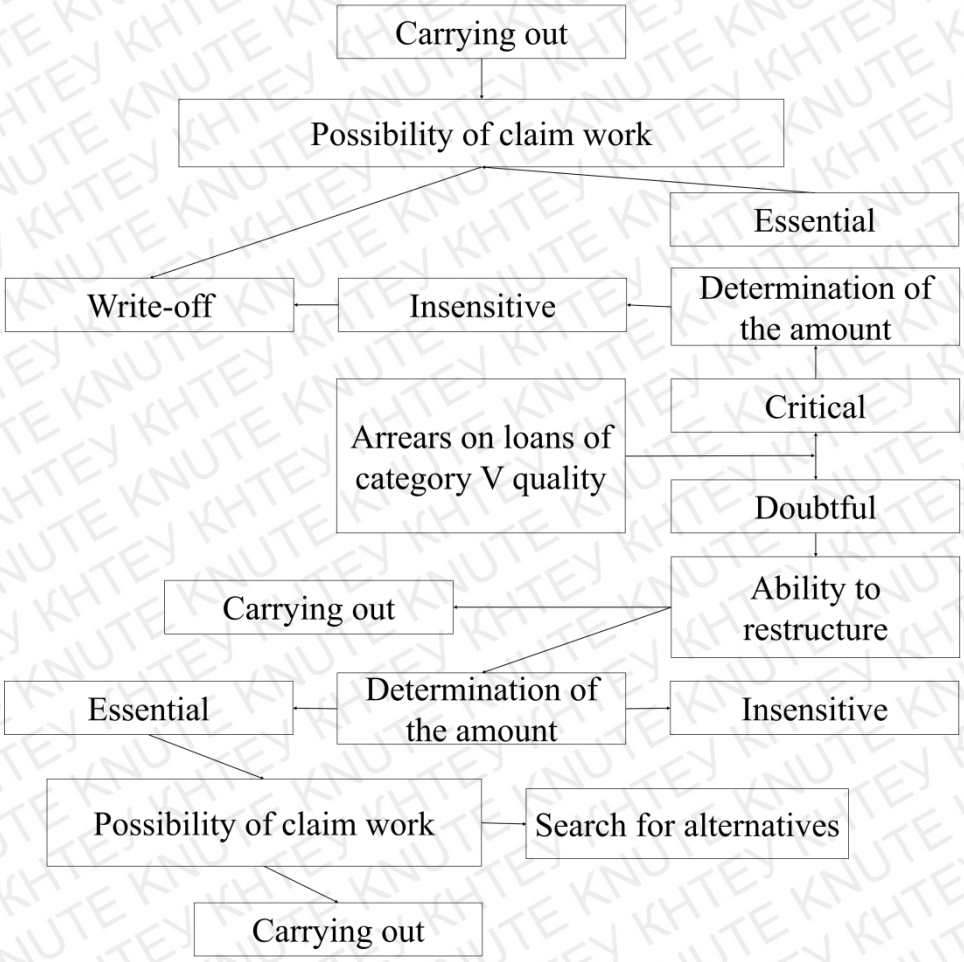

Figure 2.6 The bank’s credit acceptance decision making system [38]

Critically - problem debt is essentially hopeless, that is, has a negligible chance of being returned to the bank; however, has a greater chance of being returned. The assignment of debt for a specific loan to a critical-problem or

doubtful-problem remains for the responsible officer of the bank who is a loan expert.

The use of the algorithm proposed in the provided decision support system will allow optimizing the bank's work on problem loans management.

As a result of the SWOT analysis, prospective strategic alternative solutions of JSC «RAIFFEISEN BANK AVAL» are outlined in the context of certain strengths and weaknesses of the bank's loan portfolio, its potential and threats in the context of improving the policy of managing the credit portfolio of the institution (Table 2.9).

Table 2.9

Strategic Alternatives to Managing a Credit Portfolio of JSC «RAIFFEISEN BANK AVAL» on the Basis of the SWOT Analysis of a Credit Portfolio

SO - strategy	ST - strategy
Increase in lending to customers and other banks. The capture of a larger share of the bank credit market in Ukraine and abroad. Development and implementation of lending terms more attractive than competitors. Active advertising of bank lending. Deepening of lending to reliable, regular customers. Broader introduction of modern information technologies and software into the bank's activity.	Determining the optimal interest on loans, taking into account the discount rate and the ability of clients to process and repay the loan. National-patriotic brand advertising of the bank. Informing the bank's clients about the positive achievements of the bank. Monitoring the situation in the regions. Improvement of qualification of employees and control over their work. Preparation of optimistic, pessimistic and realistic forecasts of the bank's loan portfolio.
WO - strategy	WT - strategy
Development and introduction of beneficial for existing customers of bank programs for mortgage and other lending to individuals. Implementation of new management decisions within the framework of risk management policy of the bank's loan portfolio. Improving the efficiency of managing a bank's loan portfolio.	Cleardetermination of certain normative values of additional indicators of riskiness of a loan portfolio. Development of the bank's development strategy in the framework of stable decrease of profitability. Working out of algorithm of actions in conditions of emergence of crisis situations in safe and stable regions.

Continuation of Table 2.9

Improving work with problem borrowers. Development of the bank's development strategy in the framework of stable growth of profitability.	Diversification of the list of partner banks and debtor banks on the basis of analysis of the current financial situation of financial institutions. Pond system of prompt response to the disclosure of false and discredited information about the bank.

Made by the author

Since WO and WT strategies are mostly based on changes in the external environment of the bank's operation, these alternatives may have wider implications for the bank than its credit portfolio management policy.

Based on the SWOT analysis of the strengths and weaknesses of the bank's loan portfolio, the opportunities and threats posed by the management of the bank's loan portfolio management and the planned alternative development strategies of the bank, we propose the following measures to improve the management of the loan portfolio and reduce the bank's credit risk:

• Development and implementation of a flexible system for determining the terms of credit depending on the economic situation, the financial condition of the bank and the financial capabilities of the client and determining in it the key conditions that have a certain advantage over the terms of the main competitors;

• Determination of tougher requirements for the assessment of borrowers' creditworthiness based on the use of modern innovation and information technologies;

• Conducting an active informational and advertising campaign in banking institutions and on the bank's website as well as in the media for confirming the good reputation of the bank and responding promptly to the publication of false or discredited information about JSC «RAIFFEISEN BANK AVAL», as well as to deepen the application of national-party motives in documentation, informational, advertising handouts, corporate colors of the bank;

• Development of a program of in-depth cooperation with reliable permanent clients of the bank, including in other areas of banking activity;

• Search and realization of possible directions of cooperation with reliable banks of developed countries and expansion of crediting of OECD banks;

• Improving the process of using information technology not only to assess the creditworthiness of bank clients, but also monitoring the situation in the regions of the state and the world;

• Preparation of the forecast of the dynamics, structure, quality and risk profile of the loan portfolio, based on optimistic, realistic and pessimistic scenarios for changing the internal and external environment of JSC «RAIFFEISEN BANK AVAL»;

• Organization of work of a bank with problem borrowers using the proposed decision support system;

• Developing an algorithm of action in the conditions of emerging crisis situations in safe and stable regions and familiarizing them with the Bank's staff within the framework of training of employees of the financial structure.

The application of the above measures will not only improve the policy of managing the loan portfolio and reduce the credit risk, but also increase the efficiency of its lending activity as a whole, subject to a tolerable level of risk.

PART 3
IMPROVEMENT AND PROSPECTS FOR DEVELOPMENT OF CREDIT RISK MEASUREMENT SYSTEM

3.1 Improvement of the methodological basis for measuring credit risk in Ukrainian banks

Consideration of the current legislative and normative documents in Ukraine on the analytical assessment of individual credit risk allows us to conclude that such assessment is to determine the creditworthiness of a potential borrower, taking into account its current financial state, and the forecast estimate of its future changes is only declared. Taking into account national experience and recommendations of the National Bank of Ukraine regarding the analysis of the financial condition of companies of borrowers, the following generalizations can be made:

1) for the analytical assessment of the financial condition of the borrowing companies, a group of indicators is used based on which the financial ratios characterizing the creditworthiness are calculated. Thus, compulsory for such an analysis are solvency and liquidity indicators that ensure the implementation of the principles of maturity and loan repayment, indicators of financial stability, which characterize the expediency of a loan agreement and indicators of profitability and business activity that ensure the implementation of the principle of payment of credit;

2) the obtained values of the financial coefficients are compared with the values recommended as theoretically optimal (normative) and the credit rating of the borrower is determined, which is evaluated by the classes A, B, B, D (respectively, from the highest class A to the lowest grade D).

However, the practical implementation of these recommendations, as shown by the practice of crisis phenomena in recent years, is accompanied by certain problems caused by the following.

According to national realities, when the legislation regulating the activities of enterprises is constantly changing, implementation of these recommendations is considerably more complicated, because an adequate assessment and study of the trends in the financial condition of the borrower requires the study of the values of the coefficients in the dynamics (sufficient time series), which is quite problematic.

On the other hand, it is much more difficult to compare the indicators of the company's creditworthiness, which is analyzed, with the normative (theoretically optimal) values of financial ratios. According to the current state of the Ukrainian economy, the criteria for permissible levels of values of individual indicators will vary depending on both the state of the economy in general and the levels the efficiency of individual industries, the levels of supply and demand for products of individual enterprises, and many other factors, which will allow taking into account objective individual characteristics and differences in the quality of debts on loans. That is, only the system of indicators of such an enterprise, which is close to the type of products manufactured and has a stable financial status, can be accepted for a comparative standard. Accordingly, since such data do not exist at the state level, the development of such benchmarks for diverse enterprises should be carried out by banks on their own, which is quite expensive and time-consuming.

In addition, it should be borne in mind that the methodology for assessing the quality of a loan portfolio (taking into account the level of credit risk of individual lending operations) in commercial banks of Ukraine is regulated by the "Regulation on the procedure for the formation and use of a provision for reimbursement of possible losses on credit operations of banks". In accordance with the requirements of the specified normative document, the level of riskiness of a bank's credit operations is determined on an integrated basis on the following three parameters:

• assessment of the financial condition of the borrower (counterparty of the bank);

• The state of servicing by the borrower with principal debt and interest (commission or other payments), as well as the ability of the borrower to continue servicing this debt (groups: good, weak, unsatisfactory).

