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Раціональне кредитне забезпечення інвестиційних проектів аграрних підприємств України

Стаття присвячена розробці моделі раціональної кредитної підтримки інвестиційних проектів сільськогосподарських підприємств з урахуванням змін в структурі банківського фінансування. Розглянуто теоретичні та методичні засади кредитного забезпечення інвестиційних проектів в аграрній галузі. Обґрунтовано вихідні положення кредитних відносин, на які спирається теорія та практика раціонального кредитного процесу, а також технологія надання та повернення кредиту. Визначено складові раціонального кредитного забезпечення інвестиційних проектів аграрних підприємств. Доведено, що система кредитно-інвестиційної кооперації при взаємодії з гарантійними компаніями забезпечує банкам перестрахування ризиків неповернення боргових зобов'язань при втраті стабільного рівня фінансового потенціалу аграрних підприємств. Запропоновано модель раціонування кредиту для аграрних підприємств з урахуванням зміни структури банківського фінансування. Застосовано диференційований підхід раціонального кредитування до окремого позичальника, який за ефективної реалізації програми фінансування інвестиційних проектів в сільському господарстві забезпечує дохідність банківських кредитних операцій.
Ключові слова: *кредит, кредитні ресурси, кредитний ризик, фінансування, інвестиційні проекти, аграрні підприємства.*

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Рациональное кредитное обеспечение инвестиционных проектов аграрных предприятий Украины

Статья посвящена разработке модели рациональной кредитной поддержки инвестиционных проектов сельскохозяйственных предприятий с учетом изменений в структуре банковского финансирования. Рассмотрены теоретические и методические основы рационального кредитного обеспечения инвестиционных проектов в аграрной отрасли. Обоснованы исходные положения кредитных отношений, на которых базируется теория и практика рационального кредитного процесса, а также технология предоставления и возврата кредита. Определены составляющие рационального кредитного обеспечения инвестиционных проектов аграрных предприятий. Доказано, что система кредитно-инвестиционной кооперации при взаимодействии с гарантийными компаниями обеспечивает банкам перестрахование рисков невозврата долговых обязательств, при потере стабильного уровня финансового потенциала аграрных предприятий. Предложена модель рационирование кредита для аграрных предприятий с учетом изменений структуры банковского финансирования. Применен дифференцированный подход рационального кредитования отдельного заемщика, который при эффективной реализации программы финансирования инвестиционных проектов в сельском хозяйстве обеспечивает доходность банковских кредитных операций.
Ключевые слова: *кредит, кредитные ресурсы, кредитный риск, финансирование, инвестиционные проекты, аграрные предприятия.*

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Rational credit security of investment projects of agricultural enterprises in Ukraine

The theoretical and methodological foundations for rational security of investment projects of agricultural enterprises in Ukraine are considered. Assumptions of credit relations, which are based on the theory and practice of credit management process, as well as equipment and technology provision and repayment, are grounded. The composition of credit security of investment projects of agricultural enterprises on the basis of credit and regulatory policy regarding the functioning of the market for loans is defined. It is proved that the system of credit and investment cooperation in the interaction of companies provides guarantee to banks reinsurance risk of default at the loss of a stable financial potential of agricultural sectors and enterprises. The model of credit rationing for agricultural enterprises considering the changes in the structure of bank financing is suggested. The differentiated approach of rational lending to a single borrower is applied. This approach ensures the profitability of bank lending operations on the effective implementation of the program of financing investment projects in agriculture.

Keywords: credit, loans, credit risk, financing, lending, investment projects, agricultural enterprises.

