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COMBINING FORECASTING OF INTERNAL AND EXTERNAL CRISES IN THE MANAGEMENT OF INDUSTRIAL ENTERPRISE DEVELOPMENT

В статті доведено, що комбінування прогнозів щодо виникнення внутрішніх та зовнішніх криз надає промисловому підприємству підстави для подальшої розробки стратегії розвитку.

Визначено, що глобальну економічну кризу найбільш доцільно прогнозувати шляхом аналізу економічних циклів. Пропонується глобальну економічну кризу прогнозувати, як попадання у нижню фазу хвиль економічних циклів або збіг декількох таких станів, що посилює кризу.

Для прогнозування економічних циклів у роботі пропонується виходити з припущення, що в цілому розвиток економіки має гладкий тренд, а відхилення від прямої лінії обумовлено або економічними циклами, або непередбачуваними подіями, наприклад, війною. У якості показника, що характеризує стан економіки в цілому, пропонується обсяг валового внутрішнього продукту. А галузеві економічні кризи пропонується прогнозувати через аналіз можливостей якісних стрибків та аналіз наслідків локальних криз у інших галузях.

Доведено, що прогноз можливостей якісних стрибків здійснюється шляхом формалізації експертних оцінок поточного становища у галузі та досліджень щодо вдосконалення продукції та технологій, що використовуються у галузі, до якої відноситься промислове підприємство.

Запропоновані у статті моделі та методи складають науково-методичній підхід щодо прогнозування кризових явищ при управлінні розвитком промислового підприємства, в основу чого покладено врахування особливостей внутрішніх та зовнішніх криз, що можуть загрожувати промисловому підприємству. Використання цього підходу на промисловому підприємстві дає можливість виявити загрозу різних видів кризових явищ та оцінити вплив кризи на прогноз реалізації продукції промислового підприємства.

The paper proves the combination of forecasting internal and external crises provides an industrial enterprise for further development of a strategy under crisis conditions. The proposed models and methods constitute a scientific and methodological approach to forecasting crisis phenomena in the management of industrial enterprise development based on taking into account the characteristics of internal and external crises, which may threaten the industrial enterprise. Using the approach in an industrial enterprise makes possible to identify the threat of various types of crisis phenomena and assess the impact of the crisis on the forecast of sales of industrial enterprises.

Ключові слова: комбінування, прогнозування, кризові явища, кризи, управління, розвиток, промислове підприємство

Keywords: combination, forecasting, crisis phenomena, crises, management, development, industrial enterprise

Introduction. Ensuring the timeliness and accuracy of crisis forecasting is one of the most difficult tasks in managing the development of an industrial enterprise. A crisis that is detected in time gives the company a competitive advantage and additional opportunities for development, and the emergence of a crisis that the company did not expect, threatens existence.

Literature review. Depending on the source of the crisis, the forecasting of internal and external crises differs. Internal crises are caused by errors in the management of an industrial enterprise or are the consequences of natural changes in the stages of the life cycle of the enterprise. Forecasting the internal crises of an industrial enterprise is a fairly popular research topic, but for the most part they address financial crises and represent various improvements to the Altman model (Altman, 1967). There are also Western studies of the causes of internal crises in industrial enterprises and proposals for their forecasting, but they cannot be used in the conditions of the eclectic post-Soviet economy, which is typical of Ukraine. Among the current studies on forecasting internal crises in enterprises should be noted carried out by T. Kulakovskaya (2014).

Analysis of methods and models for diagnosing the critical state of the enterprise, which explores the indicators used in models for forecasting crises and bankruptcy. It is concluded that all popular models ignore or underutilize the indicators of business activity of the enterprise, and focus on financial stability. Also, common models do not take into account the specifics of the industry and the peculiarities of national economies. These findings confirm the relevance of developing crisis forecasting methods for industrial enterprises, which would take into account the above features and provide an opportunity to predict not only financial crises and the likelihood of bankruptcy, but also business crises, which are prerequisites for financial crises.

The analysis of approaches to the diagnosis of financial insolvency of the enterprise and ranking in terms of prognostic ability was carried out in the work of O. Vasiliev and V. Goy (2016). It was concluded that the greatest prognostic ability has methods based on regression and discriminant analysis, the average - rating, criterion and coefficient analysis, and the lowest - analog and regulatory approaches. It is concluded that the most appropriate is to use a hybrid approach with the analysis of the cause-and-effect relationships of early bankruptcy. It is claimed that this makes it possible to identify imbalances in the organizational and economic structure of the enterprise and to identify the deterioration of both financial and non-financial indicators. But how exactly it is proposed to analyze non-financial indicators in this study is not disclosed. Thus, like other approaches, the main focus of O.Vasiliev and V.Goy (2016) is on predicting bankruptcy, and other types of crises have been ignored.

