BANKRUPTCY DIAGNOSIS AS THE ELEMENT OF STRATEGIC MANAGEMENT OF THE ENTERPRISES MARKETING ACTIVITY

Abstract. The article is aimed at the forming approaches for the estimated probability of bankruptcy in the system of strategic management of marketing activity which serves as a tool for coordinating production and distribution of goods and services based on the customer needs, market characteristics and the development of practical measures to meet identified needs. It is proved that strategic management of marketing activity is the difficult task because it is necessary to achieve a dynamic balance between environmental factors and internal resources of the enterprise.

The proposed analytical and applied support for the estimated probability of bankruptcy in the system of strategic management of marketing activity is based on the use of diagnostic expert systems that make it possible to formulate reasonable conclusions, to implement the necessary procedures aimed at the obtaining answers, to obtain the generalized results of analysis and to assess the probability of bankruptcy in a convenient form.

It is substantiated the procedure for the estimated probability of bankruptcy in the context of strategic management of marketing activity providing for the formation of a set of indicators based on the selected criteria characterizing the state of the enterprise as a whole and the level of marketing activity. It is established the membership functions of the fuzzy value of the indicator to the previously introduced term-sets of the levels of the probability of bankruptcy. The results of calculating membership functions for each of the selected indicators made it possible to obtain the objective result of the estimated probability of the enterprise bankruptcy according to the selected system of indicators grouped by the activity areas in conditions of uncertainty and variability of the external environment for the current and future periods. The proposed approach for the estimated probability of the enterprise bankruptcy based on the regression mechanism of inference serves as the basis for the production of strategic management influences aimed at the stabilizing the financial condition of the enterprise by harmonizing production and sales activities in the context of marketing activity.

Further areas of researches are the formation of a mechanism for strategic management of the enterprise marketing activity based on the implementation of the marketing concept in the context of the need to adapt to changing environmental conditions and consumer needs.
Keywords: management, strategic management, marketing, marketing activity, bankruptcy, estimated probability of bankruptcy.

JEL Classification G21, J31

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ДІАГНОСТИКА БАНКРУТСТВА ЯК ЕЛЕМЕНТ СТРАТЕГІЧНОГО УПРАВЛІННЯ МАРКЕТИНГОВОЮ АКТИВНІСТЮ ПІДПРИЄМСТВ

Анотація. Спрямовано на формування підходів до оцінювання імовірності настання банкрутства підприємства в системі стратегічного управління маркетинговою активністю, що виступає інструментом координації виробництва і розподілу товарів та послуг на основі дослідження потреб клієнтів, особливостей ринків збуту і розроблення практичних заходів задоволення виявлених потреб. Доведено, що стратегічне управління маркетинговою активністю являє собою складне завдання, оскільки необхідно досягти динамічної рівноваги між факторами зовнішнього середовища і внутрішніми ресурсами підприємства.

Запропоновано аналітико-прикладне забезпечення оцінювання імовірності банкрутства в системі стратегічного управління маркетинговою активністю базується на використанні діагностичних експертних систем, що дозволяють формувати обґрунтовані висновки, упроваджувати потрібні процедури, спрямовані на отримання відповідей, отримувати узагальнені результати аналізу та оцінки імовірності настання банкрутства у зручному форматі.

Обґрунтовано процедуру оцінювання імовірності банкрутства в контексті стратегічного управління маркетинговою активністю, що передбачає формування набору показників на основі обранних критеріїв, які характеризують стан підприємства в цілому і рівень маркетингової активності. Установлено функції належності нечіткого значення показника попередньо введеним терм-множинам рівнів імовірності настання банкрутства. Результати розрахунку функцій належності для кожного з відібраних показників дозволили отримати об’єктивний результат оцінювання імовірності банкрутства підприємства за обраною системою показників, що згруповані за напрямами діяльності, в умовах невизначеності та мінливості зовнішнього середовища для поточного і майбутнього періодів. Запропонований підхід до оцінювання імовірності банкрутства підприємств, заснований на регресійному механізмі логічного висновку, слугує основою для продукування
управлінських впливів стратегічного характеру, спрямованих на стабілізацію фінансового стану підприємства шляхом гармонізації виробничої та збутової діяльності в контексті маркетингової активності.

Подальшими напрямами досліджень є формування механізму стратегічного управління маркетинговою активністю підприємства на основі реалізації маркетингової концепції в умовах необхідності пристосування до мінливих умов зовнішнього середовища і потреб споживачів.