Introduction. Stable environment of investment activity of agricultural enterprises is determined by the parameters of rational credit support of agriculture. Instead, rational loan for the investment project of agricultural enterprises as a system of factors affecting the organization, forms and results of their investment and meet the need for financial resources is under cyclic fracture of the banking system. This period can be considered a process of changing the structure of the financing of agriculture, which forms a stable environment of agribusiness relationship with the financial and credit institutions. Priority of rational credit security and its role in the growth of agricultural enterprises due primarily to a change in external markets borrowing. Large agricultural enterprises are attractive customers for commercial banks, as well as for international financial institutions such as the International Finance Corporation, European Bank for Reconstruction and Development. However, the agricultural micro environment depends on changes in terms of financing agriculture. This affects the access of economic entities to the efficient reallocation of credit resources to ensure the effectiveness of investment projects. However, the presence of factors such as credit support of agricultural enterprises as the stringent requirements for the creditworthiness of borrowers and collateral, low savings and fragmented capital investors in the financial market, do not allow time to convert loans into investment potential of the banking sector. Formally, the real value of the loan as a financial tool of investment activity of agricultural enterprises have not formed an appropriate regulatory policy on the mechanism of credit support of sustainable agriculture and strengthening national security, which in turn inhibits the growth of qualitative and quantitative indicators of investment activity and the financial capacity of businesses.

The analysis of recent publications on the problem. The theoretical and practical principles of banking, credit and credit relations, including in agriculture, are dedicated in works by Z.M. Vasylchenko [2], M.J. Demyanenko [4], Yu.O. Lupenko [13], O.O. Nepochatenko [15], A.A. Chukhno [18] and others. Methodological and methodical approaches of the banking system and credit support of Ukraine agricultural enterprises are studied in the works of such famous scientists as L.O. Vdovenko [3], V.V. Korneev [10], I.V. Kushnir [12], O.O. Oliynyk [16] and others. Instead, there is a need to review and improve the rational model of bank credit support of investment projects of agricultural enterprises in Ukraine, which has to take into account changes in species structure for credit recovery in investment activity and preserves the solvency of business entities.

Aim of the study is to develop a model of rational credit support of investment projects of agricultural enterprises considering changes in the structure of bank financing.

The main results and their justification. Rational credit support of agriculture in Ukraine requires in-depth understanding of the proper management of fixed financial instruments that govern the actions interdependence between agribusiness and banking sector. The main financial instrument is a loan – a base of the modern market economy, an integral part of economic development of agricultural enterprises, the purpose of which is to promote the circulation and turnover of the funds. Existing patterns of rational credit investment security of agricultural enterprises have enhanced the range of related economic categories «credit» and «credit security» to determine their interconnected areas. Credit as an economic category is considered in terms of the return movement of borrowed value which reflects credit relations theory, that indicates its nature [9, p.209]. This definition of is reduced to two main features of the economic concepts. First, the loan should be considered as a specific type of contractual economic relations on the movement of funds between the lender, the borrower with the participation of a mediator who can be replaced by pledge agreement, in the terms of payment, security, maturity, target character and return. Second, it partially fulfills redistribution function that displays a particular manifestation of its inner essence - emission, control, concentration and centralization of capital, saving costs, creation of additional purchasing power, and maintenance of the investment process by changing the results, which affect individual members of credit relations (banks).

However, the term «credit security» embodies the principles and rules of conduct of the bank and the borrower in the course of the investment activity of the borrower through credit operations [11, p. 140]. In our opinion, it defines assumptions of credit relations, which are based on both theory and practice of efficient credit process that reflects the techniques and technology provision and repayment. This focuses on the mechanism of credit rationing, which accelerates restorative value of financial assets of agricultural enterprises and stabilizes the banking market asymmetry on the creditworthiness of borrowers, in the conditions that the existing financial instruments are provided with regulatory policy of the state on the functioning of the capital market security.

Analyzing the distribution of credit to potential borrowers in a market equilibrium when «demand for credit of any borrower remains unsatisfied, even if the borrower is ready to fulfill all price and non-price conditions of the loan agreement» [1, p. 114], there are two types of rational credit security of agricultural enterprises. The first type assumes that all borrowers receive resources, but at a rate less than they require, second type - random allocation of credit among borrowers that some farms receive funds in full, while others are not satisfied in general [14, p. 6]. First, we should clarify the mechanism of action of rational credit security of agricultural enterprises. At some point of time the banks place financial resources for investment. However, they are not able to select the best investment projects. Agricultural enterprises, by contrast, can effectively allocate resources, but they have no money. The task of financial institution is to perform intermediary functions - efficient allocation of credit among borrowers. To solve the problem, banking institutions must efficiently allocate credit resources through restrictions on the amount of credit in the form of credit quotas [14, p. 8]. According to the theory of credit rationing, the rate of financing investment projects depends not only on the difference between the interest rate and rate of return, but also on access to credit. Access to credit, in turn, depends on the expected flow of financial resources from investment projects [5, p. 170]. Therefore, at the low interest rates banks are rationing credit to agricultural enterprises, as they prefer less profitable investment projects in terms of cheap credit.

