The Quantitative Assessment of the Cyclical Development in Modern Conditions*

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ABSTRACT

The article studies applicability of the resource-oriented approach in assessing the impact of extensive and intensive factors on stable and continuous development of economic systems under cyclic conditions. The quantitative assessment of impact of efficient resource utilization on structural growth rates of the economy dependent on domestic public policy showed that excessive development of financial services makes the economy quite vulnerable to external factors. Results of the research according to the suggested method show that Russian economy has been in crisis since 2006, which matches the downward wave of big economic dynamics cycle described by N. D. Kondratyev

INTRODUCTION

In modern conditions the development of the global and Russian economies is characterized by a variety of transient processes where the crisis and as a consequence their accompanying critical situations become an integral part of the functioning of economic systems what creates uncertainty of economic situation. Occurring fluctuations (upturns and downturns) reflect operation of cyclic development law (Mazur, 2017, pp. 435-452; Kovacic & Vilotic, 2017, pp. 453-468). The

business cycles law as well as the law of transition from quantity to quality reflects the effects of such dialectical laws, as the negation of the negation, unity and struggle of opposites. These laws are implemented in the form of "spiral processes" combining cyclic recurrence, relative repeatability and progressive advance. At the same time development of economic systems is based on some concepts and principles, in particular, sustainable development concept and activity continuity principle where resource utilization efficiency (resource intensity) is used as factor restricting sustainable development. Consumed resources characterize the economic, social and environmental component of sustainable development of economic systems.

Despite of numerous developed models that are used in the economy, crises reoccur, i.e. activity continuity condition, concept of sustainable development and manifestations of the cyclical development law come into conflict with each other, and therefore it is necessary to develop a method of analysis and quantitative assessment of impact of the cyclical development law in continuous and sustainable development of economic systems with account of resource utilization efficiency.

1. LITERATURE OVERVIEW

The development and operation of economic systems occur in repetitive fluctuations, growths and declines, that is under the influence of the law of business cycles. Scientific attempts to explain cyclic recurrence permeate all subject areas, having more profound effect on the development of such sciences as philosophy and history of philosophy, engineering sciences, and economics. The evolution of the theory of cycles in economics revealed in publications of W. Mitchell, 1913; N. D. Kondratieff, 1926, 1984; F. A. Hayek, 1929; A.H. Hansen, 1951; J. A. Schumpeter, 1954; R. M. Solow, 1956; R. Harrod, 1973; R. E. Lukas, 1980; D. Romer, 1996; B. N. Kuzyk and Y. V. Yakovets, 2006 and many other scientists. In fact, the modern economic science (as established by Schumpeter tradition in 1954) primarily uses four types of cycles while there are over 1380 types of them. These cycles are as follows:

– Juglar cycles or "investment cycles" (up to 6 – 13 years), identified in 1862,
– Kitchin cycles or "inventory cycles" (3 - 4 years), discovered in the 1920s,
– K-waves (Kondratyev waves) or the "long economic cycles" (40 - 60 years), discovered in the 1925,
– Kuznets swings or "building cycles" (15 - 25 years), identified in 1930s.

In their studies, N. Makashina et al., 1998; Y. Kuznetsov, 2011; L. Bernard et al., 2014; L. Grinin et al., 2017, state that the statistical proof of the existence of most of these cycles is empirically impossible, and therefore their reliable description and comparison with observations are not likely to be possible. A. Chubarin, 2007 confirms that despite the fact that none of the existing methods of mathematical statistics can confirm or deny with a sufficient degree of probability the existence of long waves, on the vast majority of the curves these cycles are clearly visible without any mathematical processing, where the periods of the oscillations and the main (upper and lower) influence curve points of different indicators are congruent (+ 3 years, Table 1).