• The level and quality of collateral maintenance.

These features determine the category of credit transaction: standard, under control, substandard, doubtful and bad loans.

In essence, such a classification of loans in terms of their risk is based on a retrospective analysis, since the main criterion for migration of a loan from one category to another is the actual availability of overdue debt for a separate lending operation. That is, such a classification is based on the facts of the real deterioration in the quality of the loan (occurrence of delay) and the assessment of the financial state of the enterprise in the past, but it is impossible to calculate such a deterioration in the near future, especially at a time when payments on loans are not overdue. At the same time, the main task of the bank is to identify exactly those lending operations, the arrears on which may become problematic in the future. Thus, such a methodology is not oriented to the estimation of probable losses on credit operations in the future.

That is why, as in domestic and foreign banking practice, the main indicator that determines the borrower's creditworthiness at the present stage is the credit rating. Such ratings provide an opportunity to assess the borrower's ability to execute a loan agreement. The high rating points also testifies to the high class of creditworthiness and vice versa. Unfortunately, in domestic banking practice and stop at this stage, ending the evaluation process. But the main objective of the analysis of creditworthiness is not so much the credit rating as the establishment of the relationship between the value of the individual credit rating of the individual borrower and the amount of individual credit risk associated with it. At the same time, in domestic banks, interpretation of the rating from the point of view of the level of credit risk is quite subjective: the rating of class A corresponds to low level of credit risk; grades B and C are average, and grades G and D are high. Accordingly, the typical final conclusion of credit specialists about the level of credit risk, in most cases, is: "the borrower has been assigned a credit rating of class B, and the level of credit risk for operations with this borrower is considered average." In our opinion, this is not sufficient to provide an adequate assessment of the borrower's

creditworthiness. The final result of an assessment of creditworthiness should not be to assign a borrower a particular credit rating, but to determine the likelihood of changing such a rating (first of all, the probability of a default on the obligations of the borrower) and the corresponding change in the borrower's class.

Also, considering the regulatory requirements for regulating the activities of banks in Ukraine, we note that one of the main is the norm of adequacy of regulatory capital (solvency H2), in the calculation of which the regulatory capital of the bank relates to assets weighted by their level of risk. At the same time loans to economic entities are classified in the tenth group of risks (the level of risk at which is 100%). That is, the absolute value of credit risk is estimated, but its nature and economic essence are not taken into account. Accordingly, further classification of loans granted in the light of the creditworthiness of different enterprises is not practical, since it does not affect the level of credit risk in calculating the regulatory capital adequacy ratio. In essence, enterprises - economic entities with different financial positions are equated to each other, despite the apparent differences in the level of risk that occurs in the implementation of individual credit operations. Thus, the requirements established in Ukraine for calculating the H2 norm indirectly limit the ability of national banks to lend to the real sector of the economy.

The domestic practice of evaluating individual subjective parameters of individual credit risk also has significant disadvantages. This is the allocation of the total number of potential borrowers of a particular group (including insiders), which has significant advantages and uses more favorable conditions for obtaining and repaying loans. This practice substitutes the market factors for assessing the creditworthiness of borrowers by administrative and complicates the development of common methodological criteria for such analysis.

Accordingly, the return of such loans in most cases is doubtful for the bank, accrued interest is unrealistic to receive, and the debt is eventually subject to write-off. The indicated problem for Ukraine today is one of the most relevant in the field of an adequate assessment of borrowers' creditworthiness.

Thus, in the domestic banking practice, a situation arose in which, firstly, commercial banks have to calculate the indicators and norms of credit risks in accordance with the legislative and regulatory requirements of the National Bank of Ukraine. Such indicators, as shown above, can not be an effective instrument for managing credit risk, since they not only do not take into account the objective differences existing in the activities of borrowers, but also fail to determine the level of risk in the near future. Secondly, the necessity of daily monitoring of individual credit risks encourages banks to develop their own calculation methods, which complicates the work of the bank, increases the workflow and expenses.

The above deficiencies of the existing system of analytical assessment of individual credit risk in Ukraine were inherent in foreign banks and banking supervisors. There was a need for further reform of the international banking system on the basis of unification of norms and rules of conduct of banking business, as well as the development of international standards of conduct. The Basel Committee on Banking Supervision, whose activities are intended to maintain the sustainability of national banking systems and prevent bank-led crises, plays an important role in such processes.

In relation to the assessment of individual credit risk, the Basel Committee recommends using the following approaches: a standardized approach and an internal rating based system (IRB) approach.

Consider the advantages and disadvantages of these approaches to individual credit risk assessment.

The most simple approach to assessing individual credit risk is the standardized approach, which involves determining the credit rating based on the ratings (external ratings) of specialized rating agencies (credit agencies). Accordingly, the banking supervisors must form lists of such agencies, whose ratings can be used in the calculation, using the following main criteria:

- independence of the agency from political and economic structures, reputation of the agency and reliability of the rating assigned;

- the objectivity of the rating methodology with the description of quantitative and qualitative factors that affect both the rating value and the likelihood of its change (with the definition of the level of default), etc.
The Basel Committee proposes to weigh the respective types of assets (loans granted to governments, banks, enterprises) as indicated in the table. 3.1 levels of risk.

That is, the introduction of such an approach will reduce the credit risk of highly reliable enterprises from 100% to 20%, which will weaken the requirements of regulatory authorities regarding banks' capital adequacy. At the same time, the credit risk associated with lending to borrowers with a low level of credit (below BB-) will increase to 150%.

Table 3.1

The dependence of the level of risk on the category of lending operations is proposed by the Basel Committee

Credit rating assigned by the agency	AAA-AA	A+-A-	BBB+-BB-	Lower than BB-	Withoiut rating
Risk, %	20	50	100	150	100

Made by the author by [95]

Thus, a standardized approach to credit assessment is relatively simple, it allows determining the borrower's rating with the estimation of the probability of its change (with the definition of default level) and reducing regulatory requirements for banks' capital adequacy for the appropriate expansion of the credit potential of banks.

But, in Ukrainian realities, this approach has a number of very significant shortcomings. Yes, well-known international rating agencies almost do not work in Ukraine or work irregularly. In obtaining a credit rating interested only those large companies and banks that have access to international credit markets and are forced to provide information on the credit rating assigned to one of the leading rating agencies. This is due to the fact that in the absence of such a rating, foreign banks refuse to grant a loan, or set too high interest rates.

There is also a problem of incompatibility of credit ratings assigned by local rating agencies and external international credit ratings assigned by world-known rating agencies (Fitch, Moody's, etc.). In addition, national rating agencies assign loans to local governments with the highest ratings, while international rating agencies can assess government loans of these countries to a much lower rating.

Another important disadvantage that inhibits the extension of the standardized approach to individual credit risk assessment is the incompatibility of the cost of collecting information about the borrower and the price that is more or less acceptable to domestic banks of Ukraine. In our opinion, solving this problem is connected with the necessity of further development of credit bureaus in Ukraine and creation of centralized reporting databases of Ukrainian enterprises, as this will allow not only to create a sufficient database for the formation of the information field necessary for constructing statistical models of risk assessment, but also to increase the level of access to information in the field of financial intermediation - a necessary condition for both the efficiency of lending to domestic banks and effective economic development.

In particular, according to data from the Center for Studies in Economics and Finance (CSEF), they are shown in Table. 3.2. Regarding the efficiency and volume of lending in more than 40 countries, the availability of information provides an increase in the volume of bank loans in relation to gross domestic product (GDP), which is almost doubled. In addition, an increase in lending is carried out in the context of a significant reduction in credit risk and, accordingly, a reduction in the share of provisions to cover possible losses on loans in the total lending.

In general, despite the specific Ukrainian conditions, the foreign experience of the development of credit bureaus is very useful. Today, the creation of such structures in our country is hampered by the absence of a special law on credit bureaus and centralized reporting databases of Ukrainian enterprises. In our opinion, if the said law is developed and adopted, this will increase the level of availability of information about the borrower and, accordingly, reduce the level of individual credit risk associated with individual borrowers.

Table 3.2

The relationship between the efficiency and riskiness of lending and the availability of information about the borrower

Indicators	Availability and possibility of information exchange		
	none	Only “black”	“black” + “white”
Bank loans / GDP,%	31,1	67,57	66,42
Provisions for repayment of loan expenses / total loans,%	1,31	0,86	0,81
Credit risk (0-50)	15,20	5,11	7,14

Made by the author by [50]

On the other hand, in order to level off the aforementioned shortcomings of the standardized approach, the developers of the new Basel Accord proposed another approach based on the use of internal rating systems (IRBs), the systems for building credit ratings by the bank itself. An analysis of such systems conducted by the Basel Committee suggests that this approach is more sensitive to credit risk and stimulates the further improvement of the rating system's internal banking systems. Namely, the application of this approach to the determination of individual risk in lending to organizations involves identifying the following risk components:

- The probability of default (Probability of default - PD) - reflects the probability of default on all obligations of the company based on a predictive assessment of changes in the financial condition of borrowers and, accordingly, their creditworthiness. The PD level and the borrower's solvency class should coincide. At the same time, in our opinion, to determine the real creditworthiness of the borrower, it is important to compare the obtained values of financial indicators with other similar enterprises of the same industry, since the industry features of the enterprises activity have significant differences, as well as carrying out a retrospective analysis of the borrower's activities over the past few years;
- Loss Given Default (LGD) - depends on the level of collateral under the loan agreement, the availability of guarantees, the use of credit derivatives, and so on.

In this case, it is necessary to take into account the probability of higher costs for the implementation of collateral (in the event of bankruptcy of the borrower), as well as a decrease in the market value of collateral;

- The amount of the bank's claims to the borrower under an active transaction (Exposure at default - EAD) - it must be taken into account that various banking operations (various types of loans) are accompanied by different risk levels. Distinguish not only the absolute values of risk, but also the causes and factors that cause the risks inherent in each group of active operations (operations with states, banks, enterprises, with the population, project financing, etc.);
- maturity (M) - since the duration of the loan agreement directly affects the credit risk (long-term loans are more risky than short-term ones).