Fig. 1 shows the part of rational credit security of agricultural enterprises, which represents a realization of the program of bank financing investment projects and financial capacity of entities on the basis of credit and regulatory policy of the state on the functioning of the capital market security. Credit policy is manifested primarily in the redistribution of credit from a particular industry to another, regulatory - to stimulate to attract resources on foreign stock markets through private investors. Public offering of shares provides large agricultural enterprises, especially agricultural holdings, with the access to large size international capital investors.
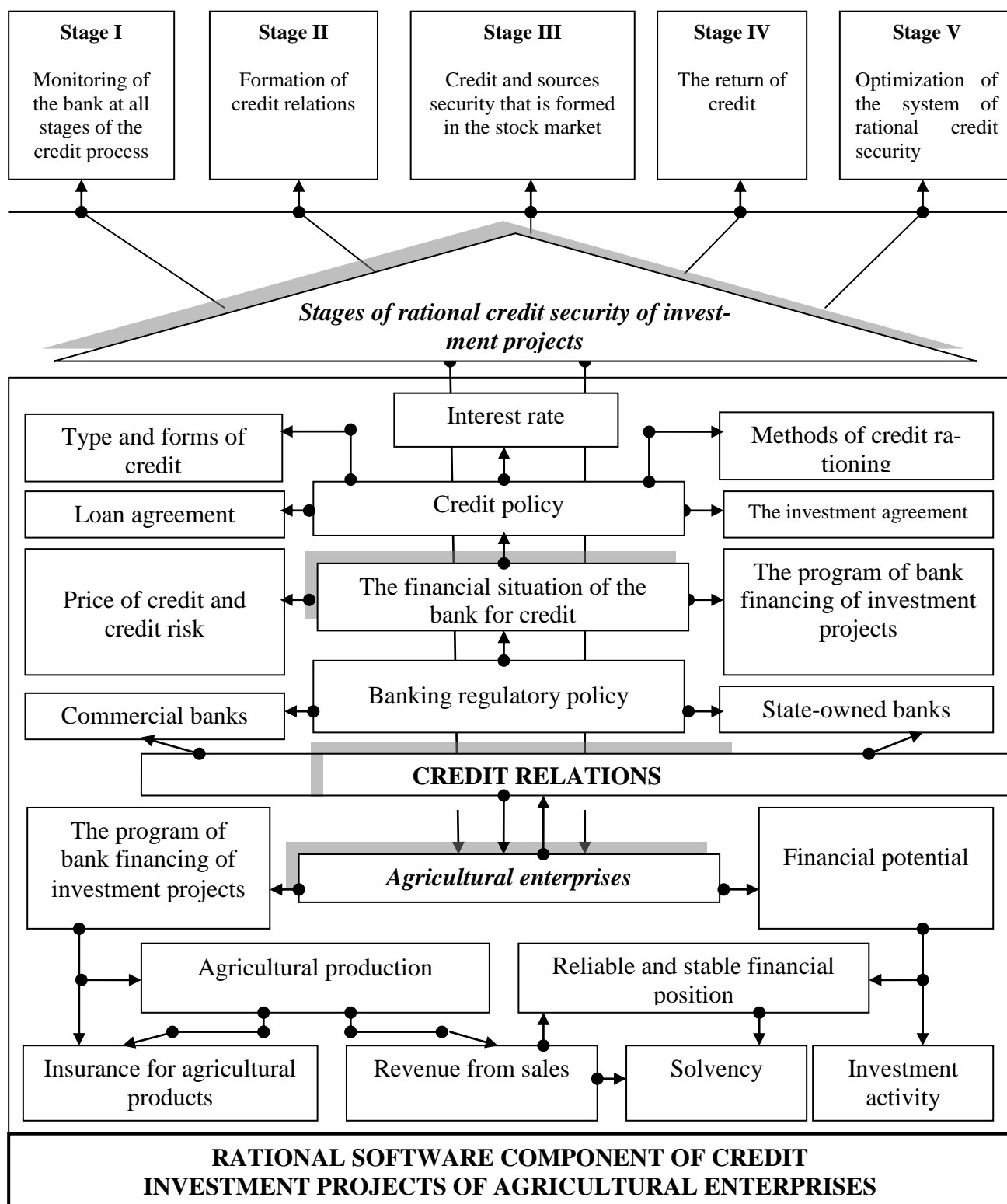
Stage I	**Stage II**	**Stage III**	**Stage IV**	**Stage V**
Monitoring of the bank at all stages of the credit process	Formation of credit relations	Credit and sources security that is formed in the stock market	The return of credit	Optimization of the system of rational credit security

