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# THE ASSESSMENT MODEL OF THE FINANCIAL SUSTAINABILITY OF THE FUND FOR FINANCING LEASING OPERATIONS

## ABSTRACT

The effective functioning of the financial and credit mechanism for the activation of leasing activity in Ukraine is important for increasing the number and quality of leasing operations, as well as improving leasing activity in general.

In this context, the methods of assessing the financial stability of the Fund for Financing Leasing Operations become particularly relevant and important as an important element of the system of functioning of such a mechanism, which at the same time is a set of multiple sources of financing of the leasing portfolio of the lessor or financial company engaged in the provision of financial leasing. This article is devoted to this issue, in which, with the help of economic and mathematical modelling, an assessment of the probability of default of the Fund for Financing Leasing Operations was carried out due to the growth of the ratio of financial leverage and taking into account the action of a number of economic and financial factors, and it was determined that the most stable form of financing leasing operations is loan capital. It is proposed to estimate the probability of the event of default of the Fund for financing leasing using the method of building Bayesian logistic models with a normal type of conditional probability distribution.

The study found that the expected macroeconomic situation and low inflation environment are necessary factors for the sustainability of the Fund for Financing Leasing Operations. It was emphasized that a significant role is played by state support in the financing of leasing projects and reasonable opposition to competition from competitive technologies of the Fintech sector.

The obtained results can be used for evaluating the efficiency of lessors' portfolios and making decisions regarding the selection of optimal sources of financing for leasing operations.

**Keywords:** leasing, leasing operations, leasing activity, financial stability, financing fund for leasing operations, Bayesian logistic models, financial leverage

**JEL Classification:** C50, C59, G20, G21

## INTRODUCTION

The successful development of the national economy depends on the sufficiency of financial resources, which today can be attracted from various sources to finance the investment processes of domestic enterprises. One of the forms of such financing is leasing, which in the world is recognized as a fairly effective tool for the interconnection of the financial and real sectors of the economy, as it allows for attracting free monetary resources and at the same time being an investment mechanism for the renewal of fixed assets.

The choice of financing tools for leasing operations, which are components of the financial mechanism for the activation of leasing activity, is a multi-vector task both in terms of solving the issue of achieving liquidity, profitability and stability for each source of financing, and their effective further attraction in the form of provided leasing credits.

Therefore, the development of a model for assessing the financial stability of the Fund for Financing Leasing Operations consists in determining the impact of the increase in

the risk of financial leverage on the ability of the lessor to fulfil its obligations, as well as in determining the possibility of ensuring the continuous profitable activity of lessors and, at the same time, preserving the financial stability of the Fund.

On the one hand, the Fund for Financing Leasing Operations can be a tool of the mega-regulator, which through the use of this tool will be able to influence the development of the leasing market and ensure its stable functioning in the long term. Accordingly, the Fund for Financing Leasing Activities is one of the elements of the system of the financial and credit mechanism for the activation of leasing activities (FCMALA).

On the other hand, the Fund can be an element of the FCMALA itself in the event that it is its security and therefore is able to self-regulate the implementation of this mechanism.

In this article, the Fund for Financing Leasing Operations is considered one of the elements of the functioning system of the financial and credit mechanism for the activation of leasing activities, without which it is difficult to ensure the proper functioning of the mechanism.

## LITERATURE REVIEW

The problems of the development of the market of leasing operations are actively studied in the works of O. Bohdanchuk [2], O. Vasylychshyn [3], I. Vyshnyakov [4], V. Gavrylyuk, N. Kovalenko and Yu. Chovniuk [8]. The results of their research give grounds for asserting that in order to improve the activity of the leasing industry in Ukraine, it is necessary to improve the financial and credit mechanism for the implementation of leasing operations directly through instruments, forms and diversification of sources of financing leasing operations.

The issue of financial and credit provision of leasing operations was highlighted in their works by scientists S. Burdenyuk and V. Svirsky [1]i, N. Vnukova [5], A. Kuznyetsova [12] O. Levchenko [14], T. Mayorova [15], T. Topishko [21]. These scientists paid attention to the essence of leasing based on the analysis of current domestic and foreign legislation. They created a comparative description of the common and distinctive features of financial and operational leasing, systematized the forms of leasing according to the following classification features: the composition of the participants in the leasing agreement; the object of leasing; scope of property maintenance services; the level of payback of the leasing object; the term of use of the leased object; market sector; nature of leasing payments; type of property; method of financing; the initiator of the leasing agreement.

Scientific publications by O. Dorofeeva [7], M. Krupka [10], O. Kovalyuk [9], P. Kutsik [13], I. Paliienka [20], V. A. Kuzne-cova [11], O. Trygub [22] are devoted to the problems of improving the financial mechanism of leasing activities. Among foreign scientists, D. Vahitov and A. Zamaletdinov [34], A. Nair, R. Kloepfinger-Todd, and A. Mulder [31] dealt with the outlined problems. Scientists paid special attention to the study of the world experience of the functioning of the financial and credit mechanism for the implementation of leasing operations and the justification of the need to introduce in Ukraine new instruments and forms of leasing and the use of new sources of financing leasing operations. The researchers determined that in order to improve the functioning of the financial and credit mechanism for the implementation of leasing operations in Ukraine, it is necessary to diversify the sources of financing leasing operations by using funds and certificates of institutional investors or venture capital investors, pools of securities provided with assets that are a lease agreement.

Regarding the experience of applying logit models to assess the financial stability of a financial institution, we can rely more on foreign experience and a large number of foreign publications devoted to this issue. The use of Bayesian models for forecasting the conditional probabilities of bankruptcy of banking and non-banking financial institutions was also proposed in the works of R. Kole and J. Gunter [34], F. Crowley and A. Lovichuk [25], T. Poghosyan and M. Chigaki [32], R. De Jong and J. Thorne [26]. Moreover, R. DeJong and J. Thorn used, in addition to this toolkit, probabilistic models (probit Bayesian model) and turned to the analysis of the main components in the regression analysis. These models made it possible to create a sufficiently adequate model for an integrated system of early response to the bankruptcy of financial institutions and legal entities engaged in financial activities.

The coefficient approach was implemented in their works by O.I. Amosha, V.G. Andriyuchuk, P.Yu. Belenky, E.I. Boyko, T. Cheremysova, and, in particular, the net reduced cash flow method for a leasing loan is found in V. Nastasiev [16].

Despite the large number of scientific publications related to the outlined issues, insufficient attention is paid in the domestic economic literature to the systematic study of the formation and development of the financial and credit mechanism for the activation of leasing activities, its tools and the study of a separate element of such a mechanism - the Fund for Financing Leasing Operations.

