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Methodological Approaches to Structural-Logical Analysis of Interaction For Business Cycles Based on The Theory of Expectations

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Abstract

Traditional approaches to modeling economic cycles, which have been formed within the theory of economic growth, are based mainly on the use of complex multidimensional methods for constructing differential equations of production functions (Abalkin, 2002; Braudel, 1984; Kondratyev, 1989; Marat *et al.*, 2016; Yakovets, 1997). In our opinion, the main disadvantage of such models is their linearity, which forms the predetermined results of simulated phenomena. The development of so-called trend models based on the use of a simple mathematical apparatus (the development of polynomial, exponential, linear and other functions) as part of conducting statistical analysis of time series is quite a popular mechanism for constructing economic cycles. No less common tool for diagnosing cyclical fluctuations in the economy is the mechanism for developing production functions.In our opinion, modern economic systems are characterized by a very wide range of uncertainties, what predetermines an appropriate analysis of a significant number of factors. In addition, the formed system of administrative markets greatly distorts the classical tools of market regulation, what forms a special mode of generation of economic cycles. Thus, the use of traditional mechanisms and tools for diagnosing cyclical fluctuations in the economy does not fully contribute to objective modeling of economic processes, what affects the methodological tools used in forecasting economic trends, accordingly. This predetermines the need to develop new methods adapted to the new realities for evaluating economic cycles and factors generating them. This paper is devoted to finding methods for solving this issue.

Keywords: Economic cycles; Expectations of economic agents; National economy; Phase shifts forecasting; Modeling; Multicyclicity; Interconnection of economic cycles..

1. Introduction

A brief insight into the theory of economic cycles demonstrates the heterogeneity of causes, factors, and effects that induce uneven and cyclical economic development, including from the point of view of response horizons for changing factors. Meanwhile, this heterogeneity in all three cases is characterized by the commonness of a "general driver" that triggers the macroeconomic generation mechanism, which is the mechanism of accumulation and redistribution of capital. The question only arises in what level of impulses on the part of capital serves as an object of research, and what falls into the "research field" as a subject of research. For example, in the Kitchin and Juglar economic cycles the key driver for the launching of phase shifts is the level of interest rates in capital markets. However, fluctuations in market conditions of financial markets have different levels of impact on the perception and management decisions of economic agents, depending on planning horizons and expectations.

Similarly, in accordance with the Kondratieff long-wave theory, major cycles are determined by the mechanisms of "formation, accumulation and dispersion of capital", including financial and economic capital, which forms the basis for the transformation of productive forces (Glazyev, 1993; Leo, 2001; McNeill, 1982; Schumpeter, 1982). Thus, as an object of study, here are also the mechanisms for adjustments in the capital markets, but the subject of the study is the super-long transformation in the economic system with an average period of 40 to 60 years.

The structural-logical model of the above approach to the definition of objects and subjects of study in traditional theories of short, medium and long-term economic cycles is presented in Figure 1.