It should be noted that among the listed components of credit risk the main result is the indicator of the probability of default of the borrower (changes in the credit rating), for the definition of which in foreign banking practice the method of so-called matrixes of change rating (transition matrix) is used. Such matrixes are based on historical information about default defaults provided to borrowers with different credit ratings and allow them to assess the likelihood of a change in their credit standing over time (these matrix tables are also referred to as rating migration tables for borrowers). In general, the method for constructing matrix tables was widespread in the first place in the activities of international rating agencies, and now - and among many foreign commercial banks that use this method to assess the likelihood of a change in the quality of their loan portfolio in the future based on the current value of the rating of creditworthiness.

Also, with a further analysis of the credit rating, the definition of the time horizon (time horizon) during which the rating will be valid is important. The Basel Committee provides for the use of two types of time horizons. At the same time, credit ratings of leading international rating agencies are based on the "through the cycle" principle, which takes into account the worst credit ratings that are relevant to the depression phase and do not experience significant fluctuations over time. By the time most foreign banks count credit ratings with a less than perfect point-of-time

principle, in which credit ratings are subject to significant fluctuations in the course of changing the phases of the borrower's economic cycle. Accordingly, such credit ratings require an appropriate adjustment in the event of a change in the phase of the economic cycle, which entails an increase in the bank's expenses.

In general, the application of this approach to building credit ratings by banks alone requires either the classification of risks and the probability of default by banking institutions, together with supervisors for each type of asset (in the case of default, the size of potential losses, the degree of risk exposure is recorded and evaluated in the end by the Basel Committee - this approach is more acceptable to Ukrainian banks), or banks are given the opportunity to independently identify and regulate risks, provided their systems of assessment and Board deemed adequate risk management supervisors and system evaluation of the probability of default applies for a period of at least three years and takes into account the probability of bankruptcy of the borrower.

3.2 Development directions of the credit risk measurement and management system in JSC "RAIFFASEN BANK AVAL”

In the process of providing services in the direction of lending, JSC "RAIFFASEN BANK AVAL” face a number of problems.

First, inadequacy of rating assessments and their low informational transparency have led to a distortion of the real situation on the financial market. In particular, some foreign companies (AIG, Enron, Lehman Brothers, Parmalat, etc.) entered the state of default almost simultaneously with the assignment of their highest credit ratings. Reasons for low trust in the ratings published by domestic agencies, somewhat different: slow response to events; assumptions used in the methodology; competition between agencies; conflict of interest; bias and enthusiasm. Moreover, the methods of rating agencies are designed to determine the ratings of borrowers for a stable economic situation and usually do not take into account the impact of extreme events on their financial condition, which adversely affects the rating

assessment. It should also be taken into account the fact that the "quality of ratings" was affected by the "lateness of information" of rating agencies in comparison with the formation of the matrix of migration of internal ratings of borrowers, on the basis of which the level of risk for them and the loan portfolio of the bank as a whole are determined.

Secondly, the imperfection of the mechanism for the formation of reserves for covering losses on bank lending operations. This was manifested in the fact that banks did not form reserves to finance losses due to a significant increase in the volatility of prices in the financial and commodity markets. The latter did not allow supervisors and bank management to control the adequacy of the reserves needed to cover losses due to significant changes in the market conditions and prices in the financial and commodity markets. In addition, banks in the formation of reserves often understated their volume. This became possible due to the imperfection of the methodology for determining the expected losses on credit operations, which is based on the subjective professional judgment of credit risk managers, which depends on many factors: level of their professional training, management objectives and asymmetry of information provision on the level of bank credit risk, etc. The imperfection of the formation of reserves for the financing of losses under active operations turned out to be the failure to take into account the cyclical nature of the country's economic development, when, at its individual stages, a credit boom or credit expansion arises, which necessitates changes in the approaches to the redundancy.

Thirdly, the effectiveness of tools for assessing individual and portfolio credit risk of banks is low. In the context of individual credit risk, it appeared in the provision of consumer loans, often without collateral or with the provision of "non-market assets," determining the level of borrowers' creditworthiness according to the financial statements, on the basis of which it is impossible to predict potential losses that may arise in the future.

It should be emphasized that attention was not paid to the analysis of the correlation between default of different borrowers who received a loan in one bank,

resulting in improperly identifying potential losses on the loan portfolio of the bank. When calculating VaR (Value at Risk), credit risk did not take into account so-called "thick tails," that is, extraordinary bank losses that are rare, but the extent of their negative impact on the performance of banking activities are substantial and sometimes catastrophic. In this case, the banks did not form the capital they needed in the event of an extraordinary situation. The lack of a so-called "financial buffer" to cover such losses during the global financial crisis has often led to bankruptcy of banks.

Fourth, there is a lack of consistency between business strategy and risk management strategy, which leads to higher risks in general and lending in particular. In addition, the infrastructure of credit risk management (CRM) is imperfect, which manifests itself in the low status of the credit risk manager in making management decisions; Inoperability of organizational support, which is formed without taking into account the scale of lending activities of banks, the level and profile of their risks; fragmentation of information generating management reporting; formalities of the methodological provision of the credit risk management process, since it is oriented mainly to the fulfillment of the requirements of the supervisory bodies (banks often adhere to double standards - when deciding on the appropriateness of lending, they are often guided not by their own documents, but by the subjective opinion of the head).

In order to solve these problems it is expedient to change the vectors of credit risk management of JSC "RAIFFASEN BANK AVAL".

The first vector: the formation of a proactive CRM strategy of JSC "RAIFFASEN BANK AVAL". The term "proactivity" is widely used in various sciences. D. Newstrom and C. Davis define proactivity as a prediction of events, initiation of change, the desire to "keep in their hands" the fate of the organization and consider the availability of such qualities to be binding on top managers. A key element of the JSC "RAIFFASEN BANK AVAL" proactive credit risk management strategy is to determine its "appetite" for risks, which should include:

• limit level of credit risk;

• "appetite" of the bank to the volatility of income from credit operations;

• methodical approach to calculating "VaR" and "Stress-VaR" of credit risk;

• a clearly defined type and magnitude of risk, which is ready to accept every business line of the bank;

• zero tolerance to risk, namely the definition of risk categories that are not acceptable to the bank;

• a risk premium that should be taken into account in the process of calculating credit services;

• target ratio of profitability and risk in credit operations;

• priorities for providing credit resources;

• target loan portfolio parameters;

• the amount of economic capital to cover losses on credit risk;

• distribution of capital between business lines (lending to small and medium businesses, corporate business, individuals).

Given the "appetite" for credit risk, an appropriate matrix is developed that reflects its profile, as well as limits on individual risk lending positions (by type of currency, region, sector, type of borrower, etc.).

In addition, the strategy of proactive credit riskmanagement in the JSC "RAIFFASEN BANK AVAL" should provide:

• substantiation of the choice of the most probable scenarios for the development of events and the development of a loan business strategy for each of them, taking into account the bank's appetite for credit risk;

• forecasting the impact of possible changes in risk factors (in particular, regulatory requirements, customer needs, competitors' behavior) on lending activities of the bank, and, consequently, on the level of credit risk;

• the formation of a flexible organizational structure of the CRM service, which is capable of responding quickly to changes in the market situation, its needs, as well as modern technologies and tools for risk management;

• identification of key indicators of credit risk and the mechanism for establishing effective monitoring of compliance with them, the results of which are

adopted or planned to make managerial decisions that are able to prevent the event unfavorable for the bank events;

• definition of credit programs that are intended to be implemented by the bank in the developed market segments and those that it plans to master; branches in which the main clients work; types of clients (corporate, small and medium businesses, individuals, government agencies, commercial banks).

The second vector: to develop a culture of risk management in JSC "RAIFFASEN BANK AVAL" and to reconcile it with the general corporate culture of the bank, which is a prerequisite for building an effective risk management system in general and lending in particular. The culture of risk management can be characterized as the internal system of values adopted by the JSC "RAIFFASEN BANK AVAL", and the code of conduct, which is the basis for decision-making on risk management. The main element of an effective corporate culture of risk management, including credit, is the understanding of management and each employee of the bank's goals and how to achieve them.

According to the corporate culture of credit risk management of the JSC "RAIFFASEN BANK AVAL":

• the supervisory board regularly receives, discusses and takes note of information about the credit risks that the bank is exposed to; clearly defines the principles of tolerance to these risks, which are consistent with its goals and resources, as well as expectations of board members and other stakeholders;

• the board formulates the rules and procedures of risk management and brings them to the responsible employees of the JSC "RAIFFASEN BANK AVAL"; provides a high level of transparency of information on methods, tools and results of credit risk management that meets the needs of all stakeholders (supervisors, rating agencies, shareholders, counterparties, clients, bank employees); coordinates the tasks of credit risk management with the goals of different business directions;

• The management considers the quality of the CRM system as one of the competitive advantages of the JSC "RAIFFASEN BANK AVAL";

• senior management has the basics of CRM (credit risks management), understands its key issues and ways to solve them, and also bears personal responsibility for significant losses due to the occurrence of credit risks;

• CRM managers have high professional training and have the necessary powers when making managerial decisions in the process of credit risk management;

• delimitation of functions between the JSC "RAIFFASEN BANK AVAL" units, which perform identification, measurement, monitoring and proper acceptance and management of credit risks.

The third vector of CRM involves improving the infrastructure of credit risk management in JSC "RAIFFASEN BANK AVAL", including significant changes in organizational, methodological and information provision. Changing organizational support involves the creation of special units in the bank, whose functional responsibilities will include stress testing of credit risk, calculation of volatility of prices on mortgaged property, improvement of instruments for measuring and identifying credit risks, strengthening control of risk management at all stages of the life cycle of credit products .

For large banks with a significant share of problem loans, create a Credit Supervisory Board or Risk Committee with appropriate powers (for banks whose loan portfolio is within the marginal risk level). The Credit Council should determine the permissible (safe) level of these risks (tolerance to risk), reflecting the specifics of the lending business, the nature, scale, complexity of the bank's lending activities, risk profile, aggregate credit risk limit that is ready to be accepted by the bank in the context of the desired credit rating , local credit limits for business areas, etc.

