

Importance of Cyclicity in the Processes of Economic System Development

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Abstract – The cyclical theory has been analyzed in the article. Works of local and foreign scientists has been reviewed. It has been proved that the theory of economic cycles play an important role for entrepreneurs in explaining economic processes and accepting practical solutions for effective development. Factors influencing on the economic behavior of the object in dynamics have been considered, the relationship between economic cycles and object behavior has been investigated, a notion of cyclicity has been defined in a new way.

Keywords – cyclicity, dynamics, economic behavior of the object, trend.

I. INTRODUCTION

Economic system is constantly evolving due to the influence of endogenous and exogenous factors. The globalization of the economy, accelerate the development of economic, financial, marketing processes, presence of stochastic and dynamic in the economic behavior of the objects exacerbates the problem of the modern economic instability.

The peculiarity of economic conjuncture is very complex and variable combination of component. Structure of the economic signal is divided into "coarse" and "subtle" components. There can be defined trend, seasonality, cyclicity, stochastic "noise" and event-trigger component of dynamics in the general structure. Reasons, changes and forms of dependence of trend and seasonality can be predicted beforehand, that's why their behavior is smooth. They have found ways of detection, selection, presentation, explanation, visualization and application long time ago. Cyclicity [1], stochasticity and event-trigger components are difficult to be predicted because reasons of "subtle" component are not clear; events are difficult to be planned [2]. Economic events are uneven and conflicting and characterized by cyclic processes, which are difficult to be calculated mathematically.

II. RETROSPECTIVE OF RESEARCHES AND PUBLICATIONS

Works of the following local and foreign scientists are theoretical and methodological basis of research: V. P. Alexandrova, U. M. Bagal, S. Glazyev, V. Inozemtsev, M. Kondratiev, V. Kotysko, V. Kushlin, K. Marx, V. P. Seminozhenko, M. I. Tugan-Baranovsky, U. V. Yakovets. There are contradictions on the causes of cyclical fluctuations among scientists. Some theoretical foundations and practical results don't reflect the relationship between cyclicity and economic behavior of the object in full. There is a need to clarify the concept of "cyclicity" and to identify factors influencing the economic behavior of the object in the dynamics that lead to it.

III. MAIN PART OF RESEARCHES

Based on the fact that the structure of the economic process is an free combination of five components, which form together a time series. Its graphically economic conjuncture can be presented in the following way (Fig. 1):

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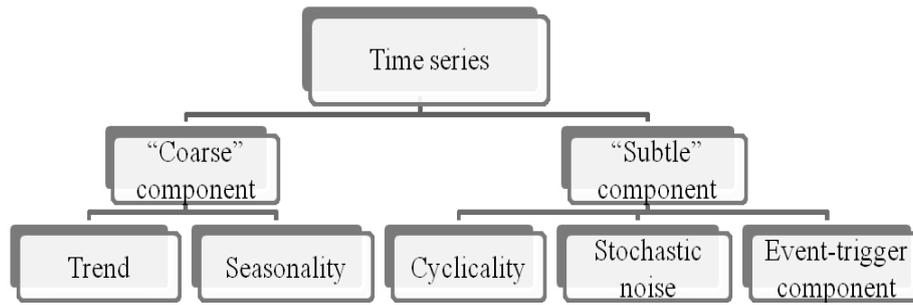


Fig. 1 - Structure of time series of economic process [2]

Many scientists studied time series, including V. A. Bessonov [3], who defined time series as an ordered set that characterizes changes of index in time.

Concept of development tendency does not have enough clear definition. In statistical literature a tendency of development is understood as the long-term evolution, that is tried to be imagined in trajectory. It is assumed that this trajectory describes the basic movement regularity over time and at some extent it is free from random effects and called the trend The trend describes actual generalized tendency of processes over time [4].

As tendencies of changes of time series indicators are very different, then the trends may have different forms, which are often represented as a models of trends that are based on functions (Table I).