## AIMS AND OBJECTIVES

The purpose of this article is to develop a model for assessing the financial stability of the Fund for Financing Leasing Operations. To solve it in the article:

- the expediency of forming the Fund for Financing Leasing Operations is substantiated;
- an assessment of the probability of default of the Fund for Financing Leasing Operations was carried out due to the increase in the ratio of financial leverage and taking into account the effect of a number of economic and financial factors;
- the most stable forms of financing for leasing operations were determined.

## METHODS

The theoretical and methodological basis of the article is the basic provisions of economic theory, theory of finance, theory of financial intermediation, theory of the firm. In the research process, the following general scientific and specific methods of scientific knowledge were used: graphic (to reflect the risk of financial leverage of the Fund for Financing Leasing Operations), economic and mathematical modelling (when calculating the sustainability of the Fund for Financing Leasing Operations).

The use of regression analysis to estimate elasticities of changes in variables is the most common analysis tool. Its simplicity and the reliability of the obtained results for a verified sample allow you to make a decision about the structure of the financial mechanism and, most importantly, to draw conclusions about the consequences of the decisions made. However, this method does not make it possible to assess the probability of the event of default of the Fund for Financing Leasing Operations due to the increase in the ratio of financial leverage and the effect of a number of economic and financial factors, such as the appearance of competitive forms of financing fixed capital and renewal of fixed assets, inflation risks, volatility of the exchange rate and deterioration of conditions in the future regarding obtaining state support for financing leasing operations. For this, the most favourable modelling tool is the technique of building Bayesian logistic models with a normal type of conditional probability distribution. This will make it possible to predict the probability of the event of financial instability of the Fund for Financing Leasing Operations under the implementation of a number of conditions and the action of a number of factors.

## RESULTS

The Fund for Financing Leasing Operations should be understood as one of the elements of the FCMALA functioning system, which is a set of own, loan, advanced and other sources of financing of the leasing portfolio of the lessor or financial company engaged in the provision of financial leasing. At the same time, we note that all participants in leasing operations must make deductions to the Fund in the appropriate amounts (a certain percentage must be set for leasing companies, and another percentage - for banks involved in the leasing operation).

The probability of default of this Fund is considered to be the frequency of bankruptcy or detection of the state of insolvency of the fund of lessors and financial companies engaged in leasing activities in Ukraine, weighted by the total number of companies on the market of leasing services.

The research of Ukrainian scientists in the field of the financing mechanism of leasing operations mostly concerns the ratio analysis of the financial stability of lessors and the forecasting of discounted cash flows for the leasing portfolio, however, no scientist has come close to answering the question of which of the factors with a high degree of probability will contribute to the realization of the event of the onset of bankruptcy of the lessor or not. Therefore, the logistic model in the assessment of the financial stability of the Fund for Financing Leasing Operations will be used for the first time in our research.

Test statistics are presented in Table 1.

At the same time, we translated the obtained results into the form of the probability of occurrence of the event of growth of financial risk (leverage) and the risk of bankruptcy of the formed leasing fund, and not in the form of the ratio of the chances of the realization of two opposite conditional probabilities, as the logistic model directly provides the results.

**Table 1. Test statistics for logistic and ordinary linear regression models.** (Source: systematized based on [25])

Specification	Equation (3.4)	Equation (3.5)	Equation (3.6)	Equation (3.7)
Breuch-Godfrey test	0.5628	0.8447	0.4240	0.2689
Probability	0.4531	0.3580	0.5150	0.6041
Degrees of freedom	1	1	1	1
Breusch-Pagan test	3.6953	6.7903	9.2079	4.5520
Probability	0.8835	0.3407	0.4183	0.8042
Degrees of freedom	8	6	9	8
Goldfeld-Quandt test	0.7882	2.8869	0.0029	1.3703
Probability	0.5884	0.1324	0.9997	0.3838
Degrees of freedom of the first sample	4	6	3	4
Degrees of freedom of the second sample	4	5	3	4
Durbin-Watson test	1.7895	1.5933	2.1172	2.1604
Probability	0.0388	0.0287	0.1451	0.1803
Autocorrelation sign	positive	positive	unspecified	unspecified

The general form of formalization of the logit model is based on the following mathematical formula:

$$f(z_i|y_i = 1) = \frac{1}{1+e^{-z_i}} \quad (1)$$

$$z_i = \frac{1}{2} \frac{(x_i - a)^2}{\sigma^2} \quad (2)$$

$$x_{ij} = \sum_{j,i=1}^{m-1,n} \alpha_j x_{j,i} + \varepsilon_i \quad (3)$$

where  $y_i$  - binary variable, where 1 represents the occurrence of the desired statistical event, and 0 represents its non-realization;  $z_i$  - Gaussian function from the exogenous variable  $y_i$ ;  $a$  - mathematical expectation of forecast values according to the function  $y_i$ ;  $\sigma$  - variance for  $y_i$ ;  $\alpha_{ij}$  - parameters for endogenous variables, determined by the matrix  $x_i$ , where  $j$  - the number of variables ( $j=1-9$ ),  $i$  - the number of observations ( $n=27$ );  $\varepsilon_i$  - unobserved variables and "white" noise.

In our case, the following linear model will describe the risk of financial instability of the Fund for Financing Leasing Operations:

$$\text{Probability.leverage}_i \sim a_1 \text{interest.rate}_i + a_2 \text{dividends}_i + a_3 \text{lease.credits}_i + a_4 \text{disposal.income}_i + a_5 \text{d.state.support}_i + a_6 \text{d.default.risk}_i + a_7 \text{d.peer.to.peer.crediting.risk}_i + a_8 \text{inflation}_i + a_9 \text{reer.volatility}_i + v_i \quad (4)$$

where  $\text{Probability.leverage}_i$  - the probability of an increase in financial risk or negative financial leverage of financing operations of the lessor and financial institution;  $\alpha_j$  - coefficients for endogenous variables of the model;  $\text{interest.rate}_i$  - the interest rate on the financial market for attracting capital for financing leasing operations (financial leasing appears in the study);  $\text{dividends}_i$  - weighted average dividend rate, calculated as dividends paid to residents and non-residents and divided by the nominal value of the authorized capital of leasing companies in Ukraine;  $\text{lease.credits}_i$  - volumes of lease credits provided;  $\text{disposal.income}_i$  - undistributed income of the lessor; a group of dummy variables:  $\text{d.state.support}$  - a binary variable that indicates the receipt of state financing of leasing portfolios in the range of 30% and more;  $\text{d.default.risk}_i$  - the probability of fund default on obligations exceeded 50%,  $\text{d.peer.to.peer.crediting.risk}_i$  - the emergence of competition from virtual financial institutions with peer-to-peer lending technology, which may distract potential lessees who have decided to renew fixed assets;  $\text{inflation}_i$  the level of annual change in inflation, taken in first differences (quarterly regularity);  $\text{reer.volatility}_i$  - real exchange rate index taken in levels (base year - 2020);  $v_i$  - residuals of the model.