Table 1. Chronology of long waves of economic dynamics by N.D. Kondratyev

| Crisis #	Crisis phase	Time period
1	upward wave	1785 – 1790 to 1810 – 1817
	downward wave	1810 – 1817 to 1844 – 1851
2	upward wave	1844 – 1851 to 1870 – 1875
	downward wave	1870 – 1875 to 1890 – 1896

3	upward wave	1890 – 1896 to 1914 – 1920
	downward wave	1914 – 1920 to 1939 – 1944
4	upward wave	1939 – 1944 to 1962 – 1968
	downward wave	1962 – 1968 to 1986 – 1995
5	upward wave	1986 – 1995 to 2014 – 2022
	downward wave	*2014 – 2022 to 2040 – 2046*

Source: authors' approximation is based on Makashina et al., 1998; Chubarin, 2007; Bernard, 2014 et al.; Grinin, 2017 et al., who in turn drew on Schumpeter, 1954; Kondratieff, 1926.

Attention to cyclic development theory is explained by the fact that cycles make it possible to predict development not only for the world economy but also for economic systems of different hierarchical levels. If the periodization of long waves had been considered, it would have been possible to predict the economic downturn after 1970 and start preparing for it. For example, by increasing capital investments in the innovative development aimed at reducing energy consumption and intensity of use, creating new process systems on new operation principles, sound fiscal policies could have been conducted to mitigate the crisis. The cycle is increasingly considered not only as an object of study but also as a control object on both macrolevel and microlevel. This is clearly illustrated by USA development where in 1990 (the lowest point between the 4th and the 5th long waves, Fig. 1) the gain of national product growth was zero but not negative, and then the growth began. Specific features of economic development in the USA within this period are studied in publication of P. Sarte et al., 2015.

Figure 1. Dynamics of GDP PPP Annual Growth Rate (%) of the World Lead Countries
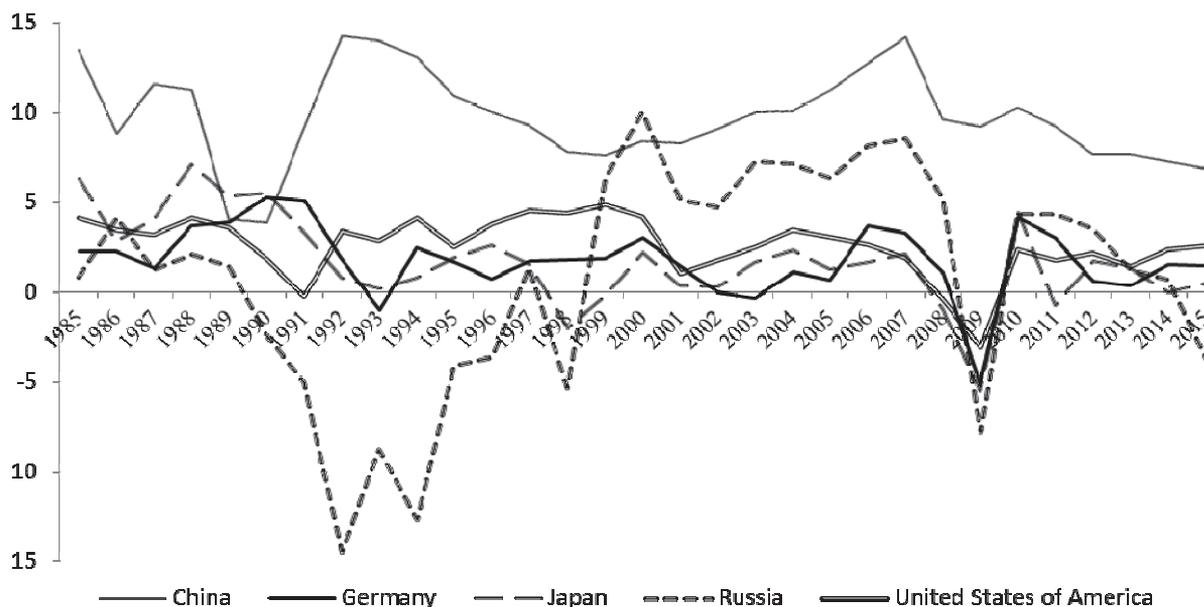
Note: GDP PPP based on 2011 International Dollars

