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THE FORMALIZED ASSESSMENT OF INTERRELATION OF REGIONAL BUSINESS CYCLES WITH MACROCYCLES: METHODOLOGICAL APPROACH AND ITS APPROBATION

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ABSTRACT

Issues revealing the features of the interaction of different-scale economic cycles in terms of scientific and practical significance are extremely relevant, especially in the context of studying the cyclical development of regional socio-economic systems and their integration into generated macrocycles. The present article deals with the study of this methodological aspect. The object of research is the cyclical fluctuations of the macro- and mesoscale economies. The subject of research is the methodology of a formalized assessment of the identification of their relationship based on the definition of an integral index that assesses the expectations of business entities regarding future transformations in the system of socio-economic transformations and forms phase shifts in the cyclical development of meso- and macro-economic systems. Practical evaluation of the developed approaches made it possible to construct the trajectories of regional economic cycles, correlate them with macrocyclic fluctuations of the national economy and reveal in a formalized form the level of their interconnection, as well as the nature of inclusiveness of regional economic cycles in the generated macro-cycles. According to the results of the assessments, a pattern was established that shows that the higher the level of the socio-economic potential of the region and the parameters of its integration into the system of global reproduction processes are, the less is the dependence of the regional economic system on the generated macroeconomic cyclical fluctuations of the national economy..

INTRODUCTION

Currently, the question of the interrelation of cycles of different scale and amplitude is of extremely high scientific and methodological importance. An understanding of the mechanisms that determine this type of relationship lies in the definition of a unified, for all studied cycles, indicator evaluation system (and the corresponding unified measurement scale) that characterize phase shifts. However, given the varying levels of scale of the cycles, and, consequently, the factors that drive the cyclical development of the economy, the solution to this problem is quite difficult, requiring consideration and the correlation of short-term market drivers of phase shifts and long-term factors of demographic, social, scientific, technological, economic, environmental and other development.

Thus, the solution is complex and ambiguous, with respect to which there is no systemic clarity and generally accepted point of view. At the same time, the scientific community has undertaken attempts and conceptual approaches that reveal the mechanisms and possible forms of implementing such interconnections [1-3].

Unfortunately, we should state that the existing theoretical developments in the field of determining the relationships between different-format / multi-scale economic cycles are, as a rule, descriptive, to a greater extent, abstract in nature and are not based on empirical calculations substantiating and confirming the assumptions and hypotheses proposed.

MATERIALS AND METHODS

A generalization of existing approaches that determine the relationship between cycles of different time scales and territorial projections suggests the development of a unified methodological framework such as the use of a concept based on modeling the expectations of economic agents. The latter, in a concentrated form, are a reflection of the system of short-, medium- and long-term indicators of the socio-economic development of the territory, characterizing and determining the pivot points of the cyclical development of the economy in the future. Considering the fact that the expectations of economic agents reflect promising macro-generations in the future, a quantitative determination of the values of their parameters allows us to determine future phase shifts within economic cycles that are classified as short-, medium-, and long-term, depending on the assessment of factors generating the corresponding short-, medium and long-term expectations. Thus, using a single indicator for all cycles that generates the trajectory of their development in the future – the expectations of economic agents, we can solve the problem of comparability of factors determining the phase shifts of the cyclical economic development of the meso- and macro-levels. Thus, the main idea is that any transformations in economic development, including in the sphere of phase shifts of economic cycles, are driven by the system of expected estimates

KEY WORDS

cyclical fluctuations of economy, expectations of economic agents, relationship of economic cycles, regional economic cycles

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about changes in the key parameters of factors that generate conditions for these phase shifts. Identifying the expected estimates of economic agents regarding future changes in the system makes it possible to determine with a high degree of certainty phase shifts within economic cycles. In addition, the relevance of the use of an indicator that estimates the expectations of economic agents is also increasing in the framework of solving the problem of identification and formalized assessment of the relationship between different economic cycles. The construction of cyclic development paths on the basis of this indicator forms the basis for conducting economic analysis within a single measurement system, which determines new possibilities for comparing various economic cycles with each other.

RESULTS

The search for answers to these questions is undoubtedly non-trivial. The solution to some of them is reflected in the works by Russian scientists [4], Briukhanova V.B., Antokhonova I.V. [5], Zageeva L.A. [6], and Smirnova S.V. Foreign researchers such as Viber R. [7], M. Schilman [8], Chase C., Villard A. [9], Thomson V. [10], Russell C. [11], Lucas R. [12], Marchet C. [13] and others made a significant contribution to the development of this question in the theory of economic cycles.