2. Methods

The methodical basis for study is based on the following assumption which state that one of the main tasks on determining the nature of economic cycles is the knowledge of the expectations of economic agents. These
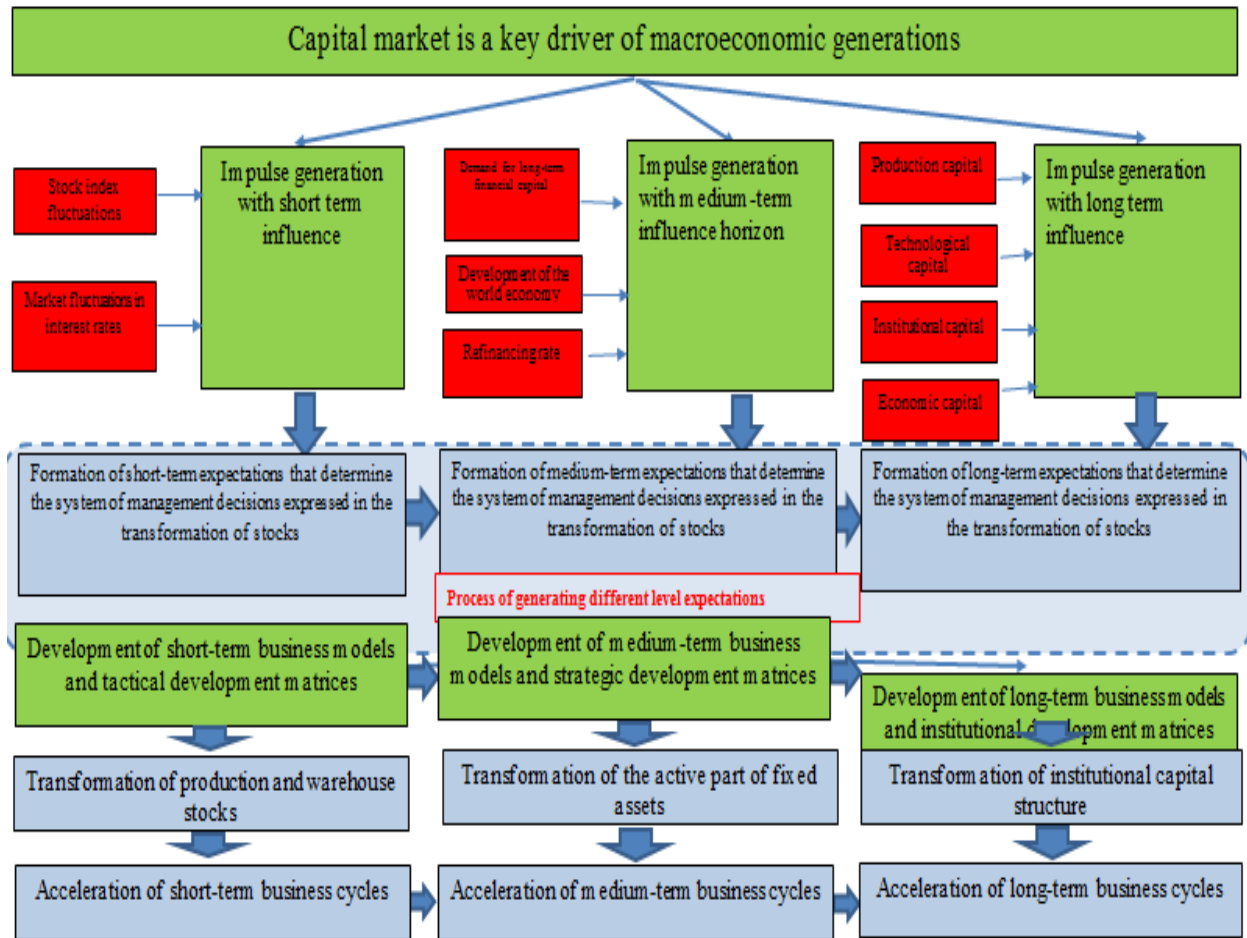
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knowledges are divided into short, medium and long-term, have the property of interpenetration and interdependence, and are also differentiated depending on the response to the impulses generated in the capital markets by:

- The degree of perception to the impulses considered;
- Planning horizons in business models.

In accordance with the studied methodology of this investigation, Figure 1 depicts the expectations of economic agents are a reflection of various-scale impulses in capital markets that form the basis of various economic cycles. These cycles also, are divided into short, medium and long-term, depending on the horizons of planning and response to the changes taking place. Moreover, business models and behavioral matrixes generated by emerging expectations are interconnected. The development of short-term business models and tactical development matrices determines the structure and content of strategic (medium and / or long-term) business development matrices, which, in turn, create the basic framework for institutional shifts and superlong behavior models. Based on the foregoing, it can be argued that there is a relationship between expectations that differ in the horizon of influence and response, and it is, apparently, not linear.