Ключові слова: управління, стратегічне управління, маркетинг, маркетингова активність, банкрутство, оцінювання ймовірності банкрутства.

Формул: 0; рис.: 3; табл.: 5; бібл.: 21.

Introduction. Marketing activity in the system of strategic management of modern enterprises is a key characteristic of business processes occurring in a separate organizational unit in a certain period of time. The key activity in this case has the signs of competitive advantages which determine the productivity of business processes, create their added value, support synergy and it is the tools of increase of competitiveness and can become a source of economy and additional effect. One of the main factors ensuring the achievement of the strategic development goals of domestic enterprises is the level increasing in marketing activity which including the activities aimed at the efficiency increasing of the enterprise. Marketing activity is determined by the flexibility of adapting production, sales, trade, financial and other activities of the enterprise to the changing conditions of the external environment, the market situation and the consumers requirements. There is a growing need for strategic business process management based on solving the critical problems for the further development of the enterprise, finding and actively using available resources to ensure continuous operation. A special place among such problems is the problem of violation of the financial stability and the emergence of a crisis due to reduced marketing activity and erroneous management decisions on the choice of strategic priorities of the enterprise. This sharpens the research interest in the problem of diagnosing the crisis as the element of strategic management of the enterprises marketing activity and the development of practical recommendations on the use of procedures for the estimated probability of bankruptcy.

Analysis and statement of the research problem. The analysis of the approaches to the enterprise strategic management and the directions of the definition of priorities of their further activity is thoroughly presented in the works of such foreign and Ukrainian scientists as Fedorovych R. [1], Kotler P. [2, 5], Lomovskykh L. [3] and others. The modern mechanisms of the bank staff motivation based on the value system have been the subject of the researchers researches, in particular Bagozzi R. [4], Hooley G. [6], Martynenko M. [7], Kosova T. [8]. Strategic aspects of marketing activities and a comprehensive study of marketing activities are the source for the study in the works of scientists: Czepiel J. A. [9], Kerin R. [10], Ranchhod A. [11]. Bankruptcy as the essential phenomenon in the enterprises development in a market economy is studied Sokhatska O. [12], Gabay J. [13], Lambin J.-J. [14].

Specific instruments of strategic management are not able to solve the problem as a whole since they do not take into account the consequences of the impact of a decrease in the enterprise marketing activity on its financial condition and the emergence of the threat of bankruptcy. The presence of the complex unresolved problems in the strategic management system caused by insufficient marketing activity and the need for a systemic vision of the issue of diagnosing bankruptcy determines the relevance of the study.

In this regard, the aim of the article is the development of analytical and applied ensuring for the estimated probability of bankruptcy in the system of strategic management of marketing activity in the context of increasing the efficiency of enterprises in general.

Results of a research study. In the circuit of strategic management of the enterprises marketing activity it is important to choose a modern decision-making method for diagnosing the state of the enterprises to identify the probability of bankruptcy based on the general principles of the diagnostic system by using the economic and mathematical methods. Expert systems are
characterized by the use of technologies for modeling the expert specialists’ behavior in the process of searching for options for solving the specific problems in the field of the enterprise activities which determines the appropriateness of their use.

The expert system using for analyzing the various aspects of the functioning of the enterprises based on the concentration of the practical experience of experienced specialists in a selected specific industry allows:

- perform the consulting functions on the specific issues at a high professional level to process the available information about the object;
- make the operational decisions on the implementation of management activities aimed at addressing key issues;
- speed up the time for preliminary research of the state and conditions of the object’s functioning;
- create the conditions for the enterprise personnel to master the theoretical and methodological basis for the analysis and diagnosis of the conditions of the object, the formation and implementation of the results of the effective administrative decision-making [15; 16].

Thus, the expert systems using in the context of strategic management of the enterprises marketing activity for estimated probability of bankruptcy has the following advantages and capabilities, in particular, it allows [17; 18]:

- to form the reasonable conclusions that allows increasing user confidence, especially when developing and managing the process of making managerial decisions by the enterprises manager and the structural divisions of the enterprises;
- to provide the users (enterprise manager, structural divisions) with the opportunity to implement the procedures aimed at the receiving answers;
- to form and provide the users (enterprise managers, structural divisions, structural units) the generalized results of the analysis and assessment of the object in a convenient and understandable format.

The procedure for estimating the probability of bankruptcy in the system of strategic management of the enterprises marketing activity is implemented in a fuzzy system with a logistic conclusion based on the regression mechanism, in the following sequence (Fig. 1).