Source: Authoring, based on http://www.worldeconomics.com/GrossDomesticProduct/Russia.gdp

It is proved that periodization of long waves by Kondratyev practically coincides with periods of dominance of technological waves. We would like to once again focus your attention on the fact that "long waves" enable to predict the state of both external and internal environment of entities. The technological wave characterizes "quality" of long waves, thus characterizing the leading country[*] (Japan, USA, Germany, China, etc.), the core of technological structure (electronics industry, computer, fiber-optic, medico-additive-nano-bio-roboto-info-cognitive technologies, etc.), key factor, the forming core of a new structure, basic economic institutes, etc. (L'vov & Glaz'ev1990; Altshuller, 2002; Reuveny & Thompson, 2004; Coccia, 2017; Grinin et al., 2017, Kovács & Kot, 2016, etc.). This implies a very important conclusion that investing in traditional technological systems makes no economic sense. It is necessary to implement the technical systems which are been based on processes with a small number of operations and fundamental discoveries of science.

2. RESEARCH METHODOLOGY

Conducted researches and studies of other scientists make it possible to draw the following conclusion. So far, none of the macroeconomic schools including those which managed to create quite integral business cycle concepts, cannot claim that they explain as part of the theory all the important symbolically-rendered factors of the theory of economic growth and business cycles (Skare & Sinkovic, 2016). At the same time the model is considered to be of sufficient quality if it only explains two or three symbolically-rendered facts, and is somewhat consistent with the rest of the symbolically-rendered facts. The description of the crisis and growth represented by O.S. Sukharev, 2012 shows that the economy trend towards the expansion is represented by an increase in resources, their prices, profitability and reducing the size of losses and probability of occurrence. A depressive condition occurs where the amount of resources throughout the sectors of economic activity reduces, the flow of funds is depleted, the profitability lowers down, and the probability of loss sharply increases. Practical calculations showed that the growth rate should be used instead of absolute indices (Endovitskiy et al., 2013).

The problem may be formulated as follows: there are multiple economic systems at different hierarchical levels of the "national economy" system. The following levels are taken: economic complex of the country (macrolevel), regional economic complexes (mesolevel); economic complexes by types of economic activity (mesolevel); individual organizations differing in types of economic activity and legal status (microlevel).

The result of activity of the i-th economic system at the j-th hierarchical level will depend on the volume of consumed resources X_{1ij} within the time period t and resource utilization intensity $X_{2ij}(t)$, i.e.

$$Y_{ij}(t) = X_{1ij}(t) * X_{2ij}(t), \quad (1)$$

where $Y_{ij}(t)$ is result of activity of the i-th economic system ($i = \overline{1, n}$) at the j-th level of the "national economy" system ($j = \overline{1, 4}$).

$X_{1ij}(t)$ is volume of consumed resources (quantitative factor) in the i-th economic entity at the j-th hierarchical level within the time period t;

$X_{2ij}(t)$ is resource utilization intensity (qualitative factor) in the i-th economic entity at the j-th hierarchical level within the time period t.

Efficiency considerations related to resource utilization intensification and their impact on extended reproduction were discussed by scientific community as far back as XIX century. Foundations of the theory of extensive and intensive types of extended reproduction were laid by K. Marx, 1955-1974, p.193 who stated that from the social point of view the extensive growth of production

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[*] The data is cited for the 5-th technological wave forecasted for 1981-2030.

means expansion of the production area. The intensive growth of production means application of more efficient means of production.

Problems with intensification of economic development under up-to-date conditions were reflected in publications of scientists elaborating both the economic growth theory and the resource theory. In 1987 R. Solou, 1956 became Nobel laureate for fundamental research in the field of economic growth theory. Among Russian scientists K. K. Waltuch et al., 1974; R. M. Petukhov, 1990; K. V. Pavlov, 2007 studied problems with intensification of resource utilization at some hierarchical levels of economic systems brought to actual implementation in their publications.

The dependence stated in formula (1) generalizes the fundamental concept of production function through multi-dimensional production representation, which represents a natural connection between indices of activity results and consumed resources (factors) for economic activity.