Stages of rational credit security of investment projects

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                    Interest rate

Type and forms of                        Methods of credit ra-
     credit                                    tioning

 Loan agreement         Credit policy      The investment agreement

Price of credit and    The financial situation of the    The program of bank
   credit risk              bank for credit              financing of investment
                                                              projects

Commercial banks      Banking regulatory policy          State-owned banks

                       CREDIT RELATIONS

The program of                                            Financial potential
bank financing of       Agricultural enterprises
investment projects

            Agricultural production     Reliable and stable financial
                                                 position

Insurance for agricultural   Revenue from sales    Solvency     Investment
      products                                                   activity
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RATIONAL SOFTWARE COMPONENT OF CREDIT INVESTMENT PROJECTS OF AGRICULTURAL ENTERPRISES

Fig. 1. **Block diagram of rational credit security of investment projects of agricultural enterprises**

Source: developed by the author

Thus, successful result of offering of shares for Ukrainian agricultural companies in the stock market is an indicator of investment activity of the domestic banking market. However, in Ukraine the activity of the banking system on rational credit security of agricultural enterprises is not satisfactory because of the low level of capitalization of financial assets, lack of cooperative gover-

nance principles and agreed long-term financial strategy.

Therefore, the only sources of attracting investment resources in agricultural enterprises are bank loans at lower interest rates, the value of which is affected by the main factor of their formation - credit risk. According to the general theoretical propositions, the value of the credit risk increases, in conditions of growth of loans, that is, the value of the interest rate is determined by a certain measure of risk that can grow (Fig. 2).
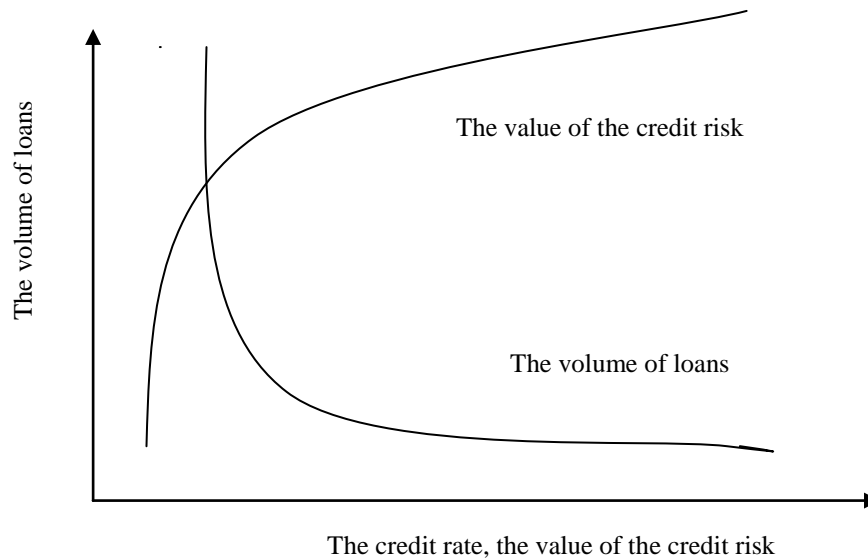