The choice of indicators for the regression polynomial was made by the rating expert selection based on a survey of experts taking into account the following selection criteria [19; 20]:

- indicators refer to each of the characteristic groups that determine the direction of the enterprise activities (asset valuation, liquidity, financial stability, profitability, marketing activity);
- the rate with which indicators are included in the traditional models for estimated the probability of the enterprises bankruptcy;
- taking into account the specific characteristics of the industry;
- lack of multicollinearity.

It was proposed to use the following indicators for estimated the probability of bankruptcy of the investigated enterprise in the system of strategic management of marketing activity: the coefficient of asset mobility ($X_1$); the rate of turnover of accounts payable ($X_2$); the level of equity capital turnover ($X_3$); payback period of assets ($X_4$); the provision with own circulating assets ($X_5$); loan capital concentration ratio ($X_6$); the coverage ratio of liabilities from equity capital ($X_7$); the level of marketing activity ($X_8$); the volume of current assets ($X_9$); the intermediate coverage ratio ($X_{10}$); the coefficient of monetary independence ($X_{11}$).

The membership functions were calculated for the selected indicators of each of the possible states (Fig. 2).
Determining the purpose and objectives of the process study for estimated the probability of the enterprises bankruptcy

Forming of a set of indicators that characterizes the enterprise state as a whole and the level of marketing activity

Analytical description of the membership functions of the fuzzy value of the indicator of each of the term-sets of possible values:

\[ \mu_{\text{low}}(X_j), \mu_{\text{med}}(X_j), \mu_{\text{high}}(X_j), \mu_{\text{vhigh}}(X_j) \]

Introduction of term-sets of bankruptcy probability levels: «low» (L), «medium» (M), «high» (H), «very high» (VH)

Formation of a matrix of pairwise comparisons of selected indicators and its coordination

Calculation of weighting coefficients of regressive polynomials

\[ y_a(\hat{X}) = \sum_{j=1}^{n} a_{ij} \mu_j(\hat{X}_j), \]

\[ y_{\text{med}}(\hat{X}) = \sum_{j=1}^{n} a_{ij} \mu_{\text{med}}(\hat{X}_j), \]

\[ y_{\text{high}}(\hat{X}) = \sum_{j=1}^{n} a_{ij} \mu_{\text{high}}(\hat{X}_j), \]

\[ y_{\text{vhigh}}(\hat{X}) = \sum_{j=1}^{n} a_{ij} \mu_{\text{vhigh}}(\hat{X}_j) \]

Calculation of regressive polynomials

\[ d_j = \frac{\sum_{j=1}^{n} d_{ij}}{\sum_{j=1}^{n} d_{ij}} \]

Source: developed by the authors.

**Fig. 1** Analytical and applied ensuring for estimated the probability of bankruptcy in the system of strategic management of marketing activity

Source: developed by the authors.

**Fig. 2.** Membership functions of values for the linguistic variable level of marketing activity (\( X_8 \)) term-sets «low» (\( \mu_{\text{low}}(X_8) \)), «medium» (\( \mu_{\text{med}}(X_8) \)), «high», \( \mu_{\text{high}}(X_8) \), «very high» (\( \mu_{\text{vhigh}}(X_8) \))

Source: developed by the authors.
For the level of marketing activity ($X_8$) is as follows:

term «low»

$$
\mu_a(X_8) = \begin{cases}
\frac{x + 0.4}{0.225}, & x \in [-0.4; -0.175] \\
\frac{0.05 - x}{0.225}, & x \in [-0.175; 0.05]
\end{cases};
$$

term «medium»

$$
\mu_a(X_8) = \begin{cases}
\frac{x - 0.03}{0.185}, & x \in [0.03; 0.215] \\
\frac{0.4 - x}{0.185}, & x \in [0.215; 0.4]
\end{cases};
$$

term «high»

$$
\mu_a(X_8) = \begin{cases}
\frac{x - 0.3}{0.2}, & x \in [0.3; 0.5] \\
\frac{0.7 - x}{0.2}, & x \in [0.5; 0.7]
\end{cases};
$$

In accordance with the indicated ranges of possible values $X$, we determine the belonging of each linguistic variable to a certain term and the value of the corresponding membership functions. In Table 1, the value of the membership functions for the studied enterprise is grouped in the context of the selected indicators.