Let's consider the hierarchical level of individual organizations differing in types of economic activity, legal status and stages of economic activity, i.e. each type of economic activity (x_3) contains many organizations (X_4):

$$\forall x_3 \supset X_4 \cdot \text{(2)}$$

The functional model of national economy (1) implies development of economic systems under conditions of limited resources, which is laid in concepts of sustainable development, life cycle of systems and risk management, which implement laws of system development.

Different combinations of the result variation dynamics, cost of resources and extent of their impact finally determine the values of indicators that characterize the type of economic development (Table 2) what is considered in detail in publication (Endovitskiy et al., 2013). The developed methodology follows the terms of the unified methodological procedures for assessing the financial sustainability of the organization through the correlation of the type of economic development (efficiency of resource use), type of financial sustainability, risks associated with the use of resources and life cycle stages of organizations at the phase of production. Since the effect of these factors is estimated by the proportion of intensive factors in the use of resources we can disregard the difference in the duration of the life cycle of organizations (model 1). The presence of extensive factors will indicate a possible loss of stability of the system, i.e. occurrence of crisis trends.

Table 2. Classification of financial sustainability taking into account the principle of the "Golden ratio" depending on the type of economic development of production

Boundaries of variation of intensive factors	Production development type	Type of financial sustainability	The stage of the lifecycle manufacturing phase	Level of risk related to resource utilization efficiency
More than 62%	Intensive	Absolute	Growth	Low
38% - 62%	Intensive-extensive	Stable	Maturity	Acceptable
14% - 38%	Intensive-extensive	Unsustainable financial situation	Juvenility	Moderate
Less than 14%	Extensive	Critical financial situation	Aging	High

The use of above-mentioned limits for variation of intensive factors according to the golden proportion principle is debatable in this methodology. In further studies the researchers used other ratios according to Fibonacci numbers and ratios reflecting the golden section.

3. THE OBTAINED RESULTS

Despite the development of concepts of continuous and sustainable development the economic crises periodically shake individual countries as well as the global economy. The Russian modern history faced four economic crises: 1990-1992 when GDP declined by 14.5% (1992), 1998-2000 when GDP decline amounted to 5.3% (1998), 2008-2009 when GDP declined by 7.8% (2009), the current crisis when GDP declined in 2015 by 3.7%. We support the conclusion G.B. Kleiner, 2015: *"As there are no grounds to expect the crisis-free development (it is enough to recall the theory of economic cycle associated with the names of N. D. Kondratyev, S. Kuznets, A. Chizhevsky, K. Juglar, J. Kitchin, etc...), the concept of economic sustainability development needs to be modified in view of a more or less regular occurrence of crises"*.
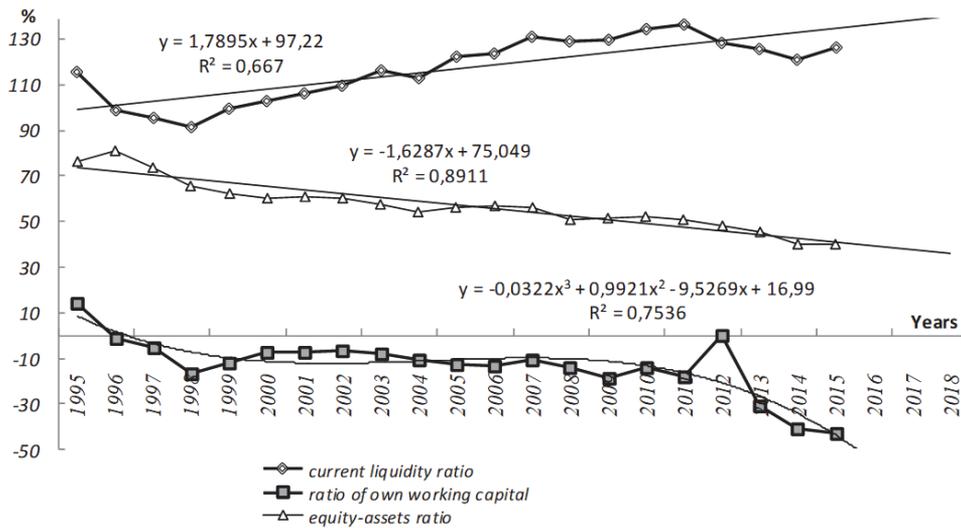
In the early 2000s the following trend appeared: *"The financial system and banks began to serve mainly themselves, it means appearance of the effect of non production sphere self-financing, disastrous in terms of the crisis prospects"* (O. S. Sukharev, 2012). This tendency was noted by a number of scientists. V.T. Ryazanov, 2013 whote: *"The excessive development of the financial services industry … clearly showed that this type of national economic systems with the phase down production and destroyed by internal and cross-sectoral interaction lines cannot be sustainable in principle, and therefore they are extremely exposed to external shocks. … In these circumstances the efficiency of inter-industry competition slumps and thereby the market mechanism of leveling the profit rates in the country`s industries goes down, hampering the capital flow between the sectors … Considering the options of the economic growth prospects during the post-crisis period, he points out that one of the options "is characterized by incomplete post-crisis recovery, followed by stagnation which, at this stage, may be a "new norm" for the developed economies"*. The probability of a long period of the low economic growth as a result structural and institutional problems, as well as cyclical and external shocks is pointed out by V. A. Mau, 2016; S. Y. Glazyev, 2016; E. Miklaszewska & K. Kil, 2016; M. Draskovic et al, 2016.