This model (4) will show how, depending on the change in the cost of raising debt or equity, changes in the demand for leasing loans and the appearance of obstacles or opportunities in the financial market, the probability of the lessor's ability to fulfil its obligations may change.

On the other hand, the financial stability of a financial company can be affected by the structure of financing of leasing operations, in which an increase in the share of loan financing can increase the pressure on the resource base of the lessor or the financial company, so the following logit model will measure precisely the probability of default of the latter depending on the level of financial leverage ratio - d.leverage:

$$\text{Probability. default}_i \sim a_1 \text{interest. rate}_i + a_2 \text{dividends}_i + a_3 \text{lease. credits}_i + a_4 \text{disposal. income}_i + a_5 \text{d. state. support}_i + a_6 \text{d. leverage. risk}_i + a_7 \text{d. peer. to. peer. crediting. risk}_i + a_8 \text{inflation}_i + a_9 \text{reer. volatility}_i + \omega_i \quad (5)$$

where *Probability. default<sub>i</sub>* - the probability of default;  $\omega_i$  - remains of this model specification.

Information on the state's intentions to support the financing of leasing projects for various sectors of the economy was based on the reports of the Association of Lessors of Ukraine regarding state participation in the financing of leasing portfolios of market participants.

We determined the risk of obtaining a leasing loan (not taking into account financial institutions) based on the history of the emergence of "person-to-person" loan services based on modern Internet technologies. In Ukraine, the first platform for this type of lending was the Credery service, which began functioning in December 2010 with a volume of up to UAH 5,000. per borrower daily [16]. Also, this market expanded with the service offered by JSC CB "PrivatBank" and MasterCard, which was named "Service of profitable investments" [160]. The threat of realizing the risk of not receiving a leasing loan is assessed at a sufficiently high level, as it is a more profitable alternative compared to deposits, and a better opportunity to obtain unsecured loans for the purpose of updating fixed assets. And this, in turn, endangers the future financial stability of the leasing fund of lessors and financial companies due to increased competition in the financial services market.

To obtain results in the form of elasticities of the interaction of external factors on the sustainability of the Leasing Fund, we estimated the marginal effects of each variable according to the following formula:

$$\frac{dP(x = \theta|y)}{dx} = \frac{1}{1 - e^{\alpha_j}} \cdot \alpha_j, \quad (6)$$

$\alpha_j$  - coefficient with a variable  $x_{ij}$ .

In order to obtain results that will allow us to interpret the mutual influence of fundamental factors on the financial stability of the Fund for Financing Leasing Operations from the point of view of economic sense, linear regressions were additionally evaluated.

We used the following specification to assess the ability to meet obligations

$$\text{leverage}_i \sim a_1 \text{interest. rate}_i + a_2 \text{dividends}_i + a_3 \text{lease. credits}_i + a_4 \text{disposal. income}_i + a_5 \text{d. state. support}_i + a_6 \text{d. default. risk}_i + a_7 \text{d. peer. to. peer. crediting. risk}_i + a_8 \text{inflation}_i + a_9 \text{reer. volatility}_i + v_i \quad (7)$$

where *leverage<sub>i</sub>* – percentage change in financial leverage of the lessor.

This specification will make it possible to assess the financial stability of the financial mechanism of the lessor not from the point of view of the probability of an increase in the chances of bankruptcy, but rather from the logic of the percentage change of a number of factors on the increase in the ratio of borrowed funds to own funds.

Similarly, we built a linear model for the risk of default from the percentage change in the cost of attracting debt and equity capital, the leasing portfolio, retained earnings, financial leverage, the possibility of receiving government support, the threat of peer-to-peer lending, price levels and exchange rate volatility. The threat of the emergence of competitive forms of lending and companies on the leasing market, devaluation and inflationary risks will contribute to the growth of the outflow of cash from lessors, creating the prerequisites for receiving a loss, and therefore, the impossibility of fulfilling all obligations.

The study was conducted on a sample of 27 observations during 2016-2022 on a quarterly basis.

The conducted simulation allowed us to obtain the following results. Regarding the ability of the lessor to settle its own obligations on time, which are part of the liabilities of the Fund for financing leasing operations, the obtained results are shown in Table 2.

**Table 2. Evaluation of the parameters of the logistic and linear model of the lessor's ability to fulfil obligations.**

Specification	Coefficient	Standard error	z-statistics	Probability
<b>Logit model</b>				
Constant	-15.453	9.305	-1.6607	0.0968
Interest rate	-0.397	3.883	-0.1023	0.9185
Weighted average dividend rate	2.143	4.424	0.4843	0.6282
Volumes of leasing credits provided	-0.117	0.633	-0.1846	0.8535
Lessor's retained earnings	-0.729	0.439	-1.6613	0.0967
State financing of leasing portfolios	-0.925	1.993	-0.4643	0.6425
Probability of default of the Fund	-1.814	1.993	-0.9101	0.3628
Real exchange rate index	14.123	8.089	1.7460	0.0808
The level of annual change in inflation	0.745	1.073	0.6946	0.4873
<b>Linear model</b>				
Constant	-18.6206	13.0198	-1.430	0.172
Interest rate	-9.0743	6.0250	-1.506	0.152
Weighted average dividend rate	-3.8594	7.5439	-0.512	0.616
Volumes of leasing credits provided	0.5214	1.0775	0.484	0.635
Lessor's retained earnings	-1.2868	0.7170	-1.795	0.092
State financing of leasing portfolios	-0.3706	3.2875	-0.113	0.912
Probability of default of the Fund	-8.7711	3.3535	-2.615	0.019
Real exchange rate index	-6.8209	2.7241	-2.504	0.023
The level of annual change in inflation	17.8511	12.4107	1.438	0.170
Interest rate	3.2534	1.7498	1.859	0.081

According to the results of the calculations, we can with a certain degree of probability claim that the loan form of raising capital contributed to a decrease in the probability of loss of solvency by the lessor, while the increase in the cost of raising equity capital contributed to the increase in insolvency by 2.1%. Provided that the yield curve for shares is flatter than the yield curve for bonds, this form of financing leasing operations will be more financially sustainable. With regard to the growth of the leasing portfolio, this form of financing of leasing operations had a positive effect on its solvency, as it contributed to the growth of the lessor's retained earnings, and, therefore, strengthened the ability to fulfil the most urgent obligations. The probability of default decreased by 84 percentage points.