Thus, most researchers consider the internal crisis of the company only as a threat to its financial condition and the likelihood of bankruptcy (Hroznyi, I. etc., 2018; 2019). But, in most cases, the financial crisis is only a consequence of crises of other types, such as technological, personnel, logistics, sales, and so on.

External crises can be the result of gradual development or qualitative leaps. With the gradual emergence of the crisis, the external environment for a long time shows a tendency to deteriorate important for the industrial enterprise indicators. The crisis due to qualitative jumps occurs relatively instantly, without a gradual deterioration. Prediction of jumps is possible only if scientific and technological progress is taken into account.

Forecasting of external crises affecting enterprises has been carried out by domestic and foreign researchers in various aspects. Thus, modeling of exchange rate forecasts in the crisis was carried out by G. Bobrytska, O. Petrenko and L. Filatova (2017). Predicting external crises due to cyclicality, long Kondratiev waves, etc. is quite common. Thus, in the study of L. Sapayeva (2013) the main factor of global crises are demographic cycles.

However, not enough attention is paid to forecasting exactly how these cycles affect the Ukrainian economy.

Similarly, the forecasting of crisis phenomena through long waves is proposed to be carried out in the study by N. Stepaniuk (2013), which analyzes the main approaches to forecasting crisis phenomena and identifies the causes of crises in Ukraine. To forecast financial and economic crises in the country, it is proposed to take into account the following indicators (Makarenko, 2008; Stepanyuk, 2013):

- reduction of the number of workers;
- reduction of wages;
- relocation of production facilities to other regions;
- mergers and acquisitions.

But this promising idea has not been brought to the level of a specific model or method of calculating the probability and strength of the crisis, taking into account the characteristics of Ukrainian industrial enterprises.

N. Orlovska (2012) O. suggests predicting crises by analyzing several types of short and long economic cycles. She believes that the coincidence of the peaks of several cycles gives a fairly reliable forecast of general economic crises. For analysis N. Orlovskaya suggests using the economic cycles of Zhuglyar, Kuznets, Kondratiev and Kitchin. Among the advantages of this approach is the stated ability to predict crises due to changes in technological structure, which is taken into account by the cycles of Kitchin and Zhuglyar. But it should be noted that not all global crises coincide with economic cycles. In addition, no specific tools have been proposed to identify these cycles in Ukraine.

Among the promising approaches should also be noted the model of forecasting the crisis in the economy of Ukraine, in which O. Shulgina (2011) tried to calculate the relationship between a set of macroeconomic indicators and the onset of the crisis. Among the indicators related to the Ukrainian crises were the volume of production of agricultural enterprises, domestic public debt, external public debt, budget deficit, industrial production index. But, like other approaches, this one does not take into account the specifics of the external crisis of industrial enterprises.

Results of the research. When forecasting general economic crises, domestic researchers used a system of indicators or analysis of economic cycles. But none of the proposed methods took into account the relationship between the general crisis and the crisis in the industrial enterprise.

Thus, the crisis forecast for the enterprise consists of two areas - forecasting external crises that affect the industrial enterprise, and forecasting internal crises due to the life cycles of the enterprise.

To forecast internal crises at an industrial enterprise, it is proposed to create a system of indicators, depending on the forecasts of deterioration or improvement of which the probability of a crisis is estimated. The system of indicators is based on the principles of building a balanced system of indicators, taking into account the characteristics of Ukrainian industrial enterprises, especially enterprises of the machine-building industry.

Forecasting crises that may arise due to lack of resources or bottlenecks requires the inclusion of indicators that characterize the effectiveness of processes:

- expansion of production;
- modernization of production;

- product modernization;
- personnel management.

All this led to the choice of indicators to predict the internal crisis of the industrial enterprise, which are combined into the following groups:

- production;
- staff;
- finance.

These groups differ from the classical groups adopted for a balanced scorecard because they are needed to forecast only internal crises. Therefore, for example, such groups as the "market" in the current aspect do not make sense, because it is a source of external crises. In addition, in contrast to the classic balanced scorecard, the task of the scorecard is to forecast the crisis of the industrial enterprise, rather than performance management.

It is proposed to include the following characteristics in the group of indicators «Production»:

- depreciation forecast;
- equipment loading forecast;
- forecast of losses and marriage.