Organizational support for credit risk management is recommended in the context of the selected organizational and functional structure of the JSC "RAIFFASEN BANK AVAL". Depending on the scale of the bank's activities, the list and volume of operations carried out by it, as well as the complexity of its organizational structure, models of building credit risk management with a greater or lesser degree of centralization can be applied.

In medium and small banks with a simpler structure it is expedient to use a model that involves the formation of a single risk management unit that manages all types of risks, including credit. In large and large banks with a complex organizational structure, it is appropriate to form a separate department for credit risk management (this may be a department, department or department). In banks with a ramified regional network, including abroad, a model is justified in which, at the central office level, separate units of credit risk management for corporate and retail business are created, which is conditioned by the specifics of their measurement, organization of management, monitoring and control .

Regardless of the model used, organizational management of credit risk management should help to resolve the conflict of interest between the bank's subdivisions (officials) at the level of which there are credit risks and those who are responsible for managing them. Clear distribution of responsibilities and functions of the bank's various departments related to risk assessment and acceptance (for example, development of methods and processes for assessing borrowers, determination of maximum limits for granting of loans, decision making on credit granting parameters); proper independent internal audit and compliance functions to confirm compliance with control mechanisms and legislative and regulatory requirements.

Significant role in the organizational support of risk management is played by the status of risk-manager. In order to provide a cross-cutting approach to risk management, it is necessary to expand the powers of the risk manager (manager of the risk management line), in particular, giving the right to veto decisions at the meetings of the Credit Committee.

Prior to the financial crisis, the risk management of part in maintaining the life cycle of credit products of JSC "RAIFFASEN BANK AVAL" was reduced mainly to the establishment of appropriate limits. A credit risk manager must become an active participant in this process, which will help minimize the bank's credit risk. In particular, when substantiating new credit products, the credit risk manager must calculate a risk premium with the controller, coordinate it with the "appetite" of each

business line of the JSC "RAIFFASEN BANK AVAL" at risk, and participate in determining their price. Therefore, in determining the value of a loan product, the bank will set the standard rate of risk tolerable in the form of a premium for the risk at the base rate of the loan. This is consistent with the current paradigm of assessing the success of credit risk management - both gaining profit and "absorbing" risks.

To improve efficiency, it is necessary to improve the methodological support of credit risk management in JSC "RAIFFASEN BANK AVAL", namely: to abandon the practice of "paper" CRM, when there is a prepared methodical provision that is not used in the bank's practical activities; introduce the practice of developing a methodological provision for credit risk management, which would track the degree of detail, adequate to the level and severity of its adoption, as well as the scale of lending activities of the bank. In order to ensure the updating of internal documents of the bank (strategies, policies, rules, procedures, regulations, methods of risk management), at least once a year, they should be evaluated on adequacy, taking into account significant changes in the market conditions in the financial market and the internal environment of the bank. According to the results of this assessment, the authorized body must make a reasonable management decision to make the necessary changes to the bank's internal documents that regulate the CRM process.

Due to the high volatility of the commodity and financial markets, there was a need to develop a methodology for assessing the value of mortgaged property on a loan, based on a conservative approach and consideration of mortgaged property as the main tool for protecting the interests of the JSC "RAIFFASEN BANK AVAL" in case of default of the borrower. This will involve a change in the methodological approach to assessing the financial stability of the borrower and his reputation for assessing the quality of collateral and the potential for its potential realization in 2-3 years from the date of the loan, which results in shifting the emphasis from the formation of quantitative estimates to expert judgments. The latter, in turn, will require a high level of competence of credit risk managers.

It is also appropriate for JSC "RAIFFASEN BANK AVAL" to improve the methodology for assessing credit risk, namely, in addition to the traditional VaR, to

make calculations for StressVaR. Traditional VaR is calculated on the basis of changes in the market during the 1-4 previous years: if during this period the low volatility of the markets is stated, then the credit VaR will be low.

VaR keeps the value low for a certain period of time and after the crisis began. In connection with these banks, it is recommended to develop a methodology for calculating Stress-VaR, which is based on determining the amount of losses from lending in the design of crisis situations on the market during the 250-day period. The advantage of the Stress-VaR method is that it provides a link between stress tests and models for assessing credit risks, interdependencies between different assets, taking into account extraordinary costs ("thick tails") and idiosyncratic risks (risks of changing / increasing the bank's sensitivity to exposure various factors).

In order to increase the effectiveness of the CRM`s information support, it is advisable to develop a system of managerial reporting of the JSC "RAIFFASEN BANK AVAL", which would provide the authorities with timely and reliable information about the level of bank risks and its business lines, compliance with this level of limit policy and "appetite" to risk, defined strategy for the purpose Immediate response (avoidance or minimization) of losses.

Management reporting should reflect the results of monitoring compliance with global and local risk limits. This information should be used for corrective measures, such as: reducing the level of risk accepted; reviewing JSC "RAIFFASEN BANK AVAL" strategy regarding the permissible (safe) level of risk; reducing the "appetite" of the business line to risk; Increase of capital to cover unexpected losses on credit risk; preventing the accumulation of losses to a critical level (loss-making positions are subject to immediate closure as soon as the limit is exhausted).

In the conditions of high volatility of prices in the financial and commodity markets there is an objective need for the establishment of appropriate management reporting. In this regard, it is appropriate to initiate forms of managerial reporting that would reflect:

• the dynamics of the volatility factor of the industries in which the key VIP-clients (borrowers) work and the prices of their mortgaged property; discount rates,

weighted value of the collateral object; the ratio of the amount of collateral and the amount of the loan granted;

• compliance with various credit limits;

• the effect of "fat tails" on the probability of a default of borrowers, the frequency of which significantly increases during periods of high volatility ("tail thickness" depends on the frequency of trend change: the more variable data trend, the greater the "tail thickness", and vice versa).

Tracking the volatility of the market, industry, income and collateral for customer loans, etc., is an important information source for making managerial decisions regarding:

• determination of the optimal ratio between the amount of collateral and the amount of the loan granted to the borrower;

• establishing the size of credit limits or the prohibition on lending to certain sectors of the economy, the categories of customers and (or) the definition of the time horizon in the form of a limitation of the term of the loan and payment schedules;

• forecasting the amount of profit, which is substantially affected by the change in the amount of provisions to cover potential losses due to credit risk due to increased volatility of prices on financial and commodity markets.

On the basis of managerial reporting, a credit risk manager should analyze potential losses on the JSC "RAIFFASEN BANK AVAL" business lines, which are determined using risk measurement methods like VaR or EaR (Earnings at Risk). This information can be used to plan capital requirements to cover unexpected losses on credit risk, as well as to establish limits for credit risk.

The fourth vector of CRM development is aimed at building a multi-level system of credit risk limits for the JSC "RAIFFASEN BANK AVAL". It is expedient to formulate a system of limits in the form of a multi-level structure, which, besides traditional (limits of individual and portfolio credit risks, limits of authority for making management decisions), should also include a general limit, based on the "appetite" of the bank to the credit risk defined in the strategy, the limits for capital to cover credit risk, sensitivity limits.

The most important and most controversial issue is the transformation of the JSC "RAIFFASEN BANK AVAL" "appetite" to credit risk into a system of limits that is comprehensive and understandable as well as practical. To solve this problem, banks need to determine the amount of economic capital required for risk taking and (or) counteraction, as well as credit limits on capital both in general for the bank and for its business lines.

In today's conditions there is an objective need to establish limits of sensitivity, which is due to the high volatility of the value of collateral for loans and debt securities in the bank's portfolio. Sensitivity limit is an indicator that reflects the magnitude of the absolute change in the value of a collateral or debt securities of a bank under the influence of risk factors on a given value.

Within the limits of the system it is recommended to distinguish the hard and soft limits. Tough limits should include absolute limits that can not be exceeded under any circumstances. On soft limits within the limits of the established "threshold of materiality" it is allowed to temporarily exceed them, indicating the period during which this permit is valid. At the same time, it is necessary to record in the internal documents of the bank the list of circumstances in which temporary excess of soft credit risk limits of the bank is possible.

The fifth vector of CRM development involves changing approaches to creating reserves to compensate for potential losses in case of realization of credit risks. To this end, it is recommended that the JSC "RAIFFASEN BANK AVAL" is created along with the static reserves provided for by the current legislation of Ukraine, as well as dynamic reserves as an instrument of counter-cyclical regulation of banking activities. In the course of the credit boom, banks have to make deductions to such reserves, and during the reduction of credit offers use them.

The total amount of static and dynamic reserves should remain at the same level. During the active lending activity of the bank, dynamic reserves are increasing, while standard ones are decreasing. In times of crisis, on the contrary, standard reserves increase due to the accumulation of overdue debts, while dynamic ones are spent.

Dynamic redundancy is designed to: "amortise" credit shocks; to perform a buffer function that holds out cyclic oscillations; to promote strengthening of financial stability and reliability of banks in case of a sharp deceleration of the lending process in the event of a change in the financial market situation and outflow of capital; to restrain the financial dollarization of the market through the introduction of increased requirements for the formation of provisions for loans in foreign currencies.

The sixth vector of CRM development aims to change the approaches to external and internal ratings of borrowers, which involves revision of internal scoring models and rating systems of corporate borrowers and strengthening control over external ratings. Banking risk management should pay more attention to the algorithm of calculating external ratings and establish procedures for checking them for adequacy. Internal ratings should be constructed taking into account the specifics of the industry in which the borrower works, the nature of its activities and types of collateral.

3.3 Stress simulation as a perspective tool for evaluating promising credit risks

Today, stress testing in banks is a universally recognized component of the risk management system whose purpose is to assess the various risks and determine the ability of banks or the banking system to withstand the shock of the financial market in general. Given the special urgency for domestic banks of the risk of non-repayment of loans, the use of stress-testing of credit risk and the choice of the most optimal method of its use becomes important.

Stress testing of credit risk is a reliable assessment of the sensitivity of the bank's portfolios (credit, securities, receivables and off-balance sheet commitments) to the impact of various extreme events that are considered to be exceptional, but hypothetically possible. In the general definition, STCR combines a group of

methods for assessing the impact on banks' lending activity of adverse events, which are defined as exceptional but possible.