State support at the level of 93 percentage points turned out to be other factors that led to a decrease in the probability of growth of the financial leverage ratio of the Leasing Operations Financing Fund. and the probability of default is 1.8%. That is, provided that the lessor has concerns about the possibility of non-fulfilment of the assumed amount of obligations, the financial leverage will be gradually levelled in the direction of the growth of its own sources of financing. Since the risk of the emergence of competitive Internet lending technology, including leasing financing, turned out to be statistically insignificant, we removed the estimate of this parameter, but in the linear regression, we left it to demonstrate the weight of the reaction of the lessor's solvency to the change of this factor.

The increase in the level of the real exchange rate and inflation turned out to be not significant enough in the increase in the pressure of liabilities on the equity capital of the Fund for Financing Leasing Operations - at the level of 17.9% and 3.3%, respectively. This indicates that these risks will be taken into account by the lessor in the form of an increase in the lending rate for the leasing loan.

According to the linear model, we estimated the elasticity of the growth of financial leverage depending on the action of the factors outlined above:

- firstly, the increase in the interest rate on loans to attract funds to the leasing fund reduced financial leverage by 9%;
- secondly, a 1% increase in retained earnings contributed to a 1.3% decrease in financial risk;
- thirdly, an increase in the probability of default will contribute to a more moderate financing structure of the lessor's capital by 8.8% per 1% increase in the risk of default on obligations;



- fourthly, the risk of increased competition with peer-to-peer lending turned out to be insignificant and with the value of covariance, which contradicts our ideas about the growth of financial leverage;
- fifthly, inflationary pressure and devaluation of the real exchange rate will increase the financial risk by 21% and the influence of these factors is significant for the financing of the leasing fund.

Marginal effects of factors influencing the ability of the lessor to fulfill obligations are shown in Table 3.

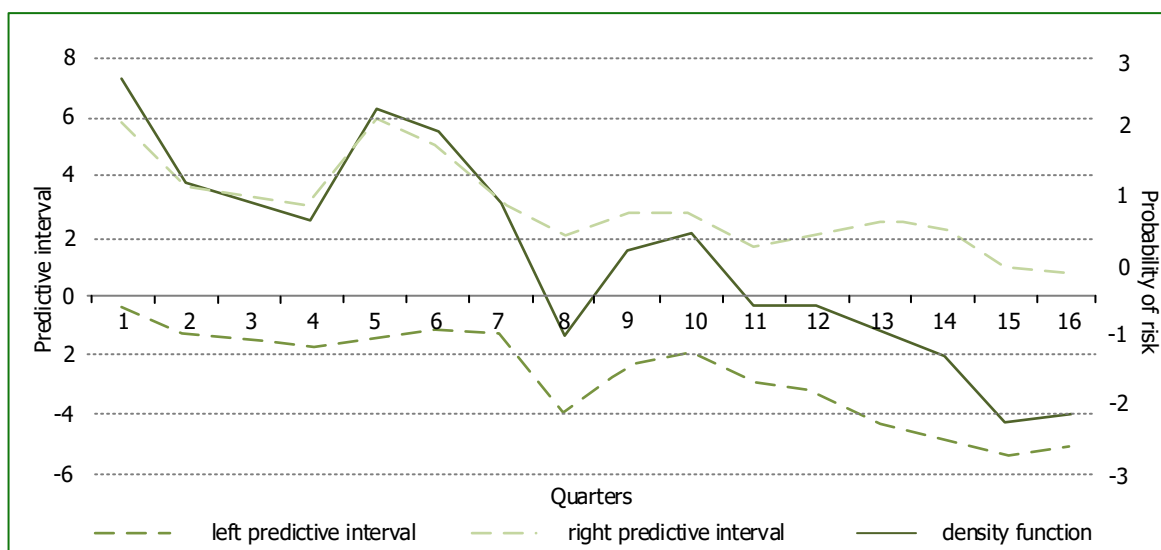
**Table 3. Marginal effects determined by the factors of model (4).**

Change	Effect	Error	t-statistics	Probability
Constant	-2.685	1.607	-1.671	0.113
Interest rate	-0.069	0.675	-0.102	0.920
Weighted average dividend rate	0.372	0.769	0.484	0.635
Volumes of leasing credits provided	-0.020	0.110	-0.184	0.856
Lessor's retained earnings	-0.127	0.077	-1.651	0.117
State financing of leasing portfolios	-0.227	0.474	-0.480	0.637
Probability of default of the Fund	-0.315	0.348	-0.905	0.378
Real exchange rate index	2.454	1.404	1.748	0.098
The level of annual change in inflation	0.129	0.186	0.695	0.497

The marginal effect of the influence of the cost of the loan capital and equity capital turned out to be such that with a 1% increase in the loan interest rate, the lessor's solvency remains, but with an increase in the dividend rate, it decreases and the probability of default increases by 37.2 percentage points. Growth in solvency and reduction in financial leverage are facilitated by the growth rate of leasing loans (2 percentage points), the growth of retained earnings (12.7 percentage points), and the receipt of state support (22.7 percentage points). In turn, the risk of default contributes to the reduction of the level of financial leverage, and, therefore, to the reduction of financial risk for each source of financing of leasing operations by 31.5 percentage points. The volatility of the exchange rate contributes to the emergence of the probability of insolvency by 2.5% and the increase in the domestic price level by 12.9 percentage points.

Therefore, the foreseeable macroeconomic situation and a low-inflation environment are necessary factors for the stability of the financial mechanism for ensuring leasing operations. An important role is played by state support in the financing of leasing projects and reasonable opposition to competition from competitive technologies of the Fintech sector.

The probability distribution of the growth of financial risk in the financing of leasing operations will look like that during a fairly long period of unprofitable activity involving leasing loans, we will with a high probability have an increasingly high value of financial leverage due to the growing need to support the lessor's short-term solvency, and therefore the risk of insolvency will also increase. The density distribution for forecasting according to model (4) is presented in Figure 1.



**Figure 1. Distribution of the growth density of the risk of financial leverage of the Fund for financing leasing operations.**

The next part of the analysis is an assessment of the impact of fundamental external and internal factors on the probability of bankruptcy of the lessor after a long history of unprofitable activities and failure to fulfil all obligations. The impact of financial leverage on the financial stability of the Fund for Financing Leasing Operations is shown in Table 4 and Figure 1, the marginal effects of influence on the increase in the probability of default are shown in Table 4.