The group of indicators "Personnel" is proposed to include characteristics, which reflect the qualifications and staffing:

- forecast of staff qualifications;
- staffing forecast;
- forecast of labor costs.

Finally, the group of indicators "Finance" is proposed to include characteristics, which characterize the crisis on the part of financial security:

- liquidity forecast;
- forecast of the cost of borrowed capital;
- profitability forecast.

Forecasting of indicators-indicators of the internal crisis of an industrial enterprise is proposed to be carried out by combining simulation modeling and regression-correlation modeling. This makes it possible to take into account both the trends that exist in the development of the industrial enterprise, and changes in the life cycles of the enterprise and the products it produces.

In addition, this type of forecasting can use forecasts of exogenous factors, which are provided by authoritative sources (Prokopenko, 2015). This makes it possible to take into account the bottlenecks in the functioning of the industrial enterprise system. The relationship between the forecasts of indicators of the internal crisis of the industrial enterprise and endogenous and exogenous sources are shown in tabl. 1.

That is, already existing forecasts from authoritative sources are used to calculate forecasts of the internal crisis at the industrial enterprise. Thus, the inflation forecast, which affects the cost of borrowed capital and makes it possible to identify the internal funding crisis, can be taken from the forecasts of the World Bank or from the forecasts of the International Monetary Fund.

Table 1

Relationship between forecasts of indicators-indicators of internal crisis of industrial enterprise and endogenous and exogenous sources

Indicator	Endogenous sources	Exogenous sources
Depreciation	Equipment modernization plan	–
Loading equipment	Production plan	–
Losses and shortages	Quality management plan	–
Qualification staff	Staff structure, staff turnover indicators, qualifications	Demographic forecasts
Staffing	Indicators of staff turnover, qualifications, age of staff	Demographic forecasts
The cost of labor	Financial plan	Demographic forecasts, migration policy of neighboring countries
Liquidity	Financial plan	–
The cost of the involved capital	Financial plan	Inflation forecast
Profitability	Financial plan	Exchange rate forecast

The forecasting of all the above indicators is based on regression-correlation models, with additional consideration of the impact of other forecasts, which are irregular sources of the crisis. In general, the model for forecasting indicators has the form:

$$P_t^k = G\left(F\left(P_{t-1}^k, E_t^r\right), E_t^i\right), \quad (1)$$

where

P_t^i – forecast of the k-th indicator of the internal crisis in the t-th period;

G – a function that makes adjustments for factors that cannot be taken into account in the correlation-regression model;

F – a function that reflects the dependence obtained by approximating the correlation-regression model;

P_{t-1}^i – the value of the i-th indicator of the internal crisis in the t-1st period;

E_t^r – many factors that are related to the indicator and the relationship with which can be established by correlation and regression analysis;

E_t^i – many external factors that are related to the indicator, but due to the lack of sufficient statistics can not be included in the correlation-regression model.

Therefore, when developing a system of indicators for forecasting the internal crisis, first with the help of correlation-regression analysis, an approximation of the studied dependence is carried out. Then to the received model adjustments which consider influences of other factors, first of all, changes in a life cycle of the enterprise and production are added. This model makes it possible to calculate medium-term forecasts of indicators, further analysis of which using the previously described model to analyze the trends of a balanced scorecard provides an establishment of whether the projected dynamics of industrial enterprises is positive or negative. The presence of negative trends indicates the possibility of a crisis. In addition, this simulation model can be used to test crisis management scenarios and assess industrial bottlenecks. The method of selection of such factors as the schedule of equipment modernization, production schedule, sales plan, etc. can take into account the narrow months at the enterprise and build scenarios for the development of industrial enterprises in a crisis.

When forecasting external crises that affect the industrial enterprise, the main direction of the study is to forecast the market. After all, all local crises in the external environment, which develop in the country's economy, eventually manifest themselves as a crisis in the real sector, when demand for goods falls. The fundamental difference from the point of view of an industrial enterprise is only whether the crisis is global, ie the whole real sector of the economy is involved, or the crisis is sectoral, ie it is observed only in a particular industry.

From the point of view of relations between the enterprise, as an economic entity and the external environment, the main thing is the sale of manufactured products. The economic crisis is manifested as a general decline in economic activity, which ultimately affects the decline in demand for enterprise products. Therefore, the main direction of crisis forecasting is to forecast the volume of demand for its further analysis. In addition, it is proposed to forecast certain indicators of the probability of various types of external crisis, which can be used as additional grounds for analysis and development of measures for the development of industrial enterprises in a crisis.

The analysis of market trends is proposed to be carried out by correlation-regression analysis, with several strata. For the formation of strata, it is proposed to use the method of clustering k-means, which forms the strata of markets with similar characteristics.

