

SCIENTIFIC AND METHODOLOGICAL APPROACH TO ADAPTIVE DIVERSIFICATION OF INDUSTRIAL ENTERPRISE DEVELOPMENT UNDER CRISIS CONDITIONS

Hanna Tarasova

Abstract. The article establishes that Ukrainian enterprises operate in the conditions of permanent economic crises and changes in the economic environment as a result of further integration of Ukraine into the world markets. This leads to the discrepancy between the state of domestic industrial enterprises and the requirements of the economic environment. To solve this problem, a scientific and methodical approach has been developed to adapt the diversification of the industrial enterprise development in a crisis that is based on the assessment of the existing and potential crises and the formalization of the assessment of the crisis impact, which enables an industrial enterprise to justify diversification measures in order to adapt to the crisis and to save the planned strategic development benchmarks.

Keywords: adaptation, diversification, development, industrial enterprise, assessment, strategic reference points, crisis

JEL Classification: L230, C530, O210

Author(s):

Hanna Tarasova

Kyiv National University of Technologies and Design (KNUiD), Nemirovich-Danchenko Street, 2, Kyiv, Ukraine, 01011

E-mail: tarasova.ganna@gmail.com

<https://orcid.org/0000-0002-5476-9881>

Citation: Tarasova, H. (2018). Scientific and methodical approach to adaptive diversification of industrial enterprise development under crisis conditions. *Virtual Economics*, 1(1), 42-52. [https://doi.org/10.34021/ve.2018.01.01\(3\)](https://doi.org/10.34021/ve.2018.01.01(3))

Received: June 12, 2018. Revised: August 4, 2018. Accepted: September 2, 2018.

© Author(s) 2018. Licensed under the [Creative Commons License - Attribution 4.0 International \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/)

Hanna Tarasova

Virtual Economics, Vol. 1, No. 1, 2018

1. Introduction

For Ukrainian industrial enterprises, which are still in the fourth technological stage, not only is the adaptation to crisis important, but also the diversification is, in order to increase competitiveness as a response to global technological and marketing changes.

Adaptation of the industrial enterprise in the general sense means the process of accumulation and use of information in the enterprise management system, the purpose of which is to achieve optimal state or behavior in an unstable external environment and under conditions of insufficient information. When adapting, the parameters and structure of the system, the algorithm of functioning, business processes, etc. can change (Glushkov et al., 1974; Prokopenko & Shishatsky, 2014).

Diversification in the context of the development of an industrial enterprise is an increase in diversity in the implementation of enterprise development. This may be an expansion of the range of products manufactured by the company, the change or expansion of the markets, the development of new technologies, etc. (Milovanov, 2006).

Accordingly, the adaptive diversification of the development of an industrial enterprise in a crisis means the process of accumulation and use of information on increasing the diversity of parameters and structure of an industrial enterprise, its technologies, product mix and business processes in response to existing or expected crisis.

2. Literature review

The issue of anti-crisis adaptation and diversification of industrial enterprises was dealt with by many domestic researchers, who considered some aspects of this problem.

O. Kuzmin and Kh. Drymalovska (2013) suggested diversification as an aspect of increasing competitiveness in order to better overcome crises. They believe that at the present stage of development, the diversification of Ukrainian industrial enterprises is not given enough attention. The diversification development in Ukrainian industrial enterprises is proposed to carry out simultaneously in many areas. The main directions should be strengthening of competitive positions in the national market and access to the world market, modernization of production technologies, expansion of markets, creation of new workplaces, optimization of utilization of production capacities, attraction of scientists and inventors (Hroznyi et al., 2018). But practical recommendations for the implementation of the proposed directions of diversification are not provided, which limits the use of this approach.

P. M. Maidanevych (2014) offers to calculate a comprehensive comparative characteristic of the competitive status depending on the stage of the life cycle, which reflects the potential of the enterprise, its position on the market, as well as the ability to maintain its position under the influence of destabilizing factors of the environment (Milovanov, 2006). He considers it necessary to build a development strategy depending on the life cycles of the enterprise, when

managing the development of an industrial enterprise under crisis conditions. The main disadvantage of this approach is to respond to a crisis that has already occurred without forecasting future probable crises.