Fig. 2. **The curve of the dependence lending rate on the value of provided loans and credit risk**

Source: developed by the author

The validity of this generalization is connected with the ability to analyze different situations in terms of the relationship parameters - volume of loans, loan values and credit risk and the absolute amount of problem loans. In particular, if the function changes the volume of loans in the direction of reduction, then the given curve also reduces the value of interest rate and credit risk. However, at the intersection of functional dependencies there is the optimum size of the price of credit, which is usually 10-30% more expensive than the actual amount of debt and sales charges of the borrower to the bank. To resolve this problem it is necessary to promote a system of credit and investment cooperation, which in interaction with guarantee companies can provide reinsurance of risk of default on debt caused by loss of stable financial potential of agricultural enterprises. At the same time, to support the investment activity of economic entities, integrated system of guarantee protection of debt and of foreign interbank payments can create equal conditions for investment risks of agricultural enterprises, and thus provide the financial resources for a certain period.

The need for effective cooperation and efficient system of credit for the investment project of agricultural enterprises is confirmed by the existence of an annual deficit of own funds, which is partly offset by the state in the course of payments of loan subsidies from the state budget, as well as purchases of grain by the Agrarian Fund by different types of contracts. In these circumstances, the establishment and functioning of Agricultural and Investment Bank (AIB) as the main instrument of the state in the implementation of regulatory policies on market borrowings secured by financial assets and long-term crediting of agricultural enterprises and banking reinvestment in terms of additional resources through the issue of securities is of particular relevance and appropriateness (Fig. 3).

The main objective of Agricultural and Investment Bank should ensure credit investment projects of agricultural enterprises. However, the priority for a loan of 60-70% of the valuation of financial assets should be for small and medium-sized farms.
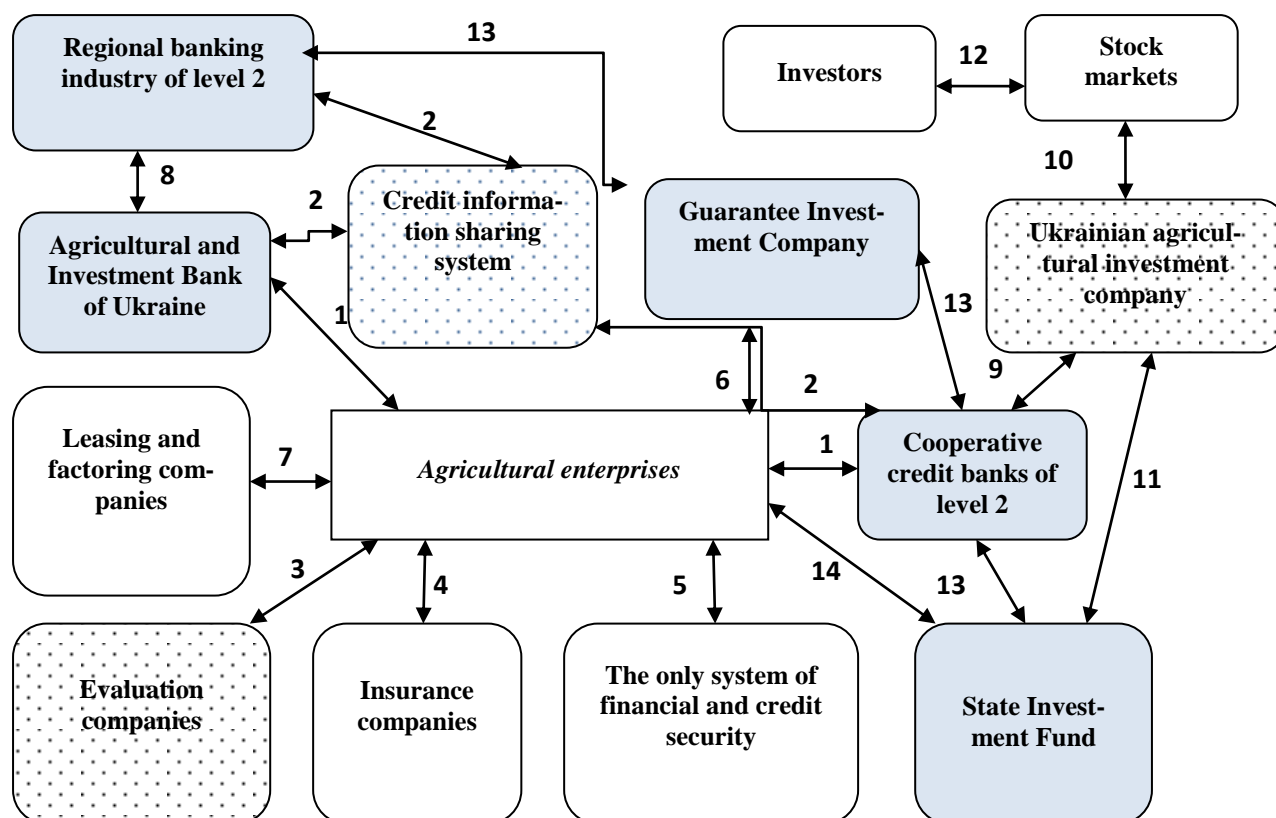
1. Credit security. 2. Obtaining credit information about the borrower. 3. Expert monetary valuation of the collateral. 4. Crop insurance risks. 5. The state registration of real estate and rights to it. 6. Providing guarantees. 7. Leasing and factoring. 8. Placement of funds. 9. The purchase and sale of financial assets or collateral property. 10. Placement of securities. 11. The use of financial assets and property in order to issue bonds, securities. 12. The purchase of securities. 13. Obligations under guarantees.14 Purchase and sale of financial assets and property, including the purchase of mortgaged property in case of a request for a penalty on it; transfer of property to leasing businesses.