**Table 4. Evaluation of the parameters of the logistic and linear model of the default of the Fund for Financing Leasing Operations.**  
 (Source: authors' calculations based on [17, 18, 19, 28, 30, 33, 35])

Specification	Specification	Coefficient	Standard error	z-statistics
<b>Logit model</b>				
Interest rate	-3.961	4.052	-0.978	0.328
Weighted average dividend rate	-1.543	4.986	-0.310	0.757
Volumes of leasing credits provided	1.509	1.423	1.061	0.289
Lessor's retained earnings	0.057	0.401	0.142	0.887
Percentage change in financial leverage of the lessor	-0.441	0.281	-1.571	0.116
Real exchange rate index	3.742	5.629	0.665	0.506
The level of annual change in inflation	0.044	0.956	0.046	0.964
<b>Linear model</b>				
Constant	-18.621	13.020	-1.430	0.172
Interest rate	-9.074	6.025	-1.506	0.152
Weighted average dividend rate	-3.859	7.544	-0.512	0.616
Volumes of leasing credits provided	0.521	1.077	0.484	0.635
Lessor's retained earnings	-1.287	0.717	-1.795	0.092
State financing of leasing portfolios	-0.371	3.288	-0.113	0.912
Probability of default of the Fund	-8.771	3.354	-2.615	0.019
Emergence of competition from virtual financial institutions with peer-to-peer lending technology	-6.821	2.724	-2.504	0.023
Real exchange rate index	17.851	12.411	1.438	0.170
The level of annual change in inflation	3.253	1.750	1.859	0.081

As can be seen from Table 4, the cost of attracting debt and equity forms of financing leasing operations has a positive effect on reducing the risk of bankruptcy, while the growth of the leasing portfolio increases the burden on the future servicing of current and long-term obligations and this increases the probability of future default. We associate this with a sufficiently long history of obtaining a negative financial result by lessors during 2019-2020 and 2021-2022.

From the point of view of retained earnings, as we noted, the loss contributed to the increased risk of bankruptcy. While obtaining a positive financial result increased the chances of maintaining solvency by 3.7%. Financial leverage also reduced the probability of an increase in the risk of bankruptcy. The volatility of the exchange rate and inflation increased the probability by 3.7%, and inflation under this specification turned out to be insignificant - at the 95% reliability level.

According to the regression analysis, three variables out of nine were found to be significant, including the volume of the leasing portfolio and the volatility of macroeconomic variables. The hypothesis that the growth of the leasing portfolio by 52 percentage points is characteristic of an unstable financial condition was confirmed. as a result of the increase in the share of problem debt. Regarding the forms of financing leasing operations, loans are the most stable form, as they are less related to profit. Although attracting financing through the emission channel also reduces the threat of bankruptcy by almost 4%.

The next stage of the analysis is an assessment of the marginal effects of factors that have a significant impact on the probability of bankruptcy of the Fund for Financing Leasing Operations (Table 5).

A comment on the marginal effect of an increase in financial leverage on the probability of bankruptcy of the lessor is as follows: an increase in this ratio of sources of leasing financing provoked an increase in the probability of bankruptcy by 7 percentage points, however, this estimate turned out to be insignificant, which may be due to the endogeneity of this

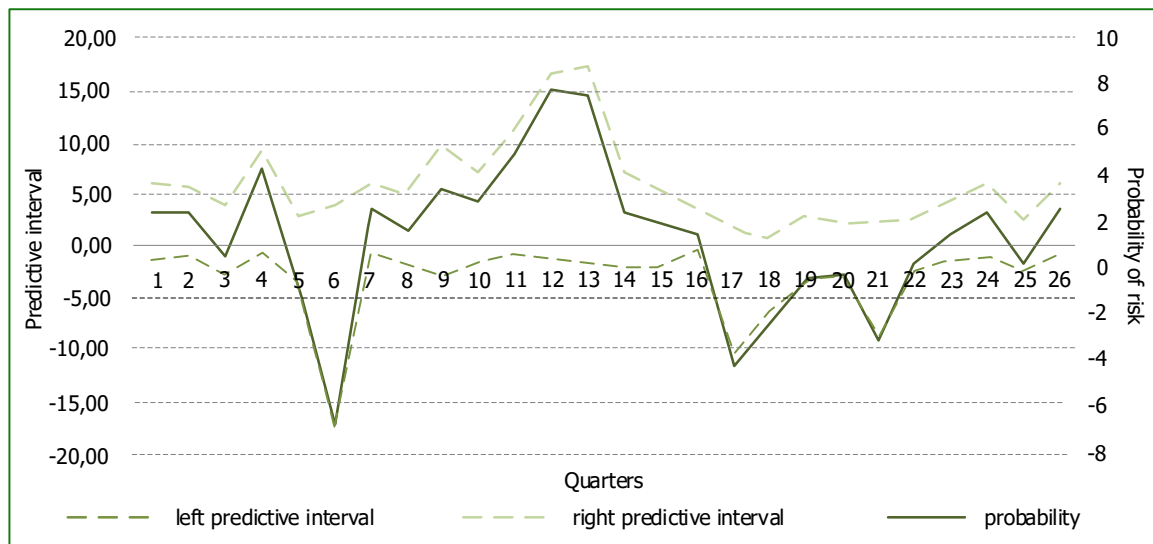


variable, and therefore this will be the subject of further improvement of this model through the introduction of instrumental variables.

**Table 5. Marginal effects determined by the factors of the model (4).**

Change	Effect	Error	t-statistics	Probability
Interest rate	-0.634	0.740	-0.857	0.403
Weighted average dividend rate	-0.247	0.791	-0.312	0.758
Volumes of leasing credits provided	0.242	0.220	1.100	0.286
Lessor's retained earnings	0.009	0.064	0.141	0.889
Percentage change in financial leverage of the lessor	-0.071	0.047	-1.510	0.148
Real exchange rate index	0.599	0.795	0.753	0.461
The level of annual change in inflation	0.007	0.154	0.045	0.964

The distribution of the density of the increase in the probability of default is shown in Figure 2. The probability of default decreased in those periods when leverage was observed in the range of 1.5 to 2 units, that is, when the weight of loan and own sources was, respectively, from 60% to 66.7% and from 40% to 33.3%.



**Figure 2. Distribution of the growth density of the default risk of the Fund for financing leasing operations.**

Therefore, the lessor's own sources of capital should not be the predominant form of financing leasing operations, but their specific weight should be at least one-third of the liabilities of the leasing operations financing fund. Currently, this form of financing accounts for 44% of all liabilities of the lessor. This is a fairly high share of financing with the help of equity instruments, but it does not pose a threat to the sustainability of the Fund for financing the main activity in terms of attracting leasing loans.