Diversification as a component of strategic development of the enterprise is considered by I.O. Gadzevych (2014), who proposed a model for evaluating the appropriateness of diversification, which is based on the comparison of income from diversification and the cost of its implementation. The main purpose of enterprise management is to select such diversification projects that would not significantly damage the financial and economic condition of the enterprise and its main activities during the implementation of these projects. Also, diversification projects are evaluated in terms of risks calculated on the basis of the yield model of the fixed assets. The disadvantage of this approach is to consider diversification as an independent value that the enterprise does in any case, rather than respond to the challenges of the environment. Insufficient attention is also paid to forecasting the state of the internal and external environment of the company, which will affect the effectiveness of diversification projects.

Methods of providing financial stability of the enterprise under crisis conditions are considered in the works (Delas et al., 2015; Lakhno et al., 2018; Pająk et al., 2016), in which the directions of carrying out the enterprise sanitation and innovative ideas search for realization of the anti-crisis strategy are investigated. Particular attention in these studies is drawn to the need for timely prediction of the onset of the crisis, but specific tools for addressing this issue are not proposed.

The solution of the problem of an industrial enterprise development through the formation of a mechanism for the adaptation of industrial enterprises to the external environment was proposed in the works of K. Orlova (2013, 2015). The basis of the proposed mechanism is the determination of responsive behavioral reactions that reflect a set of the industrial enterprise processes and arise in response to external factors. It provides an opportunity to carry out a multidimensional survey of the enterprise, identify the problems of development and build a system of actions for adaptation to the conditions of the environment. The disadvantage of this approach, as of many others, is the ignoring of the need for forecasting crises and the lack of formalized adaptation models. Consequently, most researchers who solved the problem of adapting the industrial enterprise to the crisis through diversification did not pay enough attention to forecasting crises, formalizing the process of assessing the current or future crisis, and to the diversification not only as a response to the crisis, but also as a preservation of the general vector of strategic development.

To implement the adaptive diversification of the industrial enterprise development under crisis conditions, it is necessary to determine what crisis threatens the enterprise - internal or external. Problems of enterprise development under crisis conditions are considered in the works Sabatino (2016), Chung et al. (2013), Laperche et al. (2011), Cerrato et al. (2016), Kapitsinis N. (2018). In the theory of systems, the crisis is considered as the state of the system, in which its parameters take threshold, critical values. After their achievement, the

probability of returning the system to a normal state is very small. After entering the crisis state, either the destruction of the system or its transformation usually occurs.

In the aspect of the development of an industrial enterprise under crisis conditions, it should be borne in mind that the crisis of the environment is considered only in terms of its threat to the enterprise, and not to the environment itself.

Thus, with the adaptive diversification of the industrial enterprise, it is necessary to distinguish between the internal crisis of an industrial enterprise and the crisis conditions of the environment.

3. Methodology

Crisis conditions of the environment are such parameters of the environmental system, which adversely affect the state of the industrial enterprise (Naidoo, 2010; Swan, 2009). The internal crisis of an industrial enterprise is its parameters, which have arisen not because of the influence of the external environment, but because of internal disorders. Consequently, for the adaptive diversification of the industrial enterprise development, five types of information-analytical support should be used (Figure 1):

- provision for forecasting of external crises;
- provision for assessing existing external crises;
- provision for forecasting of internal crises;
- provision for assessing existing internal crises;
- provision for developing adaptation diversification measures.

Provision for forecasting external crises includes tools for constructing the trends of key environmental indicators and the calculation of models of quality jumps in the external environment. Key indicators of the environment include those indicators that directly affect the financial performance of the industrial enterprise (Williamson & Zeng, 2009). First of all, it is the capacity of the market of products that the enterprise produces. Moreover, under the market size is meant not only the volume of total sales of such products, but the division of the market in quality, value, brand awareness and other basic characteristics of products. Each such division is treated as a separate loss. Dividing is necessary to analyze the possibility of a crisis for an industrial enterprise (Wong, 2009) if demand for its products is reduced, as well as for further internal product diversification, that is, changes in some characteristics of products in order to reach the neighboring sectors of the market.

Also, depending on the peculiarities of the industrial enterprise activity, the availability of raw materials, labor supply, availability of credit resources, exchange rates (if the enterprise carries out foreign economic activities) may include key indicators.