TABLE I –
FUNCTIONS OF TRENDS MODELS

Name of function	Function
Linear function	$Y(x) = a_0 + a_1 \times x$
Square function	$Y(x) = a_0 + a_1 \times x + a_2 \times x^2$
Power function	$Y(x) = a_0 + a_1 \times x^a$
Polynomial functio	$Y(x) = a_0 + a_1 \times x + a_2 \times x^2 + \dots + a_n \times t^n$
Logarithm function	$Y(x) = a_0 + a_1 \times x \times \log(x)$
Exponential function	$Y(x) = a_0 + a_1 \times b^x$
Logistic functions: P. Reed's function	$Y(x) = \frac{a}{1 + b \times e^{-c \times x}} ; Y(x) = \frac{(Y_{\max} - Y_{\min})}{1 + e^{a_0 + a_1 \times x}} + Y_{\min}$
Gompertz's function	$Y(x) = k \times a^{b \times x}$

As for the element of time series such as seasonality, modern scientists understand this concept as a stable over time periodicity of economic phenomena development and they use the term "season" for predicting any systematic fluctuations. Factor of seasonality cannot be displayed according to data of whole year or average annual data. Time series can be used for investigating the influence of seasonality. These time series contain information about the value of the index per quarters, months, weeks, days or hours [5].

V. A. Bessonov [3] divided seasonal component of time series in a cyclic and periodic components. He interpreted cyclicality as repetition of phenomena in general characteristics and also he interpreted periodicity as a special case of cyclicality when the picture is repeated

in detail in each following cycle. He considered seasonal fluctuations as example of cyclicity, because despite on repetition of phenomena in general characteristics, they very often demonstrate changes over time as size and form. In the study of economic dynamics problems in individual phases of the economic cycle the scientist accented that the information can be presented in the form of interval and momental time series [3].

The term of cyclicity is associated with fluctuations of age trends, because it is multi-structural pattern of economic development. Periodic manifestations of various reactions of the economic system by external and internal factors in the dynamics of constantly require scientists to investigate and analyze the causes and consequences of the manifestations of these reactions.

The English scientist W. Jevons the first time tried to investigate the long-term fluctuations in the economy. By analyzing ranks of prices, he noticed repetition of long periods of rising and falling, but could not find an explanation for this phenomenon [6].

Financial and economic dictionary [7] interprets the term of cyclicity in the following way: “the general shape of global economic development and the development of the national economy from one macroeconomic balance to another. This reflects unevenness of various elements of the national economy, change of evolutionary and revolutionary stages of development”.

The explanatory dictionary by S. Ozhegov explains term of cycle as a set of events and processes that is circulation over time [8].

Based on the fact that economic changes that are manifested from one state of economy to another one, are repeated periodically, there are four phases of the cycle development. Karl Marx was one of the first economists, who identified four phases in the cycle (Fig. 2).