Legend:

▨ —	Links forming structures that do not yet exist
⬚ —	Structural units, established in part основні елементи структури
▭ —	The basic elements of the structure

Fig. 3. **Formation of the system of rational credit security of investment projects of agricultural enterprises**

Source: developed by the author

The cost of long-term loans, even without allocating state budget for their reduction must meet attractive conditions of crediting agriculture and (or) provide a valid credit mechanism of compensation of interest on loans from the budget, through the issue of securities on the stock market. The urgent need to change credit support of agriculture defines functionality of Agricultural and Investment Bank, a specialized bank which was established by the Cabinet of Ministers of Ukraine on the basis of existing legislation, including the Law of Ukraine «On banks and banking activity», «On financial services and state regulation of financial services» and «On securities and stock market» [6; 7; 8]. Effectiveness of Agricultural and Investment Bank in Ukraine, as a specialized bank has determined the presence of the resource base for long-term loans, the sources of which shall be as follows: bonds issue under the existing regulatory assessment and their sale on the domestic and foreign stock market. This government bonds in the structure of the share capital of Agrarian Investment Bank must be 51%, private - 49%; specific issue of securities in the financial asset rein

vestment of agricultural enterprises in the domestic stock market; sale of credit commitments to domestic investment companies, corporate credit banks and regional banking institutions of the second level to ensure the real value of resources in investment projects of agricultural enterprises; attracting long-term foreign loans under state guarantees. Bank may act as borrower on international financial markets under the state guarantees of investment projects in agriculture; use of rights of regional structures of the second level to the redemption of Agricultural and Investment Bank claims on loans and debt. Supervision of Agricultural and Investment Bank has granted the National Bank of Ukraine and the National Commission for state regulation in the field of financial services market in Ukraine, according to the current legislation. The purpose of regulation and supervision is: a unified and effective state policy in the field of rational credit security of investment projects of agricultural enterprises; creating conditions for the effective functioning of the banking system to ensure return on investment projects financing agricultural enterprises, according to the level of the financial capacity of the latter; compliance of financial market participants with the conditions of rational credit security under the laws and other legal acts on regulation of relations in the field of bank financing investment projects of agricultural enterprises; adapting the methods of rational credit security of investment projects of agricultural enterprises with international standards.