To predict the external crisis, it is proposed to calculate the coefficients of reaching the crisis, which take into account how the crisis will affect the key indicators of the production of the company and its products:

$$K_p^{cr} = \frac{\sum_{s=1}^S \left(k_p \cdot \max \left(0, \frac{K_s^{base}}{K_s^{fir}} - 1 \right) \right)}{\sum_{s=1}^S k_s}, \quad (1)$$

where K^{cr} – assessment of the crisis for the sales market of the p-th type of industrial enterprise products;

k_s – the coefficient of proximity of the s-th type of loss of the market to the market of sales of the p-th type of products;

$K_{p,s}^{base}$ – the value of the market capacity for the s-th loss in the base period for the p-th type of products;

$K_{p,s}^{fir}$ – the value of market capacity for the s-th loss in the forecast period for the p-th type of products;

S – the number of market losses that are being analyzed.

The closer the coefficient K^{cr} is to 0, the less the expected crisis is. The value of the coefficients of closeness of the s-th type of loss of the market to the market of sales of the p-th type of products is determined in the range from 0 to 1, where 1 corresponds to the full coincidence with all the characteristics of the products manufactured by the industrial enterprise.

The second tool for forecasting external crises, the response to which needs diversification is the calculation of models of qualitative jumps in the external environment. Qualitative jumps mean not a slow change in key indicators, which can be predicted through trend analysis, but fast or instantaneous changes. For example, they are changes in the technology of production, the substitution of goods by fundamentally different ones or in general, the disappearance of demand for it. Such models need to take into account the scientific and technological progress and analysis of innovative developments in those industries which include the industrial enterprise.

The second component of the adaptive diversification of the industrial enterprise development, which is providing for the evaluation of existing external crises, uses both information from the external environment and the results of the forecasting of external crises. The latter information is necessary to analyze the danger that the future crisis has. It is proposed to calculate the environmental impact on the Balanced Scorecard (BSC) and to analyze the impact of the crisis on competitors and consumers.

The final stage of the adaptive diversification is the adjustment of the enterprise development strategy in accordance with the chosen scenario