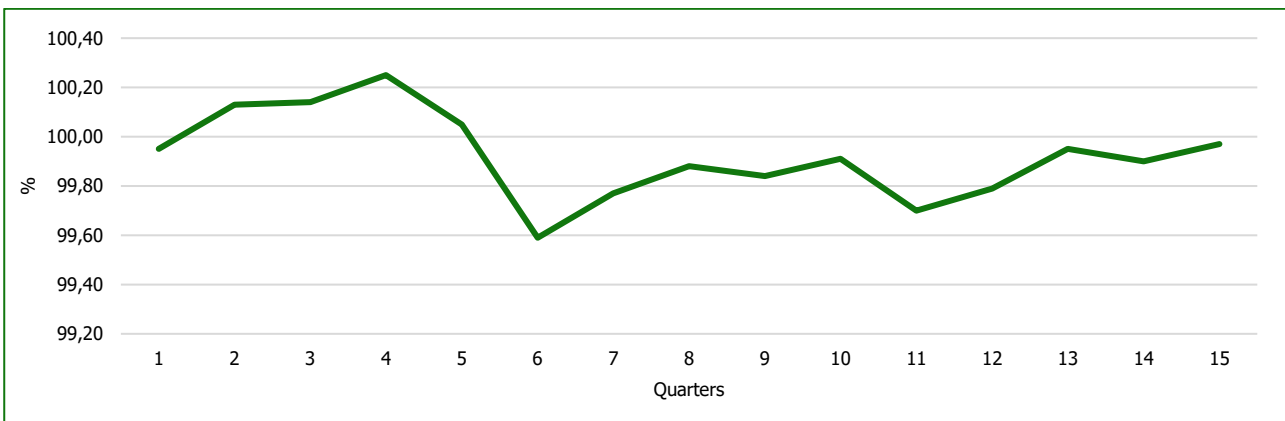
In accordance with the above, there is a problem of returning the profitability of lessors' activities, which requires the search for lending directions that will provide greater added value. To do this, we calculated the regression of the lessors' net profit from the demand for leasing from representatives of SMEs as the most promising from the point of view of the profitability of the lending direction.

Regarding the analysis of the profitability of the Fund for Financing Leasing Operations from the point of view of meeting the growing demand for obtaining a leasing loan from representatives of small and medium-sized businesses as the main generator of the lessor's profit, Table 6 shows the profitability forecast of the Fund for Financing Leasing Operations, depending on the forecast of demand for leasing from small and medium-sized businesses.

**Table 6. Forecast of the profitability of the Fund for financing leasing operations, 2023-2026** (Source: authors' calculations based on [33])

Quarter	Leasing demand forecast, % among SMEs	Forecast of changes in the lessor's profit logarithmically smoothed	Forecast of change in net profit, %	Forecast of changes in the profitability of the leasing fund, %
1	25.8	-4.85E-04	99.95	99.95
2	25.1	1.27E-03	100.13	100.13
3	24.4	1.40E-03	100.14	100.14
4	23.2	2.46E-03	100.25	100.25
5	23.0	5.14E-04	100.05	100.05
6	25.0	-4.13E-03	99.59	99.59
7	26.2	-2.27E-03	99.77	99.77
8	26.8	-1.24E-03	99.88	99.88
9	27.7	-1.60E-03	99.84	99.84
10	28.2	-8.61E-04	99.91	99.91
11	30.0	-3.02E-03	99.70	99.70
12	31.3	-2.15E-03	99.79	99.79
13	31.6	-4.87E-04	99.95	99.95
14	32.3	-1.01E-03	99.90	99.90
15	32.5	-3.22E-04	99.97	99.97

During the first year from the beginning of the intensification of meeting the demand of small and medium-sized businesses for leasing lending, the profitability of financing the leasing fund will grow to 100.25%, that is, by 20 pp. quarterly (Figure 3). But later, due to the limitation of temporarily free funds at enterprises, this direction of lending will be somewhat narrowed.



**Figure 3. Forecast of the profitability of the Fund for Financing Leasing Operations.** (Source: built on the basis of the author's calculations using statistical data [33])

These results allow us to state that currently, the most stable form of financing leasing operations is the loan form of raising capital, however, with the development of the stock market in Ukraine, the capital share mechanism will also gain weight. Currently, the most stable ratio of loan capital to own capital from the point of view of the lessor's solvency is the interval from 1.5 to 2, that is, the weight of borrowed funds ranges from 60% to 67%. The next conclusion is that the state support contributed to both the reduction of financial leverage and the risk it carries, as well as the risk of bankruptcy of the Fund for Financing Leasing Operations.

The emergence of competitive forms of lending (6.8%), the risk of exchange rate volatility and consumer price inflation (respectively 2.5% and 0.12%) increased the probability of bankruptcy due to losses from the main activity (12.7%). Currently, Ukrainian lessors have a tendency to conduct unprofitable activities. We see that this problem can be solved by strengthening the direction of financing small and medium-sized businesses, where demand growth is expected at the level of no less than 6% every quarter.

## DISCUSSION

There is no doubt that the logistic model proposed by us has both advantages and disadvantages. The main advantages are that its use:

- will provide a solution to the main task of the research, which consists in calculating the probability of financial stability or unstable financial condition of the Fund for Financing Leasing Operations under the influence of a number of economic and financial factors;
- allows you to answer the question of what effect, determined by one of the factors, contributed to the realization of the bankruptcy of the Fund for Financing Leasing Operations;
- will provide an opportunity to find out which form of capital attraction is the most optimal and most stable over time to ensure the financial stability of the Fund for financing leasing operations.

The disadvantage of this model may be the receipt of shifted interval estimates of the forecast of the probability of the realization of the bankruptcy of the Fund for Financing Leasing Operations.

However, this shortcoming is eliminated by the procedures of renormalization of variables and reduction to the first levels. This will make it possible to level the serial correlation of the residuals of the model, its heteroscedasticity and partially autocorrelation.

## CONCLUSIONS

1. The financing fund for leasing operations is one of the elements of the FCMALA functioning system, which is a set of own, loan, advanced and other sources of financing of the leasing portfolio of a lessor or a financial company engaged in the provision of financial leasing.

2. The model for assessing the financial stability of the Fund for Financing Leasing Operations is based on the determination of the impact of the increase in the risk of financial leverage on the ability of the lessor to fulfil its obligations, as well as on the determination of the possibility of ensuring the continuous profitable activity of the lessors and, at the same time, maintaining the financial stability of the Fund.