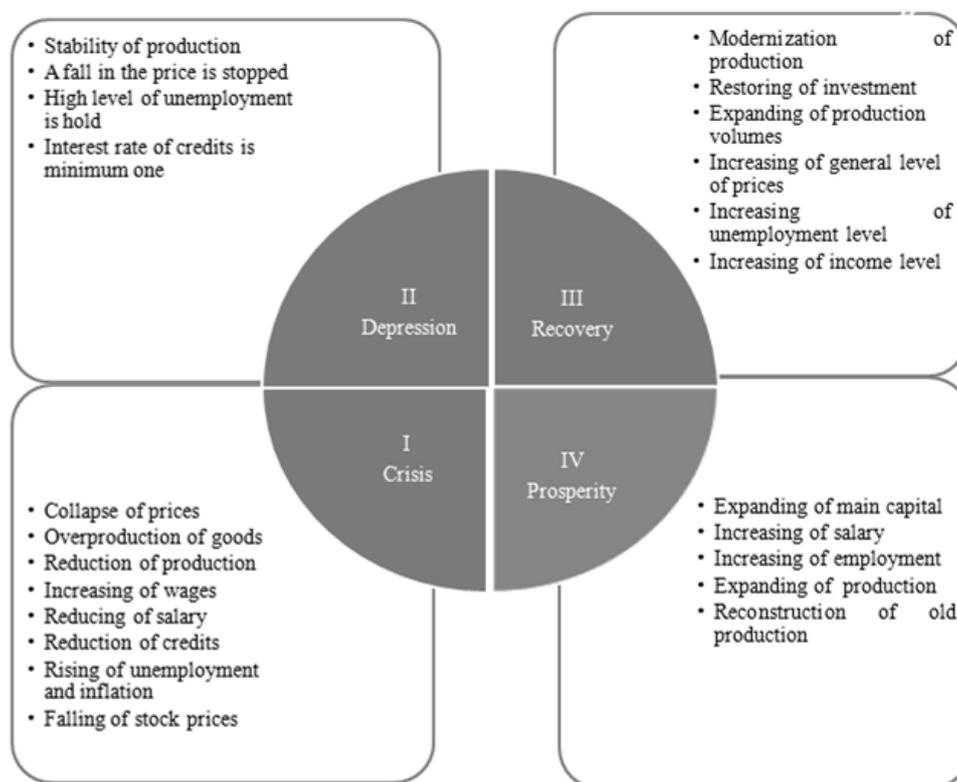


Fig. 2 - Phases of cyclical development

Graphically dynamic of indicator of economic behavior can submit wavy line, where each wave correspond the entire cycle of economic development (Fig. 3).

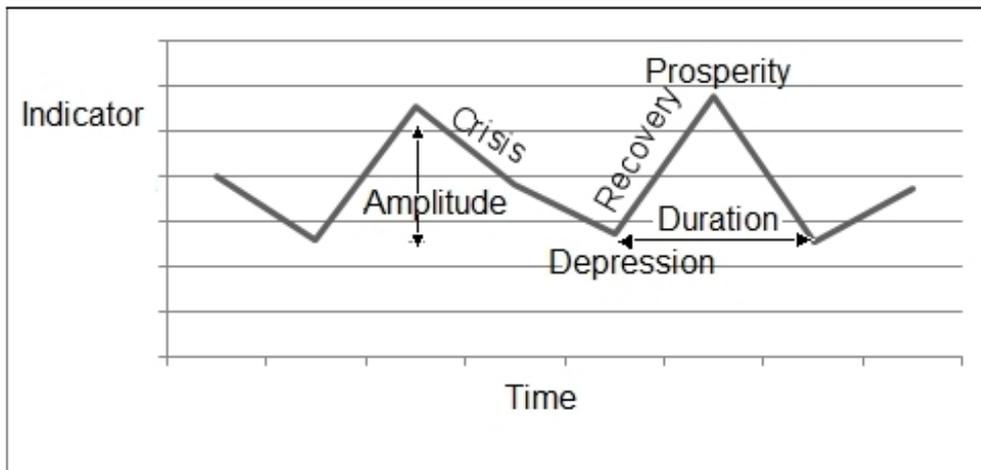


Fig. 3 - Graph of economic indicator cyclicity

In the middle 20th century (1946) R. N. Elliott examined economic fluctuations in a new. The main difference of his terminology is that each complete wave is the subwave of a larger next wave so periodicity is not. The mathematical foundation of his theory was the Fibonacci numbers (each number in the sequence equal to the sum of the preceding two numbers). The full set of waves any cycle is one of the elements of the Fibonacci numbers (Fig. 4) [14].