The purpose of the stress test of credit risk for an individual bank should be to provide perspective estimates of its credit risk level and to develop recommendations for its reduction, to estimate the range of losses and losses of capital, to adopt measures for adequate response in the case of unexpected events in the situation of stress. The purpose of the STCS of the banking system is to assess the vulnerability of the banking sector in particular and the country's economic situation as a whole to the volatility of the global situation and a significant increase in the level of credit risk.

Scientists N. Verhushha and L. Priddun determine some features of the use of stress tests for credit risk in banks [12].

First, because the credit risk is specific and can not be related to the change of only one parameter, it is expedient to apply multi-factor models of stress testing to study the influence of multi-factor factors. Secondly, it is necessary to clearly distinguish the risk of a single borrower and the risk of a loan portfolio. If for qualitative evaluation it is possible to use conclusions of credit specialists in assessing the borrower's creditworthiness, then for a quantitative one it is necessary to apply a certain model that would allow to determine the probability of default of the borrower. In this case, I. Andreevskaya recommends that in the assessment of credit risk, have an appropriate rating system of the borrowers of the bank, which reflects the probability of their default. The Bank can use both external ratings (eg Standard & Poors) and its internal ratings. Depending on the rating of the borrower, the bank assigns to each of them an appropriate indicator of the probability of losses.

For the most part, the following formula is used to assess credit risk losses:

$$Credit\ risk\ losses = Credit\ amount - Probability\ of\ defolt * defolt\ losses \quad (3.1)$$

As a stress test you can consider, for example, a change in loss or a level of default. In addition, you can use the so-called matrix of the transition, which consists

of the probability of changing the borrower's credit rating over a certain period of time. Such a matrix is made for various stress situations and, accordingly, it overestimates the portfolio.

Thirdly, when managing portfolio credit risk, the correlation between risk factors should be taken into account. Therefore, the loan portfolio should be quite diversified. However, the most negative consequences of stressful events are that the correlation that prevails under normal conditions is changing, and risk managers face new correlations, which leads to unpredictable risk concentration.

The researchers also note that a significant amount of historical data for a significant number of years is required to accurately assess the possibility of default in the event of a credit risk. However, this is problematic in Ukraine.

The last feature of STCR is determined by the international practice of using the hedging of loan portfolios to reduce risk. However, in our country, this tool may not work in stressful situations, since most domestic banks' loan instruments are not sold on the market, and therefore there is no information on the price of a particular instrument, which makes modeling of credit risk virtually impossible.

Examples of stress scenarios may include lowering GDP growth, falling stock prices and real estate prices, deteriorating conditions for large borrowers, and significant shifts in all components of risk. It is important that the stress scenario is based on the characteristics of loan portfolios, such as the sector or size of the borrower's operations.

There are various stress tests that are used to assess and analyze risks, including lending, at the level of an individual bank and within the entire banking system (Figure 3.1).

Stress tests that banks use to analyze the vulnerability of their own loan portfolios can be divided into two large groups - one-way and multi-factor.

Single-factor stress tests, or sensitivity analysis, consider the change in the impact of one of the risk factors on the value of the loan portfolio. At the same time, all other risk factors are considered constant, or constants, that is, it is assumed that they are unchanged in time. This is the simplest form of the scenario approach, which

is based on a simple econometric model with one dependent variable. Such a method is often used by Norwegian banks, for example, in analyzing the changes in the value of bank losses from lending to households. The practice of using the sensitivity analysis has accumulated by banks, however, it should be noted that it is applied along with other methods much less often. Another situation in the Belarusian banks, surveys of which show that almost 92% of banks successfully use the analysis of credit risk sensitivity.

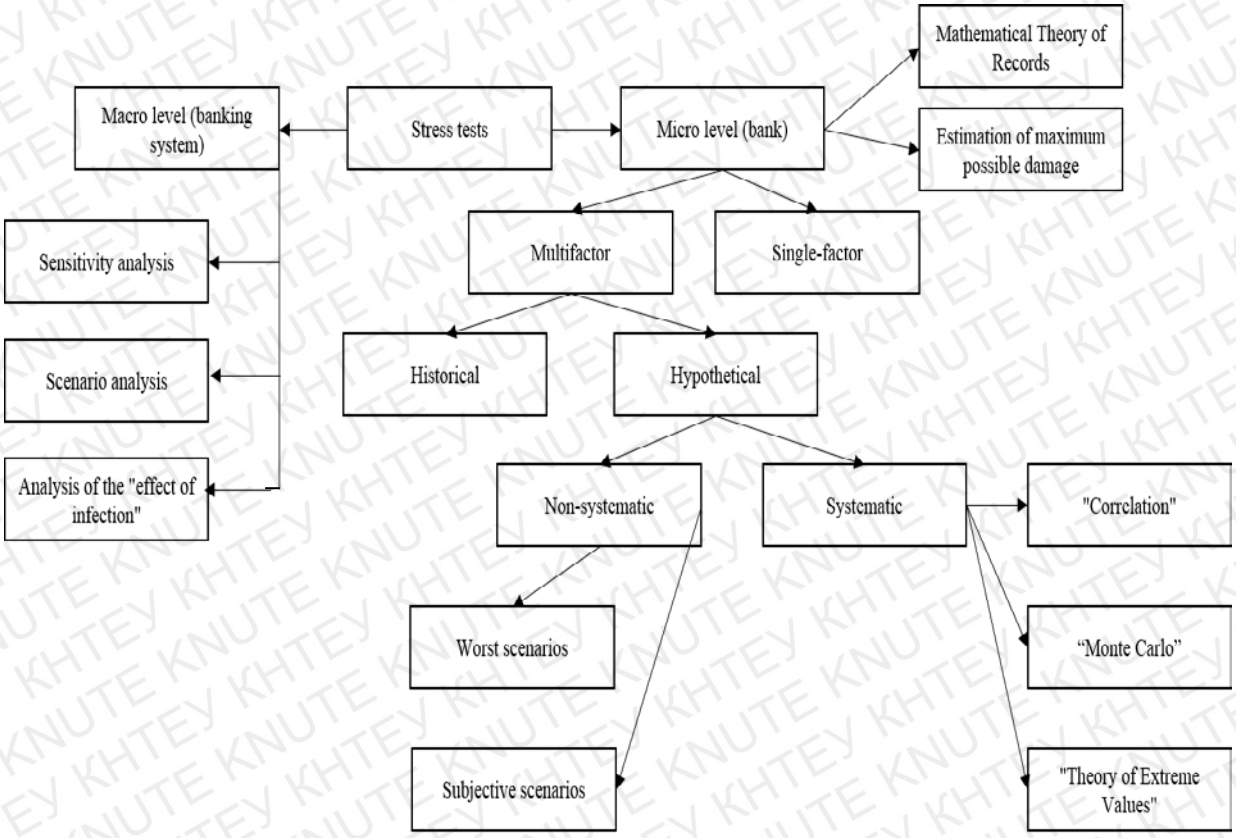

Fig. 3.1 Instruments for stress testing [22]

In order to ensure the correctness of the results of stress-testing of credit risk, one should take into account the simultaneous change of all risk factors. To do this, use multi-factor stress tests or scenario analysis. Scenario analysis is widely used by the majority of Russian, Belarusian and Ukrainian banks.

There are several types of multifactor stress tests: historical; hypothetical - unsystematic, systematic.

The most common stress tests are based on historical scenarios. Such scenarios analyze the risk factors that have already taken place in the past. Examples of extreme shifts in the global market are the fall of the stock market in 1987 and the high-yielding market in 1990, the crisis of European currencies in 1992, the rise in the interest rate in the United States in 1994, the Asian crisis in 1997, the crisis in Russia in 1998 p., crisis of LTCM 1998, Brazilian crisis of 1999 Considering the domestic financial system, it should be noted events such as hyperinflation in 1993, the devaluation of the hryvnia in 1998, the devaluation of the hryvnia in 2008, the decline in the growth of real GDP in 2009 p, growth of the share of reserves for credit risks in 2010 and so on.

Given the cyclical nature of the economy, historical scenarios today are successfully used by such large European banks as Credit Suisse, Societe Generale, Commerzbank, Deutsche Bank.

Hypothetical scenarios are used when the historical ones do not correspond to the characteristics of the loan portfolio and do not take into account the risk factors mentioned in stress testing models. Such stress tests cover all possible events for which the loan portfolio of the bank is vulnerable. More than half of Russian banks use the practice of STCR based on hypothetical scenarios.

Non-systematic hypothetical scenarios, in turn, also have several types. They can be built on the worst and subjective scenarios. Worst case scenarios for stress tests are based on the fact that the most important values of risk factors are selected and based on a revaluation of the loan portfolio. According to the survey, all the Belarusian banks that use the scenario analysis have the following method of stress testing.

Stress tests, based on which are subjective scenarios, take into account expert judgments, as a rule, bank managers, for changing the scale of risk factors. One of the most difficult questions during conducting of stress testing is the determination of how some risk factors should change in case of certain changes of others. There are different views on the correlation between risk factors. For example, some scholars believe that in extreme events, the correlation between factors remains the same as in

normal conditions. That is, the correct situation when several risk factors are subjected to stress testing, while others vary according to historical correlations (under normal conditions). Others note that in crisis correlations are changing, so the use of their historical values is incorrect. A method is proposed, which is to estimate correlations in the period of high oscillations and to use these correlations during stress testing.

The systematic hypothetical scenarios can be based on the Monte Carlo method, which allows you to simulate the complex behavior of the banking system.

Also singled out is the theory of extreme values, where, within a certain historical period of time, the distribution of the values of risk factors is considered. Then, based on this distribution, the value Var (Value at risk) is calculated. When using the normal distribution of probability of stress events are often underestimated. This can be avoided if you build a distribution of directly extreme values.

In addition to the main groups of stress tests, there are two more methodical approaches to stress testing of bank risks. The first one is the deepest estimate of the maximum loss approach. This is one of the types of stress tests, the feature of which is the search for a script, which leads to the most probable and maximum losses. With the use of this method, the search can be made either by using the expert method or by statistical simulation.