3. It is expedient to assess the probability of the event of default of the Fund using the method of building Bayesian logistic models with a normal type of conditional probability distribution. This will make it possible to predict the probability of the event of financial instability of the Fund for Financing Leasing Operations under the implementation of a number of economic conditions and the action of a number of financial factors (the appearance of competitive forms of financing fixed capital and renewal of fixed assets, inflation risks, volatility of the exchange rate and deterioration of conditions in the future for obtaining state support for financing leasing operations).

4. The most stable forms of financing for leasing operations are debt capital raising, equity share capital. State support contributes to the reduction of financial leverage and the risk inherent in it, as well as the risk of bankruptcy of the Fund for Financing Leasing Operations.

## REFERENCES

1. Burdeniuk, T., & Svirskiy, V. (2012). Teoretychni zasady finansovoho mekhanizmu. *Ekonomichniy analiz*, 10(2), 201-203.  
[http://nbuv.gov.ua/UJRN/ecan\\_2012\\_10%282%29\\_43](http://nbuv.gov.ua/UJRN/ecan_2012_10%282%29_43)
2. Bohdanchuk, O.L. (2014). Porivnialna kharakterystyka vydiv lizynhu. *Upravlinnia rozvytkom*, 4, 41-44.  
[http://nbuv.gov.ua/UJRN/Uproz\\_2014\\_4\\_17](http://nbuv.gov.ua/UJRN/Uproz_2014_4_17)
3. Vasylchyshyn, O.B. (2004). Komertsii banky ta lizynhovyi biznes v Ukraini: avtoref. dys ... kand. ekon. nauk: spets. 08.04.01. Ternopil.  
[http://library.wunu.edu.ua/images/stories/praci\\_vukladachiv/Факультет%20ББ/банк.%20менеджм.%20та%20обліку/Васильчишин%20О/дисертація/авто\\_реферат.pdf](http://library.wunu.edu.ua/images/stories/praci_vukladachiv/Факультет%20ББ/банк.%20менеджм.%20та%20обліку/Васильчишин%20О/дисертація/авто_реферат.pdf)
4. Vyshniakova, I.V. (2004). Ekonomichna efektyvnist lizynhovyykh uhod na promyslovyykh pidpriemstvakh: avtoref. dys. na zdobuttia nauk. stupenia kand. ek. nauk: spets. 08.06.01. Dnipropetrovsk.
5. Pukala, R., Vnukova, N. M., Andriichenko, Zh. O. et al. (2018). Yevrointehratsiini aspekty rozvytku rynkiv finansovykh posluh. Kharkivskiy natsionalnyi ekonomichnyi universytet im. S. Kuznetsia. Kh.:

- Ekskluzyv.  
<http://repository.hneu.edu.ua/bitstream/123456789/18677/1/УФП%20МОНОГРАФІЯ%202018.pdf>
6. Havryliuk, V.M. (2016). Analiz metodyk otsinky efektyvnosti lizynhovoykh operatsii. *Efektyvna ekonomika*, 6.  
<http://www.economy.nayka.com.ua/?op=1&z=4145>
  7. Dorofeieva, O. V. (2004). Finansovi ryzyky lizynhovoykh kompanii Ukrainy: avtoref. dys. kand. ekon. nauk: 08.04.01 / Dorofeieva Olha Viktorivna Ternopilska akademiia narodnoho hospodarstva. Ternopil.
  8. Kovalenko, N., & Chovniuk, Yu. (2000). Tendentsii rozvytku lizynhu: svitovyi dosvid i realii v Ukraini. *Bankivska sprava*, 6, 29–32.
  9. Kovaliuk, O. (2001). Finansovyi mekhanizm yak ekonomichna katehoriia. *Naukovyi visnyk Volynskoho derzhavnogo universytetu im. Lesi Ukrainky*, 4, 26–81.
  10. Krupka, M.I. (2001). Finansovo-kredytnyi mekhanizm innovatsiinoho rozvytku ekonomiky. Lviv: Vydavnychiy tsestr Lvivskoho nats. un.tu im. Ivana Franka.
  11. Kuznecova, A. Y., & Levchenko, O. A. (2017). The methodological approaches to classification of leasing. *Financial and Credit Activity Problems of Theory and Practice*, 1(22), 19–26.  
<https://doi.org/10.18371/fcaptop.v1i22.109735>
  12. Anzhela Ya. Kuznyetsova, Natalia I. Kozmuk, and Olexandr A. Levchenko (2017). Peculiarities of functioning of financial and credit mechanism for performing leasing operations in developed countries and in Ukraine. *Problems and Perspectives in Management*, 15(4), 209–221.  
[https://doi.org/10.21511/ppm.15\(4-1\).2017.05](https://doi.org/10.21511/ppm.15(4-1).2017.05)
  13. Kutsyk, P.O. (2012). Prohnoznyi analiz efektyvnosti finansovoho lizynhu yak formy finansuvannia kapitalovkladen. *Visnyk Lvivskoi komertsiiinoi akademii. Serii ekonomichna*, 39, 63–67.  
[http://nbuv.gov.ua/UJRN/Vlca\\_ekon\\_2012\\_39\\_17..](http://nbuv.gov.ua/UJRN/Vlca_ekon_2012_39_17..)  
 Available at: [Vlca\\_ekon\\_2012\\_39\\_17.pdf](http://nbuv.gov.ua/UJRN/Vlca_ekon_2012_39_17.pdf)
  14. Levchenko, O.A. (2017). Metodyky otsiniuvannia efektyvnosti lizynhovoykh operatsii. *European cooperation*, 10(29), 56–69.
  15. Maiorova, T. V. (2013). Investytsiinyi protses i finansovo-kredytni vazheli yoho aktyvizatsii v Ukraini. Kyiv: KNEU.
  16. Nastasiev, V.M. (2006). Orhanizatsiino-ekonomichni mekhanizmy aktyvizatsii lizynhovoi diialnosti pidpriemstv: avtoreferat dys. kand. ekon. nauk: 08.06.01. Lviv.
  17. Novyny Ukrainskoi Asotsiatsii lizynhodavtsiv.  
<http://www.uul.com.ua/stat/ranking/>
  18. Osnovni pokaznyky diialnosti finansovoykh kompanii ta lizynhozavtsiv.  
<https://bank.gov.ua/ua/statistic/supervision-statist>
  19. Ofitsiine veb-predstavnytstvo Derzhavnoi sluzhby statystyky Ukrainy.  
[https://www.ukrstat.gov.ua/operativ/menu/menu\\_u/sze\\_20.htm](https://www.ukrstat.gov.ua/operativ/menu/menu_u/sze_20.htm)
  20. Paliienko, I.V. (2012). Analiz suchasnykh metodyk otsinky efektyvnosti lizynhovoykh operatsii.  
[http://ela.kpi.ua/bitstream/123456789/12345/1/2012\\_2\\_Paliienko.pdf](http://ela.kpi.ua/bitstream/123456789/12345/1/2012_2_Paliienko.pdf)
  21. Topishko, T.I. (2008). Pryntsypy funktsii ta mekhanizmy lizynhovoykh operatsii. *Visnyk NUVHP. Serii «Ekonomika»*, 4(44), 210.  
<https://eprints.oa.edu.ua/1027/1/pruncypy.pdf>
  22. Tryhub, O.V. (2014). Orhanizatsiini aspekty ryzyk-menedzhmentu pry nadanni lizynhovoykh posluh. *Biznes Inform*, 6, 365–372.  
[http://nbuv.gov.ua/UJRN/binf\\_2014\\_6\\_64](http://nbuv.gov.ua/UJRN/binf_2014_6_64)
  23. Canbas, S., Cabuk, A., & Bilgin Kilic, S. (2005). Prediction of commercial bank failure via multivariate statistical analysis of financial structures: The Turkish case. *European Journal of Operational Research*, 166(2), 528–546.  
<https://doi.org/10.1016/j.ejor.2004.03.023>
  24. Cole, R.A., & Gunther, J.W. (1998). Predicting Bank Failures: A Comparison of On- and Off-Site Monitoring Systems. *Journal of Financial Services Research*, 13, 103–117.  
<https://doi.org/10.1023/A:1007954718966>
  25. Crowley, Frederick, D., & Loviscek, L. Anthony (1990). New directions in predicting bank failures: The case of small banks, *North American Review of Economics and Finance*, Elsevier, 1(1), 145–162.  
[https://doi.org/10.1016/1042-752X\(90\)90011-4](https://doi.org/10.1016/1042-752X(90)90011-4)
  26. DeYoung, R., & Torna, G. (2013). Nontraditional banking activities and bank failures during the financial crisis. *Journal of Financial Intermediation*, 22(2), 397–421.  
<https://doi.org/10.1016/j.jfi.2013.01.001>
  27. Weidner, Donald J. (2000). Synthetic Leases: Structured Finance, *Financial Accounting and Tax Ownership*, 25, 445.  
<https://ir.law.fsu.edu/cgi/viewcontent.cgi?article=1132&context=articles>