The proposed hypothesis on the relationship between cyclic vibrations of the macro- and mesoscale, undoubtedly, must be supported by the use of methods of scientific knowledge and research of the analyzed processes, which form the basis for constructing an objective evidence base. The use of modeling and quantitative assessment of the so-called "three-dimensional expectations of economic agents (3D - expectations) regarding current and upcoming transformations in three basic coordinates – economic, social, and institutional – on the meso-, macro, and global levels, which allows for a comprehensive assessment of key parameters and limits of the generation of economic cycles of individual territories" has been proposed as the main direction that fits into this research paradigm [14]. A detailed description of the essence of the developed method is described in previously published works of the authors.

In a concentrated form, the essence of the method of constructing integral indices that evaluate in a formalized form the expectation system of economic agents is reduced to modeling of the accelerated development cycles, which are understood as "periodic steady fluctuations in the expectations of economic agents with special types of patterns that are subject to changes in short-term, medium-term, and long-term market and institutional factors and forming conditions for phase shifts in economic dynamics based on transforming current x and mental evaluations regarding the upcoming changes in the future, allowing on the basis of the known theory postulates expectations improve the quality of regional forecasting, timely predict the turning points of the economic cycle phase shifts depending on programmable (identifiable) parameters of expectations of economic agents" [15].

In a generalized form, the structural-logical diagram of modeling the cycles of rapid development is presented in [Fig. 1].

The key essence of the method is to determine the aggregate values of the index of priority development based on the identification of the system of leading factors of the institutional and market order using tools of cross-correlation analysis [15]. At the same time, it is assumed that since the calculation process uses indicators of accelerated development relative to GRP/GDP, which determine the development directions of the institutional and market environment in the future, then they can help to quantitatively express the expectations of business entities regarding future transformations and transformations that they currently evaluate.

In a formalized form, the process of determining the values of the aggregate accelerated development index (ADI) is presented below (based on a previously developed author's technique [15]):

$$I_i = W_1 \cdot I_{1i} + W_2 \cdot I_{2i} + W_3 \cdot I_{3i} + W_4 \cdot I_{4i} + W_5 \cdot I_{5i} + W_6 \cdot I_{6i} + W_7 \cdot I_{7i},$$

where I_i - ADI value;

i - period value (year, in our case);

I_{1i} - subindex of urban development in the i -th year;

I_{2i} - subindex of human capital in the i -th year;

I_{3i} - subindex of production and resource development in the i -th year;

I_{4i} - subindex of institutional and cultural development in the i -th year;

I_{5i} - subindex of economic activity development in the i -th year;

I_{6i} - sub-index of research potential in the i -th year;

I_{7i} - subindex of capital change;

$W_1, W_2, W_3, W_4, W_5, W_6, W_7$ - weighting coefficients of the corresponding indices, calculated on the basis of taxonomic analysis.

The choice of the composition of sub-indexes is determined by their decisive role in the process of forming the expectations of economic agents and includes both market and institutional parameters.

Practical evaluation of the proposed methodological approaches is given in the present study on the example of the analysis of the relationship between short-term economic cycles recorded in the Republic of Tatarstan and the national economy as a whole.

The results of the calculations and estimates based on modeling the short-term expectations of economic agents identifying the dynamics of the composite indexes of the outstripping development of the studied socio-economic systems are shown in [Fig. 2].