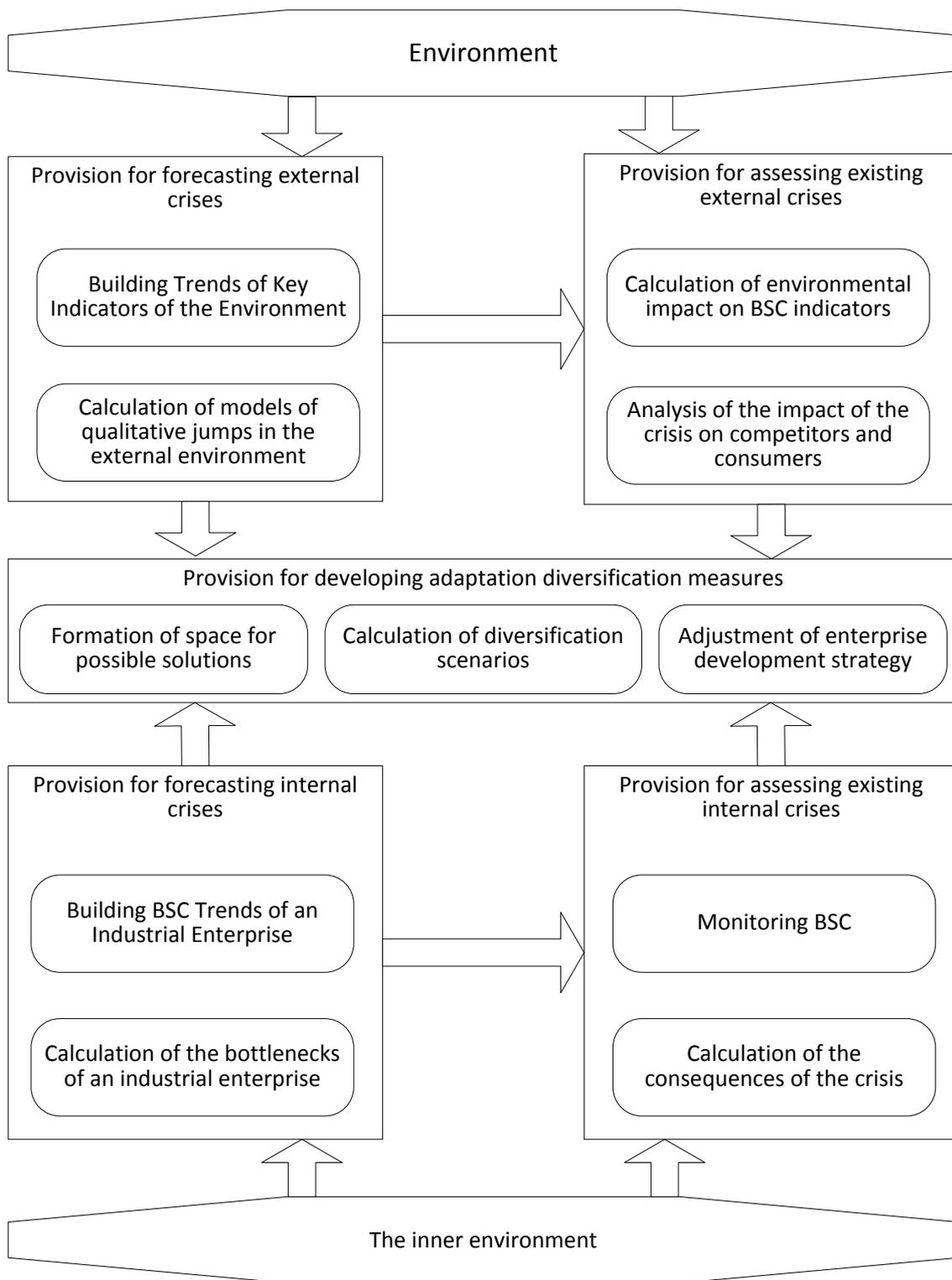


Figure 1. Adaptive diversification of the industrial enterprise development under crisis conditions

Source: own research.

To do this, the measures identified as appropriate by the optimization model for the selection of diversification scenarios should be added to the strategic plan.

Thus, a scientific and methodological approach to adaptive diversification of the industrial enterprise development under crisis conditions that is based on assessing existing and potential crises and formalizing the impact assessment of the crisis enables the industrial enterprise to justify diversification measures in order to adapt to the crisis and to preserve the planned strategic guidelines of the development.

Results and discussion

Practical testing of the developed scientific and methodical approach to the adaptive diversification of the industrial enterprise development under crisis conditions was carried out at PJSC "Keramash". An analysis of the external and internal environment of the enterprise made it possible to conclude that there is a risk of decreasing solvent demand due to the high cost of the enterprise production in comparison with competitors and the general decrease of economic activity (Table 1). It is expected that the volume of sales will decrease by 13.6%, while the cost of sales will decrease only by 10.1%. This is due to an increase in labor costs, and, in particular, an increase in the cost of imported equipment for the production of thermal equipment.

Table 1. Forecast of the crisis consequences for PJSC "Keramash"

Indicator	2016	2017	2018 (forecast)
Net income from sales of products (goods, works, services), ths. UAH	69646	64939	56100
Cost of sold products (goods, works, services), including	54267	52883	47563
Material costs, ths. UAH	43141	28971	27940
salary expenses, ths. UAH	14935	17130	15630
Deductions for social events, ths. UAH	2902	3204	2768
Amortization, ths. UAH	1647	1705	1820
Net financial result, ths. UAH	6263	3021	2610

Source: calculated by the author.

The main products of PJSC "Keramash" are electric and gas industrial furnaces, most of the production capacities are occupied by their manufacture. But in crisis-time due to lack of orders for main products the company switches to the development of spare parts and secondary products (Table 2). At the same time, the assortment of secondary products is negligible and cannot replace the main one.

Table 2. Sales dynamics of PJSC "Keramash"

		2013	2014	2015	2016	2017
Main products	Part, %	88,4	100	49,3	81,3	71,1
	Volume, ths. UAH	92011	40203	10835	56669	46174
Secondary products	Part, %	11,56	0	50,7	18,7	28,9
	Volume, ths. UAH	12027	0	11143	13035	18768

Source: calculated by author.