Depending on the restrictions of agricultural enterprises in the financial market, we have proposed a simplified algorithm for calculating the rationing of credit to finance investment projects, which has the following characteristics: the bank provides loans for agricultural enterprises under the hundred percent repayment of amount of principal and interest; performance of financial obligations (interest payment and principal repayment) by agricultural enterprises depends on the result of the implementation of investment projects that are fully funded by bank in terms of credit security; the results of investment projects of agricultural enterprises in terms of credit security are grouped according to financing as the mathematical expected value and variance of the internal rate of return (IRR); probability of financing investment projects of agricultural enterprises determines the value that is calculated by the formula:

$$E(IRR) = \sum_{i=1}^{n} IRR_i \cdot \Pr(IRR_i), \tag{1}$$

$$\sigma^2_{IRR} = \sum_{i=1}^{n} (IRR_i - E(IRR))^2 \cdot \Pr(IRR_i), \tag{2}$$

where $E(IRR)$ – the expectation of a discrete random variable internal rate of return of the investment project of (IRR) agricultural enterprise; σ^2_{IRR} – the variance of a discrete random variable (IRR); n – possible number of discrete random variables IRR (number of possible scenarios of financing for investment projects of agricultural enterprises, n = 5); $Pr(IRR_i)$ – probability of possible random variable IRR (likelihood of the realization of possible funding scenario).

We suppose that the internal rate of return of investment projects of agricultural enterprises-borrowers depends on the scenario of funding environment in which these projects are implemented (five scenarios are proposed: pessimistic, moderately pessimistic, moderate, moderately optimistic and optimistic, each of which defines the probability of their realization). Hypothetical distribution of the internal rate of return for certain groups of investment projects of agricultural enterprises-borrowers is given in Table 1. Since all agricultural enterprises-borrowers belong to one industry, these scenarios are considered common to all groups of investment projects that contribute to the value of the expectation and variance IRR for each group. The results of calculations using formulas (1) and (2) are shown in columns 1-3 of Table 2.

The simplified algorithm for calculating credit rationing allows to consider the measures of state intervention to determine the financing needs of investment projects of agricultural enterprises in the form of compensation or credit rationing to guarantee repayment. Indicator of needs in credit rationing for certain groups of investment projects (see. column 4, Table 2), under the situation of a

Table 1

**Results of investment projects of agricultural
enterprises-borrowers (hypothetical data)**

Scenario	Possible scenario	The internal rate of return of the investment project, %					
		1 group	2 group	3 group	4 group	5 group	6 group
Pessimistic	0,13	2,47	-0,45	-5,5	-12,5	-22,8	-32,4
Moderately pessimistic	0,25	2,05	8,56	9,0	10,0	10,0	7,5
Moderate	0,45	0,46	10,95	20,5	33,5	40,0	47,0
Moderately optimistic	0,13	0,03	22,05	37,5	44,2	50,1	58,3
Optimistic	0,04	-1,35	30,0	46,0	54,8	60,2	82,4

Source: developed by the author

Table 2

Initial indicators of credit rationing model for funding investment projects (under hypothetical data of Table 1)

Group of investment projects of agricultural enterprises-borrowers	IRR expectation of investment projects, %	The standard deviation of IRR of investment projects, %	The need for rationing credit, conventional monetary units	Possible effective interest rate on the loan,% *
1	1,09	1,02	0,07	1,33**
2	11,08	6,98	0,08	13,51
3	17,48	13,24	0,15	21,32
4	23,89	18,94	0,35	29,13
5	26,46	24,16	0,25	32,27
6	29,70	31,25	0,10	36,22
Total	×	×	1,00	×

* Including tax profit of agricultural enterprises-borrowers - 18%;
** Agricultural enterprises-borrowers of the 1st group in need of preferential crediting.
Source: developed by the author

single loan can be viewed as a relative indicator characterizing the structure of the agricultural needs for enterprise-borrower. Similarly, in the case of a single loan, the absolute adjusted net operating income of the bank, which is formed for a loan, can be considered simultaneously and as a relative measure of profitability of credit operations. If the cost of borrowed funds exceed the likely size of standby IRR, while the interest rate for a particular group of investment projects must meet size IRR adjusted for the effect of tax benefits for agricultural businesses, including transaction costs of financing and maintenance of projects borrowers. This involves appropriate adjustment formula 1. The results for the above hypothetical data by the formula (3) is given in column 5 of Table 2.

$$r = \frac{E(IRR)}{(1 - Tax)},\qquad(3)$$

where r – optimal interest rate to finance the investment project of agricultural enterprises; $E(IRR)$ – probable expectation value of IRR separate groups of investment projects; Tax – the average level of taxation of agricultural enterprises considering tax incentives.