Unlike Var, which is based on a certain historical period and trust level, the approach to the maximum possible damage has a higher level of freedom, the so-called trust region, which includes a set of risk factors with a given probability. Thus, the maximum possible losses are selected when the worst situation occurs within the "trust region". Almost half of Russian banks, according to the results of the poll conducted by the Central Bank of Russia, have successfully used this approach.

The second approach is a statistical evaluation using the use of models based on the mathematical theory of records (extreme value theory, - EVT). In its essence, the mathematical theory of records allows us to predict the bank's activities in case of possible occurrence of certain events. This stress test tool is often used by American banks, in particular Bank of America and Bank of New York.

Stress testing at the macro level or aggregated stress testing, as a rule, is divided into three types: sensitivity analysis; script analysis; analysis of the "effect of infection". Simple regression models of sensitivity analysis are single-factor stress tests, and the scenario analysis indicated is multifactorial stress tests described above. In fact, at macro and micro levels, stress testing methods for risk, including credit, are the same, but vary only a set of factors of influence, time horizon, information base, etc., depending on the testing of a separate bank portfolio or the entire banking system.

Scenario analysis with aggregate STCW is the most common, it is used by banks in the USA, Canada, the leading EU countries, as well as Poland, Belarus, Russia, Kazakhstan, Ukraine, etc.

The sensitivity analysis, on the contrary, has become less used, but is successfully used in the stress test of credit risk of banking systems in Switzerland, Italy, Germany, Austria, the Czech Republic, and others. The practice of analyzing the sensitivity of the banking system to credit risk is also applied by the National Bank of Ukraine.

It is appropriate to consider the technique of "infection effect". Its feature is that bankruptcy scenarios of different banks are considered - from the largest to the smallest (depending on the sample size). Each scenario analyzes whether a tier one capital is sufficient to cover its possible losses. Depending on the proportion of repayment of issued loans, calculations are made, or "pulling" the bankruptcy of the largest bank of other banks and what will be the percentage of losses from general banking assets.

An analysis of the "infection effect" is widely used in the United States. As an example, back in 1998, the sample included 719 banks, accounting for 70% of the entire banking system of the country. The share of repayment of issued loans was set by the expert method at the level of 60 and 95%. Four bankruptcy scenarios were analyzed:

1) the largest bank (in this case, its debt to other banks is also the largest);

2) the second largest bank debt;

3) the tenth largest bank debt;

4) the first two banks of the sample.

As a result of such stress testing of the credit risk of the US banking system, it has been established that bankruptcy of the largest bank at a return share of 60% will provoke bankruptcy from 2 to 6 banks of the system, and losses make up 0.8% of banking assets. If the share is 95%, then there will be no "infection effect".

In addition, it is estimated that, in the worst case scenario, losses will not exceed 1% of all banking assets.

The method of "infection" is successfully used in post-soviet countries as well. In particular, in Belarus, when analyzing reports on financial stability, it was found that the analysis of the "effect of infection" ranks second after a screening analysis of the breadth of use.

The questions of the advantages and disadvantages of the main methods of stress testing of risks, including credit, today remains controversial. In fact, both single- and multi-factor models of stress tests justify their purpose and, despite criticism from one side or another, continue to be refined and applied by banks from different countries of the world.

The main advantage of single-factor stress tests (or sensitivity analyzes) is their simplicity and ease of use. In addition, the construction of simple regressions is not costly. However, such stress tests are inferior to multifactorial ones, since the latter allow for more accurate testing results through "games" to change a huge number of factors.

The advantage of historical scenarios (the most common among multi-factor models) is the availability of reliable information about similar stressful situations in the past, as well as the ability to choose arbitrary time horizons. However, the most significant drawback of historical scenarios is the lack of opportunity to take into account changes in the characteristics of the market (that is, its market conditions) and institutional structures.

Given the inconsistency of historical scenarios with the main characteristics and conditions of the modern market, hypothetical scenarios that more accurately and

fully predict probable stressful events are becoming widespread. Hypothetical scenarios are used in two directions - both systematic and non-systematic. The worst unsystematic scenarios, despite their simplicity in distinguishing the investigated risk factors, still do not take into account correlations between them, which makes the results of stress-testing incorrect. Subjective non-systematic scenarios are also quite affordable, however, they are initially dependent on expert opinions that may distort the results of a stress test.

Among the systematic scenarios, the Monte Carlo method occupies the forefront. Its main advantage is the ability to simulate complex behavior of markets, for example, in the case of a correlation variable between risk factors. However, the drawback is the complexity of the application, which requires a "heavy" mathematical apparatus. Perhaps this explains the unpopularity of the method in Russia, Belarus, as well as in domestic practice. Currently, methods for estimating the maximum possible damage and the mathematical theory of records, which allow more accurately predict stress events and determine the magnitude of losses from them, are widespread.

For Ukrainian banks at the present stage of development, which is accompanied by a highly volatile political and economic situation, it is important to apply the methods of STCR, which allow the most accurate estimation of possible losses. Thus, one should not rely on single-factor stress tests, the advantage is advisable to give hypothetical scenarios, with what in all its varieties.

Today, Ukrainian banks were in a difficult position. Firstly, the devaluation of the national currency, which significantly shaken the liquidity and solvency of banks, and secondly, the outflow of funds from deposits and a decrease in the volume of the loan portfolio and, consequently, a reduction in its share in banking assets, caused by panic among the population after the recent political events. All this demands from Ukrainian banks the construction of an emergency response system, since the state of the domestic market is extremely volatile. In such a situation, using the worst scenarios under STCR will allow domestic banks to identify the most vulnerable

places of credit activity and assess loss of a loan portfolio in the event of extreme events, which is quite relevant today.

Subjective scenarios also take place, however, highly skilled specialists from Ukrainian banks are in need. However, today many domestic banks solve the problem of reducing costs by reducing jobs. In addition, the percentage of highly qualified economists in small banks in terms of assets is so low in comparison with the large systemic banks of Ukraine. Therefore, relying on expert judgment in this case will, as a rule, be the largest and largest banks that are able to engage in the process of restructuring the managers of the higher and middle management units, as well as to make its proper financing. The complexity of the mathematical apparatus of systematic hypothetical scenarios impedes the use of this method in the practice of domestic banks. The Monte Carlo method can only be afforded by banks that have highly qualified specialists and appropriate software and analytical support.

In general, Ukrainian banks should practice the use of as many methods of stress-testing as credit risk, which will be able to outline its limits - the minimum and maximum values under different scenarios, and choose the most appropriate method for each of them, which is both easy to apply and ensures the correctness of the results obtained.

3.4 Calculation of economic capital based on a reasonable credit risk measurement

Modern banking practice of applying the concept of using the indicator of economic capital involves the application of various methods and approaches to calculating its value. However, the calculation of the bank's economic capital by different methods makes it difficult to compare the degree of riskiness of banking institutions and often leads to a deviation of the actual calculated general risk level of the bank from its real value. In addition, based on the Bank's economic capital indicator, the process of determining the needs of the bank in equity is complicated,

which may lead to an imbalance in its structure and adversely affect the efficiency of using the equity capital of the bank (reducing the return on equity).

In domestic and foreign scientific literature it is recommended to use common requirements for calculating the indicator of economic capital, which would provide a reasonable basis for assessing the level of risk of the bank as a whole. In particular, when measuring the size of the bank's economic capital it is necessary to take into account the credit, market and operational risks of banking institutions. The composition of economic capital can also be attributed to other types of risks recognized by the bank, but the method of their calculation should be the same (using a homogeneous mathematical and statistical apparatus, the use of probabilistic methods of measurement and evaluation for all types of risk, etc.), while ensuring the possibility of comparisons between certain groups of risks.

In our study, we reviewed the methodology for determining the bank's economic capital based on the credit, market and operational risks of banking institutions, presented in the form of the following model (Figure 3.2).

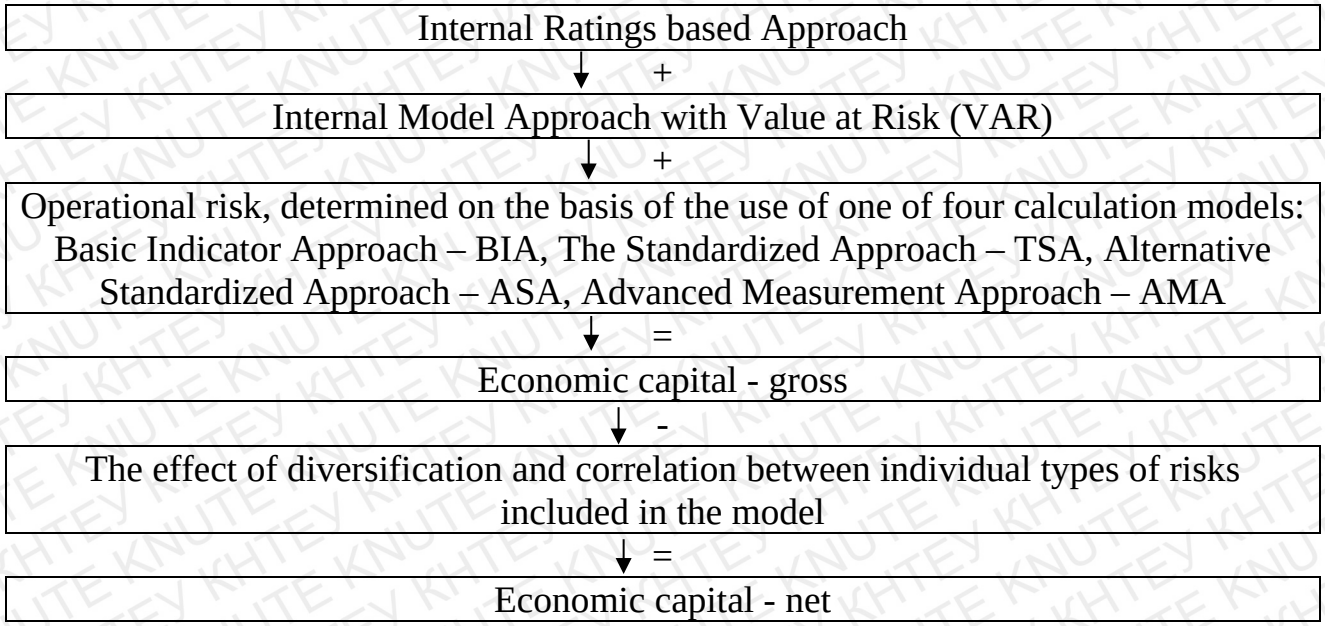

Fig. 3.2. Methodology for studying the bank's economic capital, based on possible risks [50]

The calculated economic capital, using the above methodology, is further compared with the available financial resources of the bank. If the bank's economic

capital exceeds the actual capital, there is insufficient capitalization of the bank, which indicates the risky activity of this financial institution. In the opposite situation, the bank has an excess of capital, and therefore, in order to increase the profitability of equity capital, it is necessary to decide on its reduction or to assume additional risks.