The solution to this problem is possible due to the following diversification actions:

- diversification of the marketing network and access to new markets with traditional products;
- vertical diversification of the development of the production of spare parts and components of the products,
- horizontal diversification of the development of the production of new products, which can be produced on the existing equipment.

Specific measures to diversify the marketing network include participating in exhibitions in Belarus and Kazakhstan, and opening new sales offices in these countries.

Vertical diversification includes measures for the introduction of regenerative burners into production. Burners are one of the main components of gas industrial furnaces, and the imported burners, which are currently used in the production of PJSC "Keramash," significantly increase the cost.

Horizontal diversification involves the development of production of new types of products for which there is an unsatisfied demand: cremator-insinerator and dyeing chamber.

The result of the implementation of actions on adaptive diversification of PJSC "Keramash" is an increase in the net realizable sales and a decrease in the cost price (Table 3).

Table 3. Influence of adaptive diversification on indicators of PJSC "Keramash"

Indicator	Without adaptive diversification	With adaptive diversification
Net income from sales of products (goods, works, services)	56100	61102
Cost of sold products (goods, works, services)	47563	50880

Source: calculated by the author.

Due to the diversification of production and marketing network of PJSC "Keramash", an economic effect is expected at the expense of an increase in sales volumes and reduction of the cost price. At the same time, additional costs for research and development and participation in exhibitions are needed to carry out the planned diversification activities. The components of the economic effect are given in Table 4.

Table 4. Components of the economic effect of implementing adaptive diversification at PJSC "Keramash"

Revenue or savings		Costs	
Indicator	Amount, ths. UAH	Events	Amount, ths. UAH
Increase in sales revenue	5002	Development and introduction into production of creator-incinerator	320
		Participation in exhibitions in Belarus and Kazakhstan	150
Reduction in the cost of sold products	3317	Development and introduction of production of regenerative burners	180
Revenue or savings	8319	Costs	650

Source: calculated by the author.

Due to diversification of production and marketing network of PJSC "Keramash", the estimated economic effect will be 7669 ths. UAH.

Thus, a scientific and methodical approach to adaptive diversification of the industrial enterprise development under crisis conditions was developed. The approach is based on a hierarchical structure of the effects of the crisis and economic and mathematical models for assessing the enterprise's crisis coverage, assessing the relationship between changes in the environmental indicators and the company's system of indicators, determining the direction of change of indicators and calculating diversification scenarios.

The practical testing of the developed scientific and methodical approach to the adaptive diversification of the industrial enterprise development in the conditions of the crisis at PJSC "Keramash" was carried out.

References

- Cerrato, D., Alessandri, T., Depperu, D. (2016). Economic Crisis, Acquisitions and Firm Performance. *Long Range Planning*, 49(2), 171-185. <https://doi.org/10.1016/j.lrp.2015.12.018>