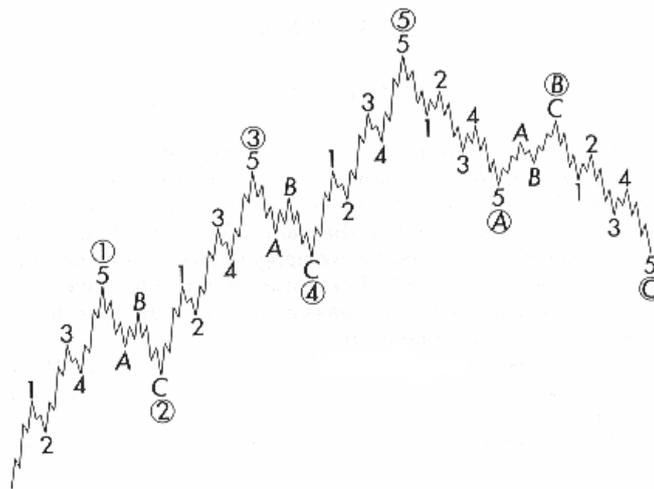


Fig. 4 - Schematic illustration of Elliott's waves

M. D. Kondratiev considered that process of real dynamics is only one. But this process is not straightforward, is not a simple upline, conversely, it is uneven, with shocks, vibrations of upline [10]. He was the first who prove that there are large cycles. It's important and essential fact of economic dynamics, which found reflection in all major areas of social and economic life. To justify his theory M. Kondratiev analyzed the development of economic indicators in dynamics: average commodity prices, loan interest, salary of industrial workers, volume of foreign trade turnover, production and consumption of coal, iron, lead, gold. For the analysis he used the statistical data of four leading capitalist countries: Britain, France, Germany, USA.

As a result of the performed researches it has been identified up-wave and down-wave in the structure of large cycles:

- the first cycle: 1787–1814 — up-wave, 1814–1851 — down-wave;
- the second cycle: 1844–1875 — up-wave; 1870–1896 — down-wave;
- the third cycle: 1896–1920 — up-wave.

Based on the theory of Kondratyev's long waves, it can be concluded that the development of scientific and technological progress is characterized by periodic fluctuations with 50-60 years cycles. Over the past centuries in the history of technological and innovative evolution there were observed five waves, that's why five technological modes were formed.

The first mode (1780-1830) was based on new technologies in the textile industry. The second (1830-1890) mode was associated with the development of rail transport and mechanization of the production of almost all types of products on the basis of the steam engine. The third (1880-1930) mode was based on the use of electricity in industry, the development of heavy engineering on the base of use of hire, studies in chemistry. The fourth (1930-1990 pp.) mode assumed the further development of energy, which was based of mainly on the use of oil and oil products, gas, communications, new synthetic materials. Industrial leaders of the fourth mode: the production of automobiles, aircrafts tractors and weapons. The fifth mode was assumed the use of achievements in the field of microelectronics, computer science, biotechnology, genetic engineering, new energy, space exploration, satellite technology.

It should be noted that research and analysis were conducted under capitalism conditions. Modern cycles differ from classical through regular practice of active state intervention in the economy and influence of advanced achievements of scientific and technical progress on economic activity.

Modern scientists determine the economic cycle, as the time interval between two states of the same quality of the conjuncture or as fluctuations of level of economic activity when periods of upturn changes periods of downturn [11].

N.V Krasnokutska [12], A.A. Kharin, I. L. Holenskyy [13] and T.P. Blyznyuk [14] think that cyclicity is a total form of movement of the national economy and the world economy as a whole which supposes changing of revolutionary and evolutionary stages of economic development, economic and progress expresses unevenness of functioning of the various elements of the national economy.

Modern economic science has more than 1,380 types of cycles, among which are the following (Table II).

Schumpeter suggested to combine static balance system with the theory of economic growth as a consequence he raised the equilibrium approach to a new evolutionary dynamic level. Schumpeter's hypothesis is based on the explanation of such factors as technical innovations that violate the previous balance and cause uneven development of economic events. The entrepreneur, who embodies innovation first, gets excess profits. If other entrepreneurs embody such innovation again the profit decreases. As a consequence, equilibrium is established at a new level. There is a decline in the old industries when introducing in production, but after some period of time new areas are expanded rapidly.