Figure-1.3.1. Structural-logical model of similarity of economic cycles which are different in frequency of their generation

The above reasoning creates a basis for the assumption that one of the main tasks on determining the nature of economic cycles is the knowledge of the expectations of economic agents, which in turn are divided into short, medium and long-term, have the property of interpenetration and interdependence, and are also differentiated depending on the response to the impulses generated in the capital markets by:

- The degree of perception to the impulses considered;
- Planning horizons in business models.

3. Results and Discussion

Taking into account that the expectations of economic agents determine the trajectories of economic cycles (Figure 1) and are, in fact, the primary sources of macroeconomic concepts, an assumption arises that the paradigm of the mechanisms and methods of forming economic cycles lies in the study of the theory of expectations, what is presented in our concept. Besides, given that expectations characterized by different time scales and degrees of response to various factors and impulses, are interconnected and interdependent, it is logical to assume that economic cycles derived from them, as well as characterized by different amplitude and frequency, are also interdependent.

In one of his scientific work (Safiullin and Elshin, 2017a;2017b; Schumpeter, 1982; Ельшин, 2017a;2017b;2017c), the outstanding Russian economist Yu.V.Yakovets notes that at present there remains an

unresolved task of assessing the relationship between business fluctuations and scientific and technological cycles, changing generations of technology and technological structures. Such work has no analogues abroad, but it is much more complex, since here long-term trends and factors of demographic, social, scientific, technological, economic and environmental development come into play.

Indeed, a review of research in the context of the problem posed demonstrates the extremely truncated nature of this type of work (Safiullin et al., 2016; Safiullin and Elshin, 2017b; Ельшин and Абдукаева, 2017; Сафиуллин et al., 2017). Researchers reveal the features of generating economic cycles of various scales in the autonomous mode. At the same time, relying on the methods of system analysis, it can be assumed that cycles of different scale being elements of the general economic trend, are in close relationship with each other. The proof of the hypothesis put forward undoubtedly requires scientific, methodological and empirical substantiation in connection with the fact that with respect to them, a generally accepted point of view has not been yet formed and there is no complete understanding of the issue.

The most notable contribution to the study of such interrelations was made by J. Schumpeter, who created the theory of multicyclicity (the theory of short-term, medium-term and long-term business cycles transforming as a result of the innovations implemented) (Zhikharevich, 2011). In accordance with it, each long- term cycle includes a series of medium-term cycles, which, in turn, are formed on the basis of the launch of short-term cycles.

It should be stated that the considered theory of multicyclicity, as well as other methodological approaches in the context of the question posed, does not find its methodological justification based also on empirical research. This proves the relevance of the task revealing the forms and mechanisms of interaction between economic cycles, characterized by different amplitude and frequent generation.

Following the developed logic of interconnection, it is advisable to assume that the process of study should be carried out in terms that reveal the expectations of economic agents.

We have previously argued and justified that short-term expectations trigger medium-term generation mechanisms, which, in turn, form the basis for determining institutional long-term expectations. Thus, we can conclude that each short-term cycle triggers phase shift mechanisms in medium-term cycles that generate long-term fluctuations in the economy (major cycles). In this connection, a methodological problem arises of defining algorithms that characterize the "launching" of mechanisms for the functioning of some cycles based on the generation of other smaller-scale cycles. Conceptually, this process is presented in Figure 2.