**The value of the membership functions of the indicators for the enterprise in 2008**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Coefficient</th>
<th>$\mu_n(X)$</th>
<th>$\mu_c(X)$</th>
<th>$\mu_v(X)$</th>
<th>$\mu_{dv}(X)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_1$</td>
<td>the coefficient of asset mobility</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,759</td>
</tr>
<tr>
<td>$X_2$</td>
<td>the rate of turnover of accounts payable</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,679</td>
</tr>
<tr>
<td>$X_3$</td>
<td>the level of equity capital turnover</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,352</td>
</tr>
<tr>
<td>$X_4$</td>
<td>payback period of assets</td>
<td>0</td>
<td>0</td>
<td>0,9</td>
<td>0</td>
</tr>
<tr>
<td>$X_5$</td>
<td>the provision with own circulating assets</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,667</td>
</tr>
<tr>
<td>$X_6$</td>
<td>loan capital concentration ratio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,8</td>
</tr>
<tr>
<td>$X_7$</td>
<td>the coverage ratio of liabilities from equity capital</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,826</td>
</tr>
<tr>
<td>$X_8$</td>
<td>the level of marketing activity</td>
<td>0</td>
<td>0,865</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$X_9$</td>
<td>the volume of current assets</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,557</td>
</tr>
<tr>
<td>$X_{10}$</td>
<td>the intermediate coverage ratio</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,96</td>
</tr>
<tr>
<td>$X_{11}$</td>
<td>the coefficient of monetary independence</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,058</td>
</tr>
</tbody>
</table>

Source: calculated by the authors.

The calculated values of the membership functions for the studied enterprise for the period 2008—2020 taking into account the previously calculated weight coefficients $d_i$ we substitute it into the regression relation. The results of calculating the regression polynomials are summarized in Tables 2—3.

**The value of calculating regression ratios for the studied enterprise for 2008—2013**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>$y_n$</td>
<td>0</td>
</tr>
<tr>
<td>$y_c$</td>
<td>0.11245</td>
</tr>
<tr>
<td>$y_v$</td>
<td>0.081</td>
</tr>
<tr>
<td>$y_{dv}$</td>
<td>0.47713</td>
</tr>
</tbody>
</table>

Source: calculated by the authors.
The value of calculating regression ratios for the studied enterprise for 2014—2020

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$y_n$</td>
<td>0</td>
<td>0.0809</td>
<td>0.28992</td>
<td>0.13524</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$y_c$</td>
<td>0.2846</td>
<td>0.1416</td>
<td>0.00864</td>
<td>0.25974</td>
<td>0.12114</td>
<td>0.1288</td>
<td>0.227</td>
</tr>
<tr>
<td>$y_v$</td>
<td>0.2566</td>
<td>0.2972</td>
<td>0.21973</td>
<td>0.2698</td>
<td>0.26045</td>
<td>0.34401</td>
<td>0.224</td>
</tr>
<tr>
<td>$y_{dm}$</td>
<td>0.0082</td>
<td>0.1151</td>
<td>0.20307</td>
<td>0.03</td>
<td>0.27333</td>
<td>0.14462</td>
<td>0.263</td>
</tr>
</tbody>
</table>

Source: calculated by the authors.

The proposed algorithm for diagnosing bankruptcy in the system of strategic management of marketing activity using the mathematical apparatus of the theory of fuzzy sets makes it possible to obtain the objective result for estimated probability of the enterprise bankruptcy according to the selected system of indicators grouped by areas of activity in conditions of uncertainty and variability of the external environment [21]. A substantiated approach for estimated probability of the enterprise bankruptcy based on the regression mechanism of inference, serves as the information and analytical basis for estimated probability of the enterprise bankruptcy in the future period which makes it possible to produce a managerial influence aimed at preventing possible problems in various areas of its activity, in particular, marketing one.

It is proposed to forecast the probability of bankruptcy in this work using the method of time series, the advantage of which is a clear presentation of the results. The values of the probabilities of the states of the studied enterprise for 2008—2020 are summarized in Tables 4—5.

Table 4

The value of the probabilities of possible states of the studied enterprise for 2008—2013

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{y}_n$</td>
<td>0</td>
<td>0</td>
<td>0.0152</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$\hat{y}_c$</td>
<td>0.16769</td>
<td>0.1325</td>
<td>0.5517</td>
<td>0.1407</td>
<td>0.15367</td>
<td>0.1869</td>
</tr>
<tr>
<td>$\hat{y}_v$</td>
<td>0.12079</td>
<td>0.2887</td>
<td>0.2173</td>
<td>0.4848</td>
<td>0.36236</td>
<td>0.4582</td>
</tr>
<tr>
<td>$\hat{y}_{dm}$</td>
<td>0.71152</td>
<td>0.5788</td>
<td>0.2158</td>
<td>0.3746</td>
<td>0.48398</td>
<td>0.3549</td>
</tr>
</tbody>
</table>

Source: calculated by the authors.