The above-mentioned statements may be considered justifiable in view of the resource-oriented approach. There might be no absolute growth of the result but at the same time the impact of intensive factors will exceed the impact of quantitative factors, which confirms our suggested theory that prevalence of intensive factors over extensive ones is an invariant of sustainable development.

We study the issues from the perspective of resource-oriented approach that are not usually taken into account when considering the macroeconomic problems. According to V.A. Mau, 2016, in order to prevent the transition of the current crisis into a long-term economy stagnation, along with short-term stabilization measures it is necessary to discuss a number of measures aimed at improving the structural growth of the economy, i.e. at *reducing the production costs* and increasing the total factor productivity, dependent solely on the *domestic economic policy* rather than on the external market and the geopolitical situation (Bilan et al, 2016; Fuinhas et al, 2016). When analyzing the financial situation of the companies many indicators are evaluated including the following (figure 2):

− share of the own working capital in current assets (recommended value is more than or equal to 0.1),
− equity-assets ratio (recommended value is more than or equal to 0.5),
− current liquidity ratio (recommended value is from 1.4 to 1.7),
− current solvency ratio (standard value less than or equal to 3.0),
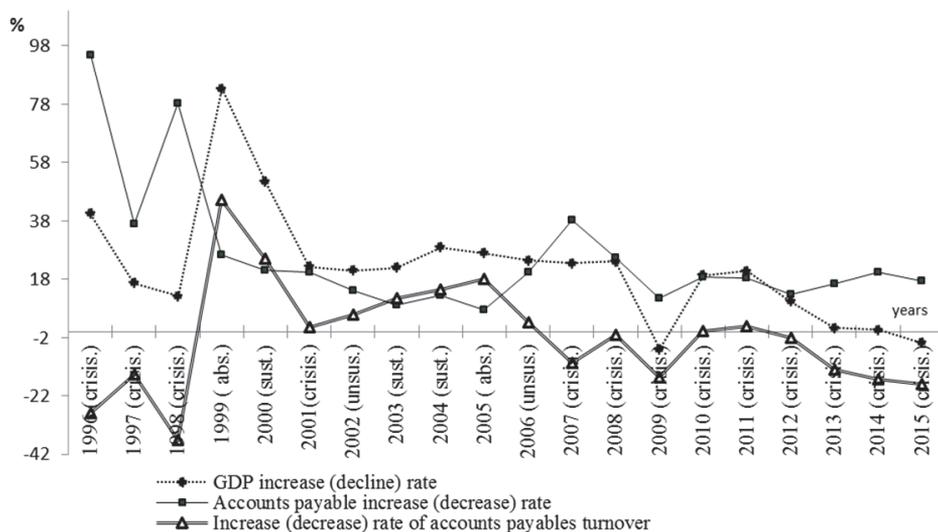− turnover of accounts payable and receivable (must tend to the maximum).