Figure- 2. The concept of the relationship and interdependence between different-frequency economic cycles
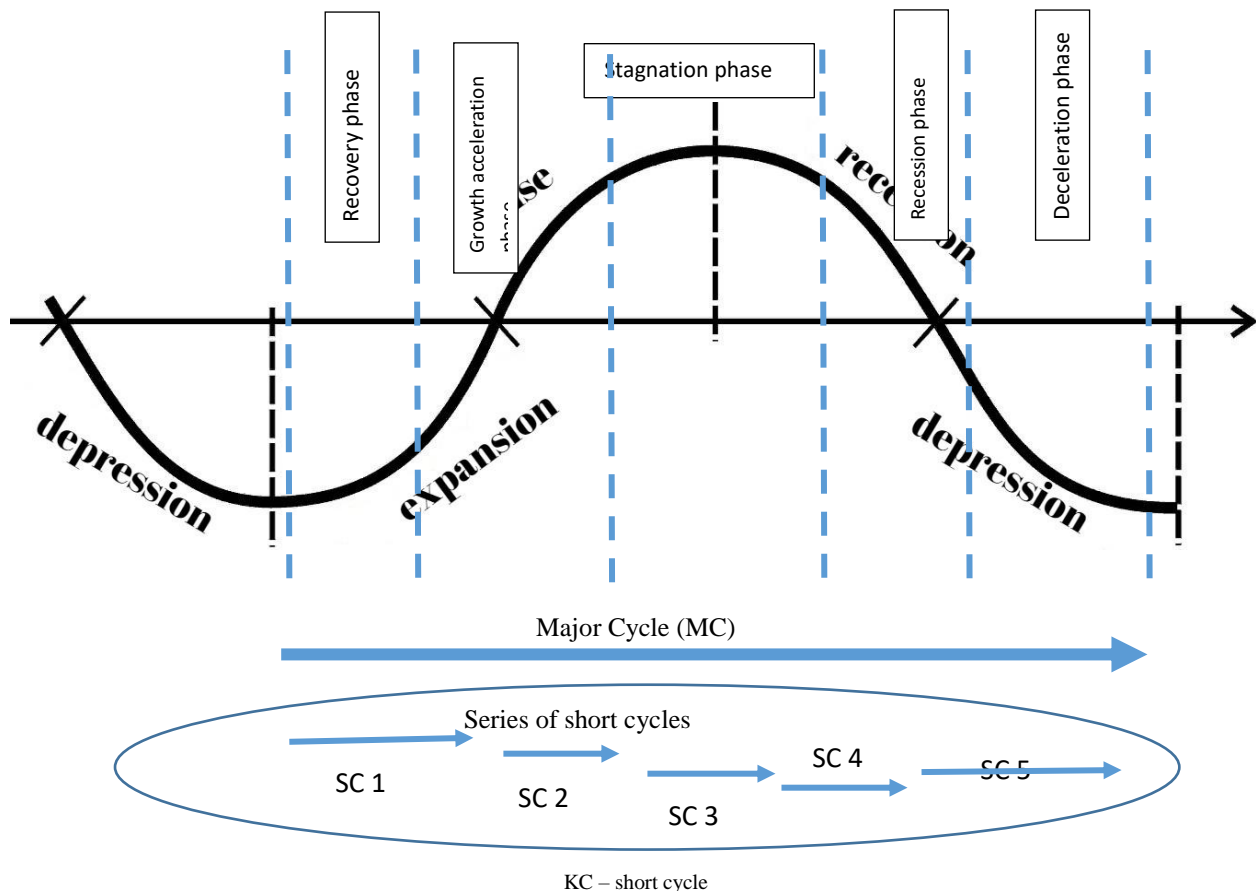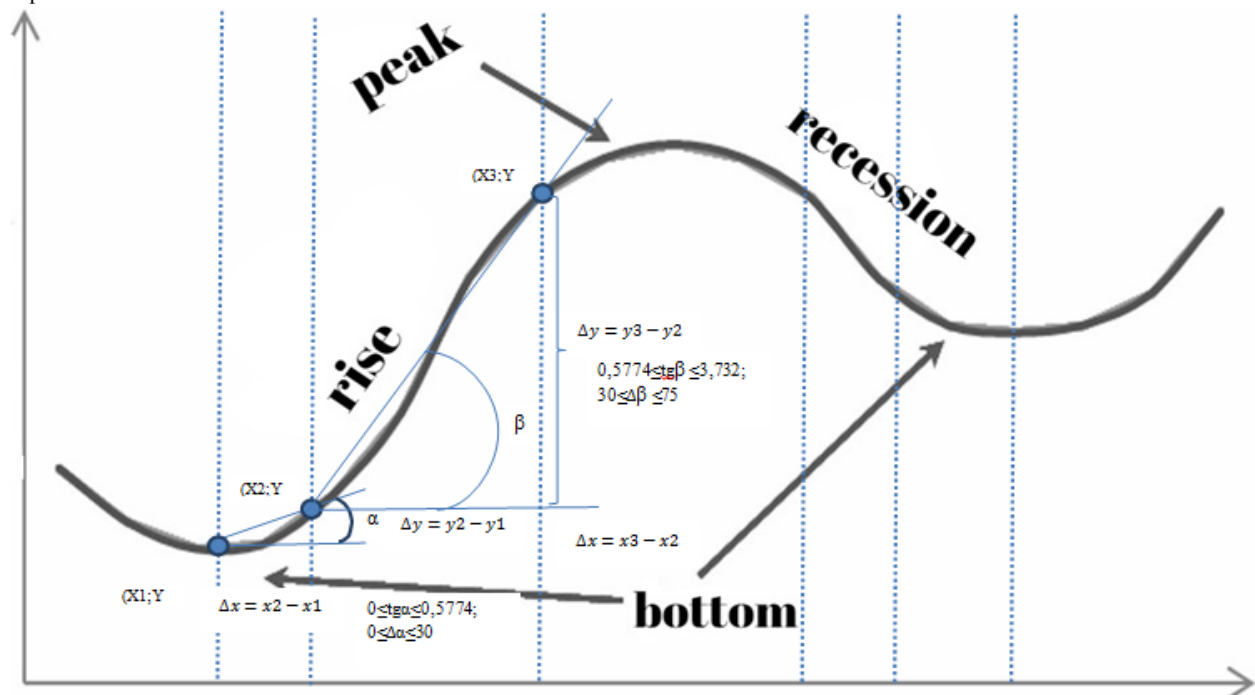