An important role in the calculation of the bank's economic capital is given to establishing the relationship between the magnitude of its level and the probable losses of the bank. The dependence of the size of the economic capital on the probable losses of the bank is presented in Fig. 3.3.

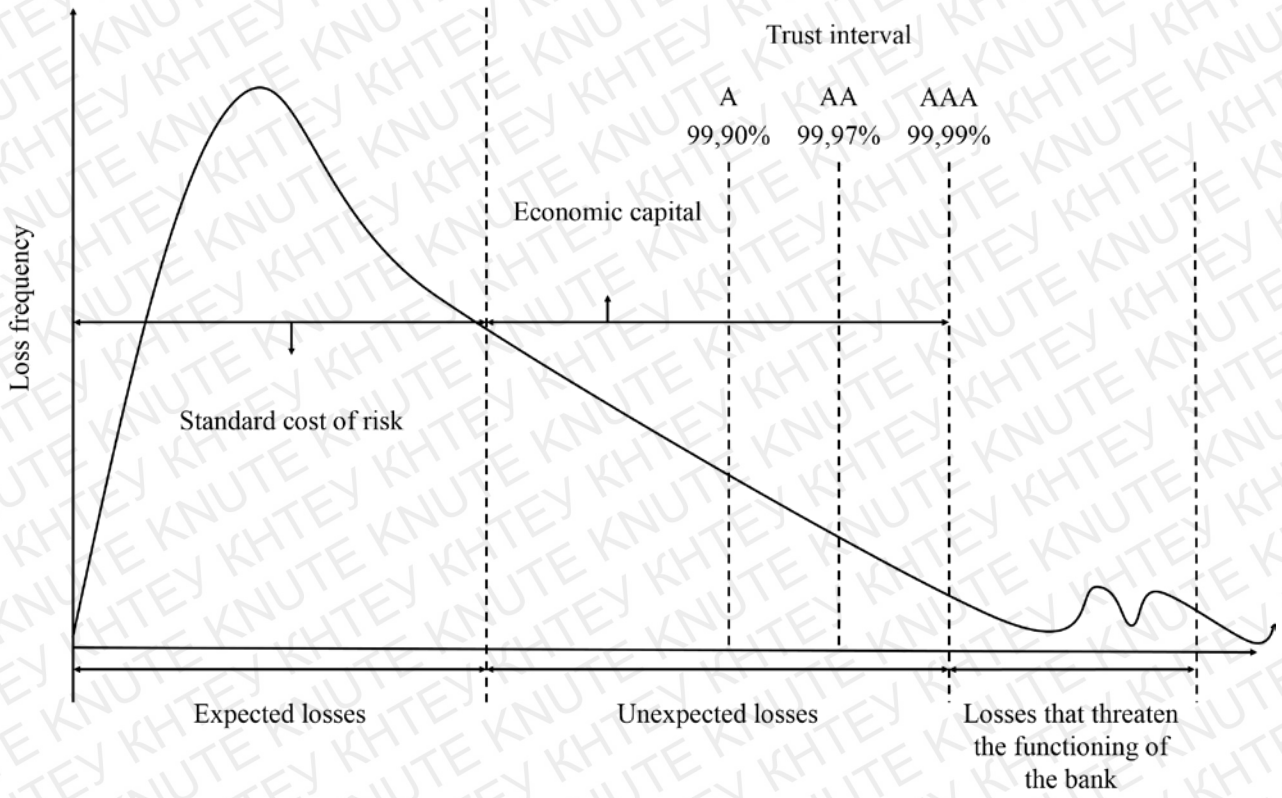

Fig. 3.3. Dependence of the size of economic capital on probable losses of the bank [12]

As can be seen from the chart above, expected losses are a standard risk assessment for the bank, that is, they are offset by the corresponding reserves or directly from the profit that was not distributed. Unexpected losses for the bank are offset by the bank's economic capital, and the higher the rating of the banking institution, the less probability of unforeseen losses. Losses that threaten the

functioning of the bank can not be compensated at the expense of the bank's economic capital, since holding capital to cover losses characterized by a low incidence rate is unprofitable for the bank. The dependence of the bank's rating on the interval of trust is given in the table. 3.3.

From tabl. 3.3 it is clear that the higher the bank's rating, the lower the probability of default, and therefore the financial institution of this type either fully covers all the risks incurred by the capital, or conducts a moderate policy of banking, avoiding unnecessary risks and satisfied with low profitability.

Consider the approaches to calculating the economic capital separately for each type of risk, which were reflected in the model of calculation of economic capital, which we have already mentioned previously.

Table 3.3

Dependence of the rating of the banking institution on the confidence interval

Indicator	Rating AA/Aa	Rating A/A	Rating BBB/Baa
Level of risk coverage (the probability that capital and margin will cover potential losses)	99,95 %	99,90 %	99,75 %
Default probability (approximate)	1/2000	1/1000	1/ 400

Made by the author by [50]

Calculates the size of the economic capital for credit risk under the new Basel Capital Adjustment (BASEL II) model based on the Internal Ratings-Based Approach. According to this approach, the bank builds its own system of internal credit rating, which envisages assigning counterparties to the bank of the appropriate rating depending on their level of creditworthiness.

When assigning a counterparty to a relevant rating, it is imperative to take into account such parameters of credit risk, namely:

- probability of default (PD);
- exposure at risk (estimated value of the counterparty's debt at the time of the probable default of Exposure at Default - EXD);

- the average expected loss in the event of default (Loss Given Default - LGD);
- time horizon of risk (maturity of debt, which usually coincides with the maturity of the loan Maturity - M).

Assigning a credit rating, you must also take into account the cost of security assumed by the bank at the time of the conclusion of the loan agreement, which will significantly affect the level of creditworthiness of the borrower of the bank. The valuation of the security should be periodically dependent on its type, since such a kind of collateral that is material in nature (machines, buildings, structures, equipment, goods in circulation, etc.) is characterized by a different degree of physical and moral depreciation, which leads to a decrease in the value of the bank's collateral, and consequently, leads to a decrease in the level of creditworthiness of a counteragent and a decrease in its respective rating.

The greatest difficulty in determining the bank's economic capital under a credit risk using the above-mentioned parameters for assessing the borrower's creditworthiness is the probability of default (PD), which creates a problem associated with the availability and reliability of the relevant data. This is conditioned, first of all, by the individuality of the system of assessing the creditworthiness of a particular bank, which is characterized by varying degrees of complexity, as well as the presence of various types of limits limiting the amount of borrowed funds provided to the borrower. However, a bank that has a simple counterparty rating system can use data from leading global rating agencies (Fitch, Standard & Poor's, and Moody's) that determine the rating of various types of financial institutions. At the same time, the bank for calculating the default index bases the probability of non-payment of the debt on the scale of the external rating, additionally taking into account its own assessment of financial indicators (liquidity, profitability, stability) and qualitative indicators (level of management, market position, position of the given company, etc.) according to its model.

In the calculation of the size of economic capital under market risk, an approach based on internal models (Internal Model Approach) is used. The essence of

this approach is to determine the maximum level of losses on a portfolio of the bank during a certain time interval and at a given level of probability (calculation of the indicator of "value at risk" - VAR). The VAR indicator reflects the maximum level of losses that a bank can incur when investing in a certain set of homogeneous assets formed by the characteristics that constitute a portfolio of the bank in the event of an unfavorable situation in the financial services market. Particular attention when calculating the VAR is given to distinguishing the risk factors that reflect the risk profile of a bank's portfolio of homogeneous assets and illustrate its real value. These risk factors are input parameters for constructing a model and assessing the risks that may accompany a portfolio of the bank.

Western practice of banking business involves getting calculated risk factors from leading world companies. Thus, in particular, Risk Metrics Group (formerly a division of J.P. Morgan Corporation) provides its clients with daily options for assessing risk factors in financial markets of different countries. For Russian banks, Price Waterhouse Coopers has developed a methodology for assessing market risks and a set of sustained risk factors that cover all the most important classes of securities.

Measuring the level of operational risk of banking institutions based on the application of the concept of the calculation of economic capital is carried out using such models: the model based on the Basic Indicator (BIA), the Standardized Approach (TSA) model, the model based on the alternative standardized method (Alternative Standardized Approach (ASA) and Advanced Measurement Approaches (AMA).

The base-case model (BIA) involves calculating economic capital under operational risk using the formula:

$$\text{ORC} = \frac{\sum_{i-1}^{3} \text{GI}_i}{n} * \alpha \quad (3.2),$$

where ORC (operational risk capital) is the size of the economic capital under operational risk; GIi (gross income) - the gross income of the bank for the i-th year,

calculated as the sum of net interest and net non-interest income. Gross income does not decrease on the amount of reserves formed by the bank for active operations and operating expenses related to the bank's activities (including payment for outsourcing). Gross income does not include the financial result of operations with securities and the result of one-time operations of the bank, as well as income received in the form of insurance indemnity; α - capital reserve ratio = 15% (set by the Basel Committee); n = 3 - the last three years during which the bank received a positive value of gross income.

This model implies a direct dependence of the level of operational risk on the scale of the bank's activities. It does not take into account the internal procedures for controlling the size of operational risk and the degree of its threat to different areas of banking business. It is recommended to use it in small banks specializing in carrying out separate operations (mortgage banks, banks engaged in leasing operations, factoring, forfaiting, etc.).