Figure 2. The dynamics of indicators of the solvency of Russian enterprises

$$y = 1,7895x + 97,22$$
$$R^2 = 0,667$$

$$y = -1,6287x + 75,049$$
$$R^2 = 0,8911$$

$$y = -0,0322x^3 + 0,9921x^2 - 9,5269x + 16,99$$
$$R^2 = 0,7536$$

— current liquidity ratio
— ratio of own working capital
— equity-assets ratio

Source: authoring according to Rosstat
http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/finance/#

The analysis of the indicator dynamics shown in Fig. 2 indicates that none of specified indicators for the financial analysis reaches the recommended values. A particular concern is the lack of the companies` own working capital since 1996. The Bank of Russia pursues to reduce the inflation key rates but, at the same time, forgets about the real economy sector. The growth of the key rate in 2013-2014 caused a sharp reduction of the companies` own working capital and that aggravated the debt nature of the economy.

Figure 3. The dynamics of the indicators of nominal Russian Federation GDP, total payables, payable turnover for 1995-2015

······· GDP increase (decline) rate
—■— Accounts payable increase (decrease) rate
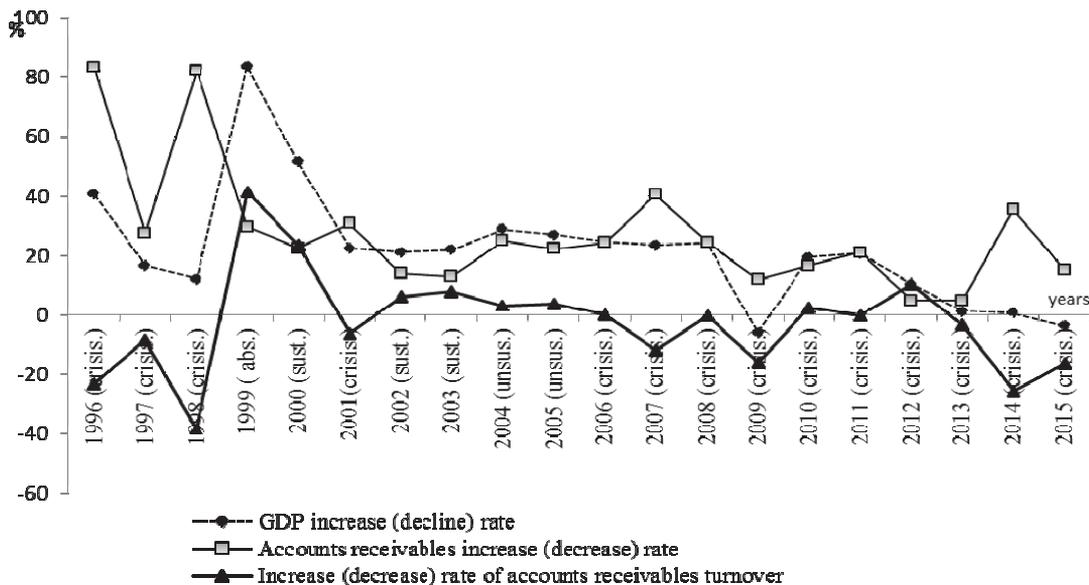—△— Increase (decrease) rate of accounts payables turnover

Conventional symbols: abs. – absolute sustainable development; sust. –sustainable development; unsus. – unsustainable situation; crisis. – crisis situation
Source: authoring according to Rosstat
http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/finance/#

Fig. 3 and Fig. 4 represent results of the economic analysis of cyclical development and quantitative evaluation of the impact of the turnover of accounts payable and receivable on Russian Federation GDP for the period of 1995-2015 using the developed methods on the basis of model (1) (Endovitskiy et al., 2013) (Fig. 3, Fig. 4).