B. C. Ilyasov in his article [15] proposed the definition of the notion of false cyclicity, which can arise after the choice of the model, which is inadequate in relation to the studied process. For example, unreasonable choice of polynomial approximation and smoothing of data by using "moving average" that led to the fact that several cycles were received as the result of modeling. Thus, wrong cyclicity can become the source of unsubstantiated taking decision to economic management.

Cyclical fluctuations of economic indicators under the influence of various factors lead to the new state of the economic object. Natural transitions from one state to another form the economic behavior of the object, that is important as for individual businesses and for the economy as a whole.

TABLE II
TYPES OF ECONOMIC CYCLES [10].

Name of the cycle	Duration, years	Driving force
Kondratiev's cycle	40–60	Radical changes in the technological base of social production and restructuring
Kuznets's cycle	15–25	Shifts in the structure of reproduction of production
Zhuhlyar's cycle (Average economic cycle)	7–11	As a result of the interaction of many monetary and credit factors.
Kitchyn's cycle (Short cycle)	3–5	Dynamics of relative amount of stocks of materials in the enterprise
Private economic cycle	1–12	Fluctuations of investment activity
R. Lukas's balanced business cycle	-	Cycles are based on unexpected cash flows
A. Stokmen's "Real economic cycles"	-	Fluctuations of potential gross national product, which are caused on changes of taste, fashion, technological shifts. If these changes are temporary, they cause periodic fluctuations. If changes are long-term, they contribute to economic growth.

On the basis of analysis of various scientists works it can be assumed that certain factors influence on the economic behavior of the object and this leads to such phenomena as cyclicity. This leads to a need to consider the relationship between these two categories (Fig.5).

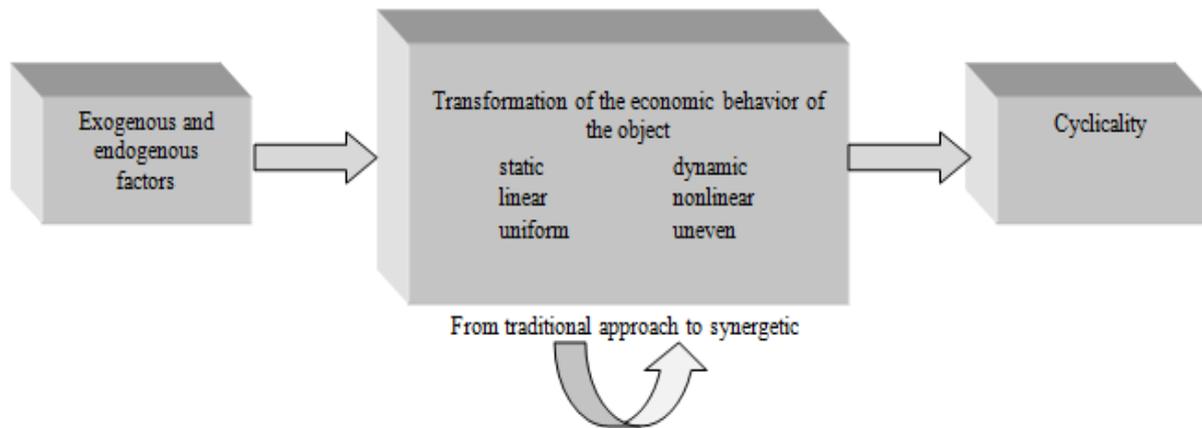


Fig. 5 – Relationship between cyclicity and economic behavior of the object

This picture shows that the economic behavior is under the influence various factors internal and external environment, properties of the economic system are changed which leads to the cyclicity.

IV. CONCLUSIONS

Thus, cyclicity of economic behavior of the object can be defined as "the process of changing of states of economic object that is repeated in varying degrees in time near point of equilibrium and can be caused by technical innovations, changes of cash flows, fluctuations in investment activity, structural reorganization of social production and that expresses uneven,

nonlinearity and dynamic of processes of development of the economic system". Later cyclicity can be the basis for building a model that it will provide an opportunity to substantiate expediency of making decision on effective management of the enterprise under the current economic conditions.

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