The application of the Standardized Approach Model (TSA) is based on the division of all of the Bank's activities into eight business lines (business lines) for which the respective weighting is set. Calculate the economic capital of the bank under the operational risk for this model by the formula:

$$\text{ORC} = \frac{\{\sum_{j=1}^{3} \max[(\sum_{i=1}^{8} \beta * GI_i^t), 0]\}}{3} \quad (3.3)$$

where GIit - gross income in the i-th business line in (t) year (may be negative); βi is the weighting factor of capital reserve for standard business lines (established by the Basel Committee). The list of business lines, in which the division of all activities of banking institutions is carried out and the corresponding weighting factor of capital reserve, is given in the table. 3.4.

This model for calculating economic capital gives a better result, since it reflects the objective level of operational risk faced by a banking institution, taking into account the specifics of conducting banking operations.

Table 3.4

The business lines of the banks and the weighting of the capital reserve are regulated by the Basel Committee on Banking Supervision

№	The name of the business line	β coef., %
1	Loans and other corporate finance	18
2	transactions with securities in the trading portfolio of the Bank Trading and sales	18
3	Retail banking operations	12
4	Agency services and custody	15
5	Payment and settlement	18
6	Asset management	12
7	Retail brokerage	12
8	Commercial banking	15

Made by the author by [50]

The method for calculating the size of economic capital under operational risk based on the Alternative Standardized Approach (ASA) model is the same as the methodology for applying the TSA model. The difference between them is to calculate the size of economic capital for two lines of the business line of the bank, namely: retail banking operations and commercial banking operations. For these activities, the total amount of loans issued by the bank (gross loans) is taken as the basis for calculating the size of the economic capital, averaged over the past three years, multiplied by the coefficient β (determined for this type of business line) and multiplied by an additional coefficient m = 0.035 (m-const). The formulas for calculating the level of economic capital for each of the business lines listed below are:

$$ORC_1 = \beta_1 * LA_1 * m \quad (3.4)$$

$$ORC_2 = \beta_2 * LA_2 * m \quad (3.5)$$

where ORC1 (operational risk capital) is the size of the economic capital under operational risk for the "retail banking operations"; ORC2 (operational risk capital) -

the size of economic capital under operational risk for the direction of "commercial banking operations"; LA1, LA2 - the total amount of loans issued, averaged over the past three years for each line of business line; β1, β2 - the corresponding capital stock ratios (12% and 15% set by the Basel Committee); m - const set the corresponding coefficient (0.035).

The general formula for calculating economic capital based on the ASA model has the form:

$$ORC = \frac{\{\sum_{j=1}^{3} \max[(\sum_{i=1}^{8} \beta * GI_i^t), 0]\}}{3} + ORC_1 + ORC_2 \quad (3.6)$$

In the ASA methodology, the total amount of loans issued under the "retail banking operations" consists of loans issued directly to individuals and small and medium-sized enterprises, as well as retail receivables purchased. The loans issued under the "commercial banking operations" include: the amount of loans issued to legal entities, banks, other financial and credit institutions of the non-banking sector of the financial market, purchased corporate receivables and book value of securities in the bank's portfolio until repayment.

The model for calculating the size of the economic capital of ASA gives an opportunity to more accurately estimate the value of operational risk within each business line of the bank. However, this model does not take into account the possible distribution of losses as a result of the implementation of various operational risks, while reflecting the degree of control of the bank for these same risks.

The use of the model for economic capital based on Advanced Measurement Approaches (AMA) involves the use of mathematical, statistical and probabilistic methods for assessing and measuring operational risk using a set of parameters:

• Exposure Indicators (EI): It is characterized by the average amount of losses that the bank is willing to incur in the event of a risk event. As such, banks can use the gross income indicator;

• Likelihood of occurrence of a risk event, resulting in the Bank having incurred operational losses (Probability of Event - PE): can be calculated as the ratio

of the number of cases with established losses to the total number of transactions conducted by the bank;

• Loss Given Event (LGE): can be calculated as the ratio between loss volume and transaction volume in value equivalents;

• Correction factor (unpredictable loss factor - γ): determined on the basis of internal statistics on bank losses and bank lending data within the entire banking system.

The above parameters are calculated in certain areas of the bank (business lines) and for a certain type of operational losses, established for each direction.

According to the Basel Committee on Banking Supervision, the division of operational losses is carried out within the seven categories of operational risk: internal fraud; external fraud; labor relations and labor safety; customers, products and practice of doing business; damage to assets; process management; system failures and errors. The formula for calculating economic capital using the AMA model has the form:

$$\mathrm{ORC} = \sum_{i=1}^{8}\sum_{j=7}^{7}\left(\mathrm{EI}_{i,j} * \mathrm{PE}_{i,j} * \mathrm{LGE}_{i,j} * \gamma_{i,j}\right) = \sum_{i=1}^{8}\sum_{j=7}^{7}\mathrm{EL}_{i,j} * \gamma_{i,j} \quad (3.7)$$

where EL, j is the expected loss amount for the i-th type of activity and j-type operational losses (average value for 1 year); i = 1, ..., 8 - business line of the bank (the business lines specified in the TSA and ASA models can be used); j = 1, ..., 7 - type of operational losses for each category of operational risk (regulated by the Basel Committee).

The above model of calculating the size of economic capital based on advanced approaches to assessing the level of operational risk requires a smaller amount of economic capital, which the Bank should hold to cover losses compared to other models. It involves the active use of banks' own approaches to the analysis of operational risks and more effective monitoring of losses incurred by the bank.

CONCLUSIONS

The bank, as an intermediary, is burdened with dual risk, since accumulation of other funds owned by legal and private entities places them at their own risk and risk, which may eventually lead to significant losses because of the probability that they will not be repaid by the borrower. Thus, the bank, on the one hand, runs the risk, together with the client who borrow to him his funds, and on the other hand, as a separate business entity, directing the property of someone else's money resources for temporary use. Thus, in the case of negative results of transactions and impossibility to fulfill their obligations to customers, there is a probability of loss of activity of all participants in monetary and credit relations, which, at the end, can lead to bank bankruptcy, and because of its special status in the economy - up to a number of bankruptcies of related companies, banks and individuals.

The essence of credit risk lies in the fact that the borrower may not return credit funds in violation of the terms of the loan agreement. In this case, the credit risk becomes realized. A situation in which a borrower is unable or unwilling to pay its debts in accordance with predefined conditions is called a default by the borrower. Such term is used in scientific and practical circles of economically developed countries.

The default risk (or credit risk) expresses uncertainty as to whether the counterparty will be able to service its debts and fulfill its obligations. The problem is that, until the very fact of default, it is impossible to clearly distinguish between firms that are defaulted and those that do not experience. The most we can do is to assess the likelihood of default by methods of probability theory. The assessment of the probability of default can help banks not only to calculate reserves at the request of the regulator, but also to more rationally determine the interest rate for a particular borrower, putting the risk of default in the spread.

The concept of external (external) and internal (internal) ratings was introduced by Basel II. External ratings are assigned by rating agencies (the most famous are Standard & Poor's, Moody's and Fitch Ratings). The greatest use of external ratings

has been in the United States and the United Kingdom. The reason for this is that in these countries a highly developed stock market. The main companies are public, so they can be analyzed by external agencies.

The Altman model relates to statistical models of credit risk assessment, since in the process of determining the probability of default, it requires the study of statistical data. Today, statistical models of credit risk assessment are the most used. This model implements the so-called F-IRB approach (base internal rating-based approach) under Basel II. That is, using banks of the Altman model can usually build their own empirical function of Altman to determine the probability of default of their borrowers. However, the methodology of this function must be agreed with the regulator. In addition, F-IRB banks should use regulator techniques to determine LGD.

Analyzing the quality of the bank's loan portfolio only during the first quarter of 2018, where the number of operating banks decreased by 14 units, we observe a rather unattractive picture, namely: the share of overdue debts in the total amount of loans as of 01.01.2018 has increased compared to the previous period, by 3,3 percentage points, and compared with 2016, credit indebtedness increased by almost 5%. Consequently, the amount of formed reserves for active banking operations is also constantly increasing, even though banks hide such information.

The essence of expert methods is to handle the judgments of experienced bankers regarding the probability of different values of losses or one or the other adverse (undesirable) event in the banking business. One of the obvious examples of credit risk assessment by expert methods is rating methods for assessing the borrower's creditworthiness, which are quite common in domestic banking practice.

According to the data, during the investigated period, there was a clear tendency to increase the volume of lending to JSC «RAIFFEISEN BANK AVAL». Thus, as of 2015, the volume of loans issued by the bank amounted to UAH 113 213 million, as of 2016 - UAH 133 604 million, as of 2017 - UAH 159 173 million.

Based on the SWOT analysis of the strengths and weaknesses of the bank's loan portfolio, the opportunities and threats posed by the management of the bank's

loan portfolio administration and the planned alternative development strategies of the bank, we propose the following measures to improve the management of the loan portfolio and reduce the bank's credit risk:

• Development and implementation of a flexible system for determining the terms of credit depending on the economic situation, the financial condition of the bank and the financial capabilities of the client and determining in it the key conditions that have a certain advantage over the terms of the main competitors;

• Determination of tougher requirements for the assessment of borrowers' creditworthiness based on the use of modern innovation and information technologies;

• Conducting an active informational and advertising campaign on the bank's website as well as in the media for confirming the good reputation of the bank and responding promptly to the publication of false or discredited information about JSC «RAIFFEISEN BANK AVAL», as well as to deepen the application of national-party motives in documentation, informational, advertising boletes, corporate colors of the bank;

• Development of a program of in-depth cooperation with reliable permanent clients of the bank, including in other areas of banking activity;

• Improving the process of using information technology not only to assess the creditworthiness of bank clients, but also monitoring the situation in the regions of the state and the world;

• Preparation of the forecast of the dynamics, structure, quality and risk profile of the loan portfolio, based on optimistic, realistic and pessimistic scenarios for changing the internal and external environment of the bank;

• Organization of work of a bank with problem borrowers using the proposed decision support system;

• Developing an algorithm of actions in the conditions of emerging crisis situations in safe and stable regions and familiarizing them with the Bank's staff within the framework of training of employees of the financial structure.

The application of the above measures will not only improve the policy of managing the loan portfolio and reduce the credit risk, but also increase the efficiency of its lending activity as a whole, subject to a tolerable level of risk.

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