KC – short cycle

According to the concept presented, any economic cycle includes five short cycles. This approach fits completely into classical, traditional theories. For example, Kondratieff's major cycles, with an average duration of 40 to 60 years, contain 5 medium-term cycles of 8-10 years long, which, in turn, include 5 short cycles of 1-3 years. However, it should be noted that, in accordance with the presented concept of the generation of short cycles, the phases of a major cycle will differ somewhat from the classical ones (Figure 3).The main difference will be in the

values for the angles of inclination of the economic development trajectory. In our opinion, the slope of the curve characterizes the emerging sentiments of economic agents about the development horizons and the scale of nearby phase shifts within a major cycle. So, for example, short cycle 1 (SC 1 which determines the recovery phase of a major cycle (MC)) is limited to the range of values for the slope of a curve reflecting macroeconomic cyclic generation (Table 1). A graphic illustration of the developed structural-logical scheme for modeling the cyclical development of the economy in accordance with the concept of correcting expectations in short cycles is presented in Figure 3.

Table-1. Grouping of phases in large economic cycles depending on the ratio of positive and negative expectations in short cycles, which determine the slope angle for the trajectory of cyclic macroeconomic generations in a MC
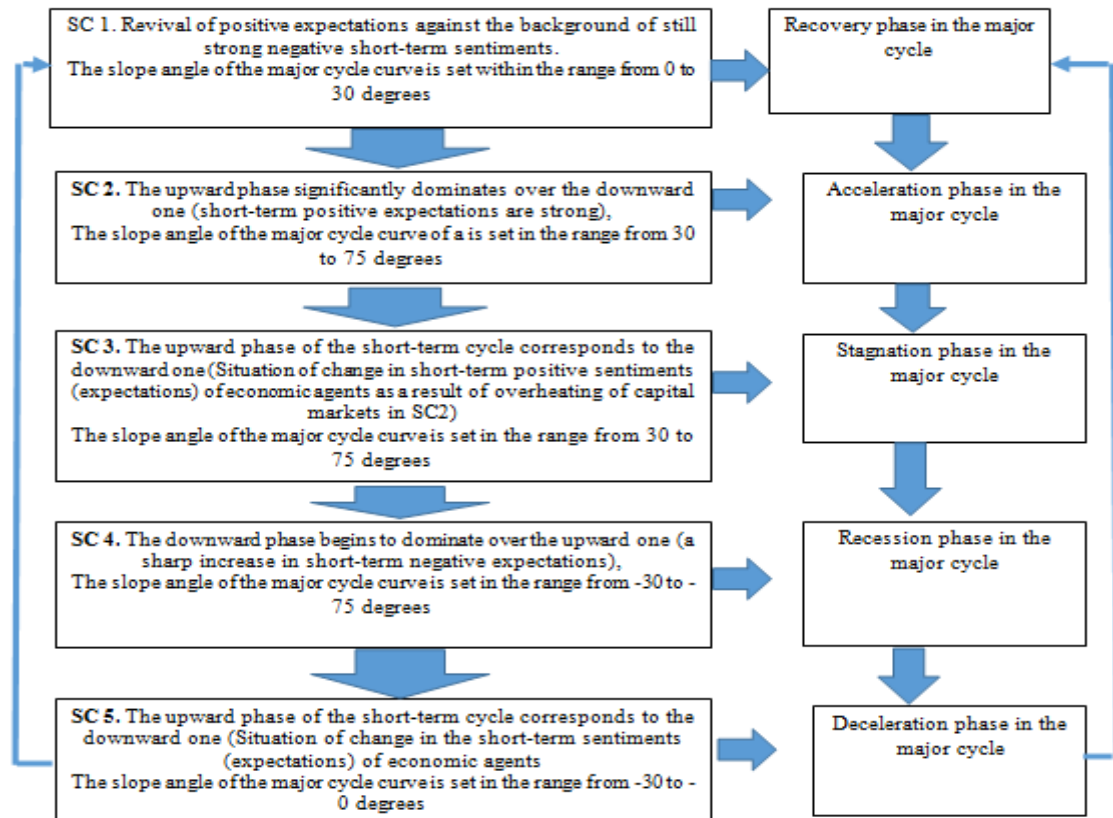
No.	SC classification	tgα (according to the Bradis table)	Slope angle range	MC Phase
1	SC 1	$0 \leq tg\alpha \leq 0,5774$	$0^0 \leq \Delta_{\alpha \leq 30}^0$	Recovery
2	SC 2	$0.5774 \leq tg\alpha \leq 3,732$	$30^0 \leq \Delta_{\alpha \leq 75}^0$	Acceleration
3	SC 3	$-0.1763 \leq tg\alpha \leq 0.1763$	$-10^0 \leq \Delta_{\alpha \leq 10}^0$	Stagnation
4	SC 4	$-0.5774 \leq tg\alpha \leq -3,732$	$-30^0 \leq \Delta_{\alpha \leq -75}^0$	Recession
5	SC 5	$-0.5774 \leq tg\alpha \leq 0$	$-30^0 \leq \Delta_{\alpha \leq 0}^0$	Deceleration

Figure-3. The concept of phase separation in the economic cycle in accordance with the approach to identification of economic agents' expectations