To cluster industrial products in order to further determine the losses of markets, it is proposed to use such characteristics as product type, product capacity, price category and so on.

It is most expedient to predict the global economic crisis by analyzing economic cycles. It is proposed to forecast the global economic crisis as falling into the lower phase of the waves of economic cycles or the coincidence of several such states, which exacerbates the crisis. Of the most studied economic cycles, it is proposed to consider four:

Kitchin cycles (2-4 years), which reflect the delays in the response of manufacturing enterprises to overproduction of goods;

Juglar cycles (7-10 years), which reflect the delays between inflows and outflows of investment capital;

Kuznets' rhythms (15-29 years), which reflect demographic fluctuations;

long waves of Kondratiev (50-60 years), which reflect the impact of scientific and technological progress and changes in the structure of production.

To predict economic cycles, it is proposed to assume that in general the development of the economy has a smooth trend, and deviations from the straight line are due to either economic cycles or unforeseen events, such as war. As an indicator that characterizes the state of the economy as a whole, the volume of gross domestic product is proposed. To take into account economic cycles, it is advisable to use the Holt-Winters method

$$GDP_{t+p} = \left(\overline{GDP}_t + p \cdot Z_t^L\right)S, \quad (2)$$

where

GDP_{t+p} – GDP forecast for p periods;

$\overline{GDP}_t$ – exponentially smoothed value of GDP;

p_L – the number of the period for which the forecast is made;

Z_t – trend value for the last period;

S – seasonality ratio for the same period in the last season.

The forecast using the Holt-Winters method can be used for all types of economic cycles, while changing the smoothing coefficient, which depends on the length of the economic cycle. It is proposed to forecast sectoral economic crises through the analysis of the possibilities of qualitative jumps and the analysis of the consequences of local crises in other industries.

The forecast of opportunities for qualitative jumps is carried out by formalizing expert assessments of the current situation in the industry and research to improve products and technologies used in the industry to which the industrial enterprise belongs. The forecast of qualitative jumps is carried out by means of model:

$$Q = max\left(\frac{v^S\sum_e w_e^S S_e}{6}, \frac{v^T\sum_e w_e^T T_e}{6}, \frac{v^M\sum_e w_e^M M_e}{5}\right), \quad (3)$$

where

Q_s – forecast of qualitative jumps which can provoke crisis at the industrial enterprise;

v^S – the share of the results of the industrial enterprise, which depends on the qualitative leaps in the field of substitute goods;

v^T – the share of the results of the industrial enterprise, which depends on the qualitative leaps in technology;

v^M – the share of the results of the industrial enterprise, which depends on the qualitative leaps in the field;

w_e^S – the weight of the e-th expert in the analysis of the development of substitute goods that can replace the products of an industrial enterprise;

w_e^T – the weight of the e-th expert in the analysis of the development of production technologies used in the industrial enterprise;

w_e^M – the importance of the e-th expert in analyzing the development of marketing communications that may affect the industrial enterprise;

S_e – forecast of the e-th expert on the possibility of substitute goods;

T_e – forecast of the e-th expert on the possibility of alternative production technologies;

M_e – forecast of the e-th expert on the possibility of alternative marketing communications.