Figure 4 The dynamics of the indicators of nominal Russian Federation GDP, total receivables, receivable turnover for 1995-2015

Conventional symbols: abs. – absolute sustainable development; sust. –sustainable development; unsus. – unsustainable situation; crisis. – crisis situation
Source: authoring according to Rosstat
http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/finance/#

Analysis of the data presented in Fig. 3 shows that, with regard to settlements with companies' creditors, the Russian economy is in crisis (1995-1998, 2001, 2006-2015) which coincides with the data of table. 1. The sustainability was revealed during the period of 2000, 2003-2004. As a rule, the increase of receivables is caused by insolvency (bankruptcy) of individual buyers of products, work and services requesters (crisis of 1994, 1998, 2014-2015) as well as by occurrence of obstacles preventing from the receivables payment due to an abrupt change of external conditions (change in rates currency, customs duties, quotas, etc.), which is typical for all the crises. With regard to settlements with companies' debtors the situation is identical.

Obtained research results confirm the assertion by A. Mogilat, I. Ipatova, 2016 of the fact that variation of the resource utilization efficiency is a key factor of dynamics for financial results of economic systems, their sustainable development and vulnerability to external shocks of operation.

We investigate the cause of 2008 crisis. As stated in many sources, the Russian crisis broke out as a result of the US credit market imbalance. In 2004 we faced a boom of foreign loans. The external debt of state-owned corporations since 2003 has grown by more than 3.5 times from $ 27.8 billion to $ 106.4 billion in 2006 (Authoring according to The Central Bank of the Russian Federation http://www.cbr.ru/statistics/?Prtid=svs&ch=itm_42266#CheckedItem). If we consider the payables structure by economic activity types (Authoring according to The Central Bank of the Russian Federation http://www.cbr.ru/statistics/?Prtid=svs&ch=itm_42266#CheckedItem), the

largest share (about 30%) during the study period is represented by the payables of companies involved into oil products treatment, 20% - wholesale and retail trade, 11% - organizations engaged in real estate transactions and provision of services, about 10% - organizations carrying out mining operations, 8% - construction, by 5 % - pipeline transportation of energy resources, production, power, gas, water supply respectively, and 3% - agricultural complexes.

The represented data confirm that the true cause of the crisis lies with the purposeful policy of active foreign loans increase, assets transfer abroad and payment of significant amounts of dividends to shareholders and big "golden parachutes" to the top management of large corporations that contributed to increase in accounts payable. According to the economists the 2014-2015 crisis in Russia was provoked by the fall of oil prices, economic sanctions on behalf of the Western countries. However, as shown by the analysis results in fig. 3,4, the Russian economy has not got out of crisis and is in depression amid the global economic crisis (remember the Great Depression which lasted from 1929 to 1939), which coincides with the results of study of N.D. Kondratyev (Table. 1, period of downward wave from 2014 – 2022 to 2040 – 2046). Apparently, the major role is still attributed to the combination of factors resulting from 1991 for 25 years of the new Russian economic history.

The resource-oriented approach makes it possible to assess and predict sustainable development since further growth of national economy may be provided due to integration of new process systems which provide intensification of production. At the same time there is much concern about social problems related to ensuring employment of population which is freed as a result of intensification of production processes due to technology factors.

CONCLUSION AND FINDINGS

Implementation of the resource-oriented approach to assess the impact of cyclicity on sustainable development of economic development systems shows that resources exercise significant influence on development. Based on the economic analysis of cyclical development it was found out that a significant impact on business continuity and sustainable development of economic systems in these conditions is caused by financial resources. The proposed method of economic analysis and quantitative evaluation of cyclical development impact on the continuity and sustainable development of economic systems taking into account resource-saving made it possible to find out that the excessive development of financial services makes the economy development highly vulnerable to external factors. It was found out that the Russian economy has been in crisis since 2006, which coincides with the downward wave of the big cycle of the economic dynamics described by N.D. Kondratyev.

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