Table 5

The value of the probabilities of possible states of the studied enterprise for 2014—2020

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{y}_n$</td>
<td>0.4242</td>
<td>0.223</td>
<td>0.01198</td>
<td>0.36007</td>
<td>0.16793</td>
<td>0.20861</td>
<td>0.368</td>
</tr>
<tr>
<td>$\hat{y}_c$</td>
<td>0.3826</td>
<td>0.468</td>
<td>0.30461</td>
<td>0.37402</td>
<td>0.36105</td>
<td>0.55716</td>
<td>0.395</td>
</tr>
<tr>
<td>$\hat{y}_{dm}$</td>
<td>0.0122</td>
<td>0.1813</td>
<td>0.28151</td>
<td>0.04159</td>
<td>0.37891</td>
<td>0.23423</td>
<td>0.426</td>
</tr>
</tbody>
</table>

Source: calculated by the authors.

Thus, the most likely in 2020 was a state indicating the highest level of stability of the enterprise ($\hat{y}_{dm} = 0.426$) and a low probability of bankruptcy.

The predicted value of the probability of the corresponding state of the enterprise in 2021 is calculated for each row of the Tables which made it possible to construct the approximating curve (Fig. 3).
Fig. 3. Dynamics of the probability of bankruptcy of the studied enterprise

Source: developed by the authors.

From the resulting graph (see Fig. 3), we can conclude that the probability of bankruptcy of the studied enterprise in 2021 will be 2%.

Timely identification of signs of possible bankruptcy in the system of strategic management of marketing activity will allow the owners and managers of the enterprises to take urgent measures to correct their financial condition and reduce the probability of bankruptcy by forming and implementing a set of management decisions aimed at the preventing possible problems in production, sales and other areas. activities of the enterprise in harmony with the external environment.

The generalization and systematization of the calculations of the probability of bankruptcy makes it possible to draw conclusions about the possibility and necessity of further organizational measures in the strategic management system to restore the enterprise stability with a certain threat of bankruptcy as the element of marketing activity which makes it possible to coordinate the possibilities of production and the process of distribution of goods and services in order to increase flexibility and its long-term performance.

Conclusions. The article substantiates the approach for estimated probability of the enterprise bankruptcy in the system of strategic management of marketing activity which allows to coordinate efforts in the production sphere and sales system based on the research of customer needs, market features of goods and services and the effective use of modern methods. It is established that the purpose of strategic management of marketing activity of the enterprises is the task of achieving a dynamic balance between environmental factors and internal resources of the enterprise.

It is substantiated the analytical and applied support for estimated probability of the enterprise bankruptcy in the context of strategic management of marketing activity, involving the use of diagnostic expert systems that make it possible to formulate reasonable conclusions on the object under study, to implement the necessary procedures in the direction of finding effective tools for solving the identified problems, to obtain the generalized results of the analysis for estimated probability of the enterprise bankruptcy in the current and future period.

The procedure for estimated probability of the enterprise bankruptcy in the system of strategic management of marketing activity which involves the formation of a set of indicators based on the selected criteria that characterize the activities and the state of the enterprise as
a whole, and in particular the level of marketing activity. The established functions of belonging to the fuzzy value of the indicator to the previously introduced term sets of the levels for estimated probability of the enterprise bankruptcy allowed to form a regression function. Based on the obtained values of regression ratios, the objective result for estimating the probability of the enterprise bankruptcy according to the selected system of indicators, grouped by areas of activity. The values of the probabilities of the studied enterprise for 2008—2020 became the basis for predicting the probability of bankruptcy in 2021 based on the construction of the approximate curve that allows to assess the effectiveness of available resources and potential marketing activities, identify the possible factors and problems in strategic management.

The implementation of the proposed approach for estimated probability of the enterprise bankruptcy allows from the standpoint of strategic management to form the adequate corrective measures to eliminate the threats at the initial stage of the economic crisis and bring them to the trajectory of positive shifts, stabilization and growth.

Further areas of research are the formation of a mechanism for strategic management of the enterprise marketing activity based on the implementation of the marketing concept in the context of the need to adapt to changing environmental conditions and consumer needs.

**Література**

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