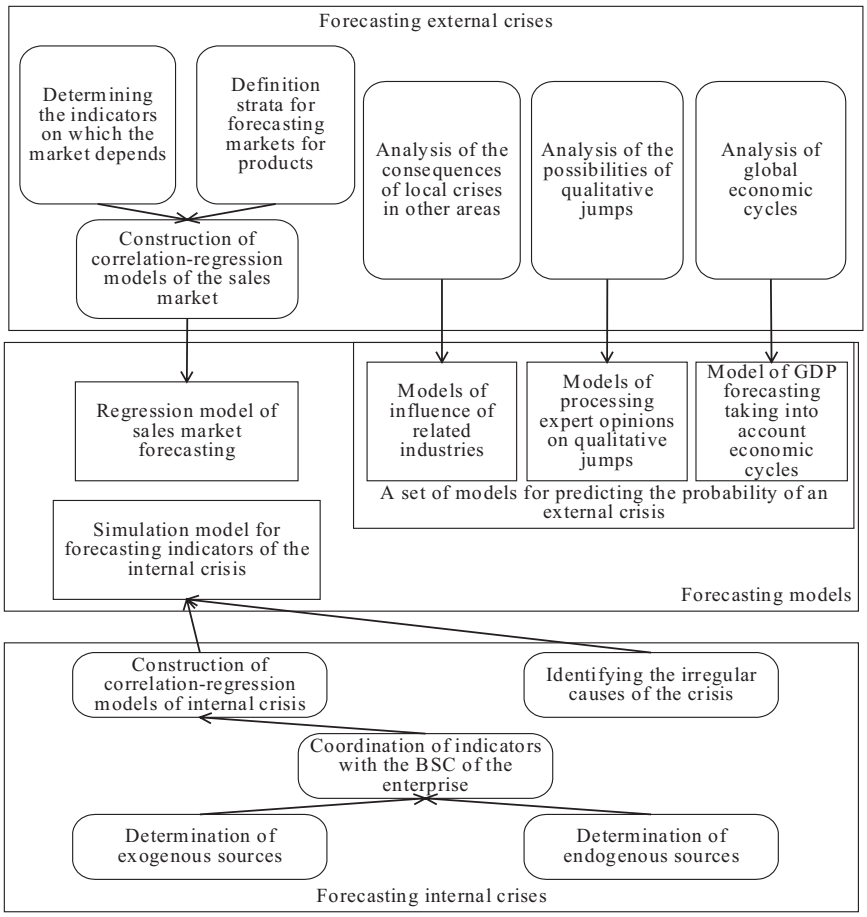
Of all the areas of assessing the qualitative leaps that can cause a crisis, it is enough to choose the one is most at risk, to assess the strength of the crisis, but for further development of measures for industrial development in a crisis requires all forecasts. Quantitative and qualitative assessments provided by experts on the possibility of qualitative changes that pose a threat of crisis are shown in tabl. 2.

Table 2

Template of expert opinions on the possibility of quality jumps

Criterion	Expert opinion	Quantitative assessment
The possibility of the emergence of substitute products with significantly better characteristics	Impossible in a strategic perspective	0
	Maybe in 1-2 years	1
	Will appear in 1-2 years	3
	They have already existed	6
The possibility of the emergence of production technologies with significantly better characteristics	Impossible in a strategic perspective	0
	Maybe in 1-2 years	1
	Will appear in 1-2 years	3
	They have already existed	6
Possibility of changes in marketing communications	Impossible in a strategic perspective	0
	Maybe in 1-2 years	1
	Will appear in 1-2 years	2
	They have already existed	5

Thus, the above measures to develop a system for forecasting internal and external crises of the industrial enterprise are carried out according to the scheme in fig. 1.



Picture 1. The sequence of development of a crisis forecasting system in the management of industrial enterprise development

Conclusion. Thus, the combination of forecasting internal and external crises provides the industrial enterprise for further development of strategy under crisis conditions. The proposed models and methods constitute a scientific and methodological approach to forecasting crisis phenomena in the management of industrial enterprise development based on taking into account the characteristics of internal and external crises, which may threaten the industrial enterprise. The use of this approach in an industrial enterprise makes it possible to identify the threat of various types of crisis phenomena and assess the impact of the crisis on the forecast of sales of industrial enterprises.

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ТОРГОВІ МАРКИ МІНЕРАЛЬНИХ ВОД: КЛАСИФІКАЦІЯ ЗА ПОХОДЖЕННЯМ ТА ЗАПОРУКА РИНКОВОГО УСПІХУ

На сьогоднішній день існує багато способів класифікації торгових марок та віднесення їх до окремих категорій. У цій статті представлено нову класифікацію торгових марок за походженням, а саме з точки зору території та часу їхньої появи на ринку. Як приклад, було обрано торгові марки бутильованої мінеральної води — продукту, який має багаторічну історію свого розвитку в Україні. Представлений у статті підхід до класифікації торгових марок мінеральних вод було створено з урахуванням того, що, по-перше, Україна набула незалежності лише у 1991 р., тоді як мінеральні джерела, розташовані на теренах сучасної України, існують протягом кількох століть, і, по-друге, незважаючи на те, що в Україні кількість мінеральних джерел є однією з найбільших у Європі (близько 500), у точках роздрібної торгівлі є багато пляшок мінеральних вод, імпортованих з країн Західної Європи, зокрема з Франції, Італії та Німеччини.

У статті проаналізовано, які бувають види торгових марок за походженням із позиції території та часу, їхні особливості, переваги та недоліки, притаманні кожному з них, а також заходи, які необхідно провести задля впровадження нових торгових марок мінеральних вод на ринок і зрештою перетворення їх на бренди.

Крім того, стаття відповідає на питання, як відрізняються один від одного той чи інший вид торгової марки та для яких категорій мінеральних і питних вод найчастіше застосовується кожен