In accordance with the above, each short cycle (SC) is characterized by its individual features in the process of their generation in the course of the evolutionary development of a major cycle (MC). This fact is due to the differentiation in the expectations of economic agents formed in each short cycle integrated in a specific historical period into a major cycle. In other words, trends of short cycles set different dynamics of phase shifts in major cycles depending on the ratio of the generated short-term expectations within short cycles. That is, for example, in the recovery phase of a major cycle the ratio of positive short-term expectations will largely exceed the pessimistic sentiments thereby forming an accelerated trend of the major cycle. Then, the mood regarding the current conjuncture parameters will be transformed and short-term negative expectations begin to develop in the system against the background of "overheating" of positive expectations at the last stage of the short cycle. The decelerating mechanisms are launched with respect to medium-term development prospects and, therefore, the trajectory of the major cycle enters the phase of "stagnation", or SC 3 of the major cycle (Figure 3). Then, it comes the phase of the accelerated dynamics of negative short-term sentiments regarding positive assessments in the sphere of opportunistic parameters of development in capital markets. As a result, in a short-term cycle, the downward phase begins to dominate the upward one and, as a result, the major cycle enters a recession and depression phase. Then, the sentiments of economic agents under the influence of short-term positive impulses in capital markets begin to gain momentum and the expectations of economic agents launch mechanisms for reviving macroeconomic generations in the short-term cycle, what is projected by positive trends in major cycles - the recovery phase of the major cycle begins. In a concentrated form, the algorithm for the interaction of short and major cycles is presented in Figure 4.

Figure-1.3.5. Algorithm for the interaction between short and major cycles

SC 1. Revival of positive expectations against the background of still strong negative short-term sentiments. The slope angle of the major cycle curve is set within the range from 0 to 30 degrees	→	Recovery phase in the major cycle
SC 2. The upward phase significantly dominates over the downward one (short-term positive expectations are strong), The slope angle of the major cycle curve of a is set in the range from 30 to 75 degrees	→	Acceleration phase in the major cycle
SC 3. The upward phase of the short-term cycle corresponds to the downward one (Situation of change in short-term positive sentiments (expectations) of economic agents as a result of overheating of capital markets in SC2) The slope angle of the major cycle curve is set in the range from 30 to 75 degrees	→	Stagnation phase in the major cycle
SC 4. The downward phase begins to dominate over the upward one (a sharp increase in short-term negative expectations), The slope angle of the major cycle curve is set in the range from -30 to -75 degrees	→	Recession phase in the major cycle
SC 5. The upward phase of the short-term cycle corresponds to the downward one (Situation of change in the short-term sentiments (expectations) of economic agents The slope angle of the major cycle curve is set in the range from -30 to -0 degrees	→	Deceleration phase in the major cycle

4. Summary

The above algorithm for the interaction between large and small cycles allows us to detect the relationship between them formed on the basis of the close interpenetration of short-term expectations of economic agents with the medium-term (long-term) ones. Thus, the study of this issue through the prism of assessing the expectations of economic agents allows us to solve an extremely relevant and methodologically complex task. The presented concept forms the prerequisites for the development of methodological approaches to quantify expectations. At the present time, this question is insufficiently developed methodologically, especially in terms of assessing medium and long-term expectations. The most popular are studies that reveal approaches to the analysis of business activity, revealing the prospects for economic growth in the short term. Studies which targets are longer-term expectations are extremely limited.

5. Conclusions

Given the limited range of existing approaches to the empirical assessment of economic agents' expectations, solution of the stated problem which reveals the relationship between economic cycles, determines the need to develop tools to allow for empirical estimates of expectations regardless of their different formats in time scale and response to the corresponding impulses in capital markets. At the same time, this toolkit should have a multidimensional nature in accordance with the frequencies of the cycles studied, which are formed on the basis of various kinds of "different-frequency" expectations: short-term, medium-term and long-term. Solving the problem and determining the dynamics of short, medium and long-term expectations in a single measurement system, it becomes possible to relate them to each other. This contributes to the understanding of the closeness of such relationships, which predetermines the possibility of developing predictive models of economic development. In addition, taking into account the close correlation between the expectations of economic agents and the generation of economic cycles, the solution of the set task allows us to determine and empirically justify the logic of phase shifts in the cyclical development of the economy.

Acknowledgments

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