- Chung, C.C., Lee, S.-H., Beamish, P.W., Southam, C., & Nam, D.-I. (2013). Pitting real options theory against risk diversification theory: International diversification and joint ownership control in economic crisis. *Journal of World Business* 48(1), 122-136. <https://doi.org/10.1016/j.jwb.2012.06.013>
- Delas, V., Nosova, E., Yafinovich, O. (2015). Financial Security of Enterprises. *Procedia Economics and Finance*, 27, 248-266. [https://doi.org/10.1016/S2212-5671\(15\)00998-3](https://doi.org/10.1016/S2212-5671(15)00998-3)
- Glushkov, V. M., Amosov, N. M., Artemenko, I. A. (Eds.). (1974). *Entsiklopediia kibernetiki [Encyclopedia of cybernetics]*. (Vol. 1). Kiev: Abs-Mir (in Russian).
- Gadzevych, I.O. (2014). Rozrobka alhorytmu perekhodu promysloвого pidpryyemstva do dyversyfikatsiyi yoho diyalnosti [Developing an algorithm for transition of industrial enterprise to diversification of its activities]. *Scientific Journal of Kherson State University. Series "Economic Sciences"*, 5(2), 58-62 (in Ukrainian).
- Hroznyi, I., Kuzmak, O., Kuzmak, O. & Rusinova O. (2018). Modeling of diversification of foreign economic interactions. *Problems and Perspectives in Management*, 16(1), 155-165. [https://doi.org/10.21511/ppm.16\(1\).2018.15](https://doi.org/10.21511/ppm.16(1).2018.15)
- Kapitsinis, N. (2018). Interpreting business mobility through socio-economic differentiation, Greek firm relocation to Bulgaria before and after the 2007 global economic crisis. *Geoforum*, 96, 119-128. <https://doi.org/10.1016/j.geoforum.2018.08.002>
- Kuzmin, O., & Drymalovska, Kh. (2013). Sutnist ta znachennya dyversyfikatsiyi na promyslovykh pidpryyemstvakh [The nature and significance of diversification in industrial enterprises]. *Ekonomichnyy analiz*, 12(3), 222-225 (in Ukrainian).
- Lakhno, V., Malyukov, V., Bochulia, T., Hipters, Z., Kwilinski, A., & Tomashevskaya, O. (2018). Model of managing of the procedure of mutual financial investing in information technologies and smart city systems. *International Journal of Civil Engineering and Technology*, 9(8), 1802-1812.
- Laperche, B., Lefebvre, G., Langlet, D. (2011). Innovation strategies of industrial groups in the global crisis: Rationalization and new paths. *Technological Forecasting and Social Change*, 78(8), 1319-1331 <https://doi.org/10.1016/j.techfore.2011.03.005>
- Maidanevych, P.M. (2014). Kontseptualni osnovy rozvytku promysloвого pidpryyemstva v umovakh kryzy [Conceptual bases of industrial enterprise development in the conditions of crisis]. *Business Navigator*, 1(33), 69-73 (in Ukrainian).
- Milovanov, Ye. (2006). Strategiya diversifikatsiyi - osnova finansovoy ustojchivosti mnogoprofil'nogo predpriyatiya bytovogo obsluzhivaniya [The diversification strategy - basis of financial sustainability of a multi-profile consumer services enterprise]. *Problemy teorii i praktiki upravleniya*, 10, 96-104 (in Russian).
- Naidoo, V. (2010). Firm survival through a crisis: The influence of market orientation, marketing innovation and business strategy. *Industrial Marketing Management*, 39(8), 1311-1320. <https://doi.org/10.1016/j.indmarman.2010.02.005>
- Orlova, K. (2015). Formuvannya orhanizatsiyno-ekonomichnoho mekhanizmu adaptatsiyi promyslovykh pidpryyemstv do zovnishnoho seredovyscha [Formation of the industrial enterprises' organizational-economic mechanism of adaptation to the external environment]. *Problems of Theory and Methodology of Accounting, Control and Analysis*, 2(32), 238-249 (in Ukrainian). [https://doi.org/10.26642/pbo-2015-2\(32\)-238-250](https://doi.org/10.26642/pbo-2015-2(32)-238-250)

- Pajak, K. Kamińska, B., & Kvilinskyi, O. (2016). Modern trends of financial sector development under the virtual regionalization conditions. *Financial and Credit Activity: Problems of Theory and Practice* 2(21), 204-217. <https://doi.org/10.18371/fcaptp.v2i21.91052>
- Prokopenko, R., Shishatsky, V. (2014). Konceptualnyj podhod k modelirovaniyu nalogovyh reakcij korporativnyh struktur [Modelling of reflexive adaptation of corporate structures to the tax environment]. *Zhurnal Nauchnyh Publikacij Aspirantov I Doktorantov*, 1(91), 18-19.
- Sabatino, M. (2016). Economic crisis and resilience: Resilient capacity and competitiveness of the enterprises. *Journal of Business Research*, 69(5), 1924-1927. <https://doi.org/10.1016/j.jbusres.2015.10.081>
- Swan, P.L. (2009). The political economy of the subprime crisis: Why subprime was so attractive to its creators. *European Journal of Political Economy*, 25(1), 124-132. <https://doi.org/10.1016/j.ejpoleco.2008.12.005>
- Williamson, P.J., & Zeng, M. (2009). Value-for-money Strategies for Recessionary Times, *Harvard Business Review*, 87(3), 66-74.
- Wong, L. (2009). The Crisis: A Return to Political Economy? *Critical Perspectives on International Business*, 5(1/2), 56-77. <https://doi.org/10.1108/17422040910938686>