28. IBRD world lending data. (2022). <https://www.worldbank.org/en/about/annual-report>
29. Kulyniak, I. Ya. (2008). Classification of leasing depending on the purpose of the implementation of the subjects of leasing activity. *Klasyfikatsiia lizynhu zalezno vid mety zdysnennia subiektamy lizynhovoї diialnosti*. <http://www.vuzlib.su/articles/984-/1.html>
30. Leaseurope association of european leasors market and reserch trends. Annual statistics enquiry. <http://www.leaseurope.org/index.php?page=stats-surveys>
31. Nair, A., Kloppinger-Todd, R., & Mulder, A. (2004). Leasing. An Underutilized Tool in Rural Finance. Agriculture and Rural Development Discussion Paper 7. The International Bank of Reconstruction and Development. The World Bank. Washington, DC. <https://www.findevgateway.org/sites/default/files/publications/files/mfg-en-paper-leasing-an-underutilized-tool-in-rural-finance-2004.pdf>
32. Poghosyan, T., & Čihak, M. (2011). Determinants of Bank Distress in Europe: Evidence from a New Data Set. *J Financ Serv Res*, 40, 163–184. <https://doi.org/10.1007/s10693-011-0103-1>
33. Survey on the Access to Finance of Enterprises. [https://single-market-economy.ec.europa.eu/system/files/2023-01/SAFE%20Analytical\\_Report%202022.pdf](https://single-market-economy.ec.europa.eu/system/files/2023-01/SAFE%20Analytical_Report%202022.pdf)
34. Vakhitov, D. R., & Zamaletdinov, A. (2015). Leasing as a factor of economic growth. *Procedia Economics and Finance*, 23, 839-845. [https://doi.org/10.1016/S2212-5671\(15\)00365-2](https://doi.org/10.1016/S2212-5671(15)00365-2)
35. World foreign exchange. Monthly reports on stock exchange markets development. [https://www.bis.org/statistics/triennialrep/guidelines\\_cbanks.htm](https://www.bis.org/statistics/triennialrep/guidelines_cbanks.htm)

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## **МОДЕЛЬ ОЦІНКИ ФІНАНСОВОЇ СТІЙКОСТІ ФОНДУ ФІНАНСУВАННЯ ЛІЗИНГОВИХ ОПЕРАЦІЙ**

Ефективне функціонування фінансово-кредитного механізму активізації лізингової діяльності в Україні має важливе значення для збільшення кількості та підвищення якості лізингових операцій, а також покращення лізингової діяльності загалом.

У цьому контексті особливої актуальності та значення набувають способи оцінювання фінансової стійкості Фонду фінансування лізингових операцій як важливого елемента системи функціонування такого механізму, який водночас є сукупністю множинних джерел фінансування лізингового портфеля лізингодавця чи фінансової компанії, що здійснює діяльність із надання фінансового лізингу. Саме цьому питанню присвячено статтю, у якій за допомогою застосування економіко-математичного моделювання проведено оцінку ймовірності дефолту Фонду фінансування лізингових операцій за зростання співвідношення фінансового левериджу й урахування дії низки економічних і фінансових чинників та визначено, що найбільш стійкою формою фінансування лізингових операцій є позиковий капітал. Оцінку ймовірності реалізації події дефолту Фонду фінансування лізингових операцій запропоновано здійснювати за допомогою методики побудови баєсівських логістичних моделей із нормальним типом розподілу умовних імовірностей.

У дослідженні встановлено, що передбачувана макроекономічна ситуація та низькоінфляційне середовище є необхідними факторами стійкості Фонду фінансування лізингових операцій. Наголошено, що вагому роль відіграє державна підтримка фінансування лізингових проектів і розумне протистояння конкуренції з боку конкурентних технологій Fintech-сектора.

Одержані результати можна використовувати при оцінюванні ефективності портфелів лізингодавців та ухваленні рішень щодо вибору оптимальних джерел фінансування лізингових операцій.

**Ключові слова:** лізинг, лізингові операції, лізингова діяльність, фінансова стійкість, фонд фінансування лізингових операцій, баєсівські логістичні моделі, фінансовий леверидж

**JEL Класифікація:** C50, C59, G20, G21