The profitability of credit operations under the proposed model of credit rationing may be considered without regard to cost, to create the required financial reserves to finance agricultural enterprises:

$$N = \begin{cases} (IRR_i - c) \cdot (1 - Tax), & IRR_i \le 0 \\ IRR_i - c \cdot (1 - Tax), & 0 < IRR_i < E(IRR), \\ (r - c) \cdot (1 - Tax), & IRR_i \ge E(IRR) \end{cases}\qquad(4)$$

where N – profitability of financing certain groups of investment projects; c – operating costs of financing and maintenance of investment projects of agricultural enterprises-borrowers.

Considering the worst possible results of the investment projects with a high level of credit risk, the principle of prudent credit transaction can provide a separate group size of expectation and variance *IRR*. Profitability of credit operation (y) is calculated as a weighted average result of financing investment projects of agricultural enterprises:

$$y = \sum_{i=1}^{k} N_i \cdot X_i , \tag{5}$$

where N_i – the result of financing investment projects of certain groups of agricultural enterprises; X_i – the share of loans in total financing of investment projects; k – number of groups of funded projects.

Dispersion of profitability of credit operations is calculated taking into account the values of the covariance of returns of individual groups of investment projects (the result of funding), involving the calculation of covariance matrix:

$$\sigma^2 = \sum_{i=1}^{k} X_i^2 \sigma_i^2 + 2 \sum_{i=1}^{k-1} \sum_{j=i+1}^{k} X_i X_j \sigma_{ij} , \tag{6}$$

where σ^2 – variance of profitability of credit operations; σ_i^2 – variance of profitability of funding certain groups of investment projects; k – number of groups of financed investment projects; X_j – possible share of loans in total financing of certain groups of investment projects; σ_{ij} – covariance of profitability of financing certain groups of investment projects.

By optimizing (σ^2) profitability of credit operations with an increase of the minimum level, in the conditions of limiting credit information asymmetry, the volume of credit security of agricultural enterprises increases. Thus the need for financing investment projects of enterprises increases. The simplified algorithm for calculating credit rationing of agricultural enterprises at the criterion of maximizing the profitability of credit operations with limits of the maximum value of variance (σ^2_{max}) optimizes the expected result. The choice of alternative measures of state intervention regarding the financing of investment projects of agricultural enterprises is made through the compensation of lending rate or a guaranteed return of principal on loans.

Conclusions. Everything that was mentioned above allows the author to formulate a position on the construction of model of rational credit security of agricultural enterprises, which involves the calculation of weighted average cost of credit rates on the financial market and is profitability of credit operations of banks providing credit in the range of agribusiness and agriculture in general. Considering the share of loans in total financing of investment projects of agricultural enterprises and the number of groups of projects, the sources of funding and practical actions of banking institutions to provide loans and repayment are identified. On the basis of compliance all the basic principles of crediting, considering individual needs of business entities, a differentiated approach of rational crediting to a single borrower is applied that at effective implementation of the program of financing of investment projects in agriculture provides profitability of bank lending operations. But it should be noted that the credit policy of banking institutions at the regional level is an additional form of part of the credit relationship, which defines the kind of compensation mechanism to invest available cash resources into the development of agricultural enterprises. However, for agricultural enterprises interest rate policy on loans as the buying right to use borrowed resources for a specified period has to ensure their investment activity and keep a stable level of return projects in economic activity. From the standpoint of regulatory policy of the state the functioning of the capital market on the security of property should be considered an important segment of the financial market - the securities market that enables businesses to have multivariate range of sources of concessional financing and lending and contributes to the mobility of their financial potential and minimizes the risks that are inevitably accompanied in bank credit operations.

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