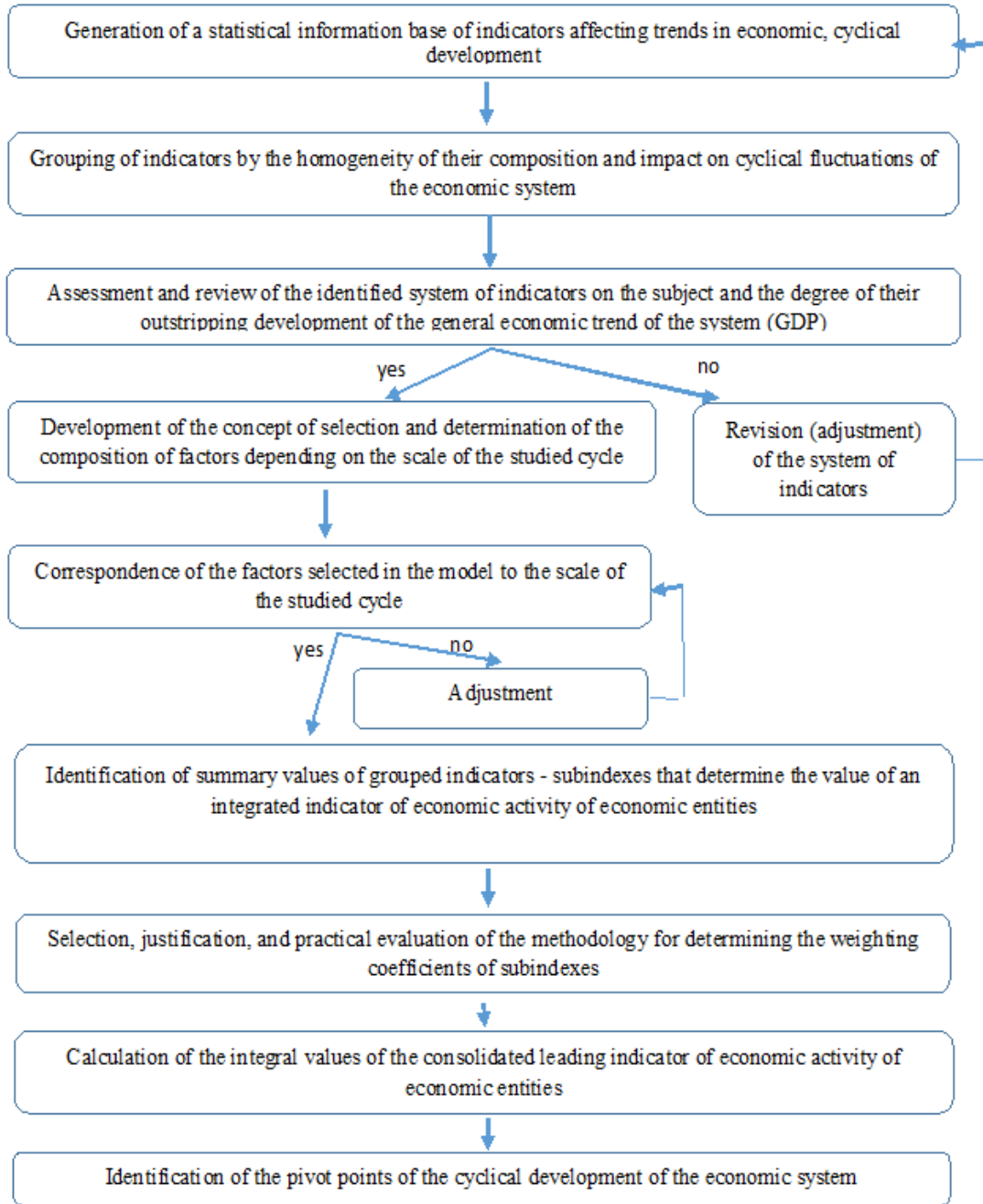


Fig. 1: A structural-logical scheme of modeling the accelerated development cycles [14].

The time series shown in the figure is characterized by a high level of convergence. At the same time, their graphic illustration clearly demonstrates the discrepancies in growth rates and oscillation amplitudes. Given that the composite index of accelerated development, in accordance with the developed concept, is an expression of the expectations of economic agents, in a concentrated form reflecting the essence of the upcoming cyclical fluctuations of the economy, we can conclude that, firstly, the economic cycles of the meso- and macro-levels are asynchronous; secondly, they are in an unambiguous relationship. According to the results of the correlation analysis aimed at determining the level of such a relationship, the correlation value was established at the level of 0.81, which indicates the presence of a high level of interdependence between the analyzed time series.

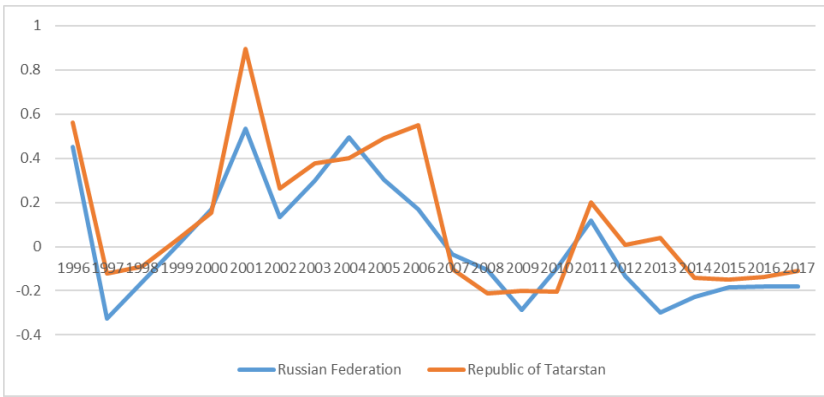


Fig. 2: Integral values of composite indices of the advanced development of the Russian Federation and the Republic of Tatarstan (formalized estimates of the expectations of macro- and mesoscale economic agents).

The presence of a high level of correlation actualizes and justifies the conduct of regression analysis, the results of which are presented below.

The following equation is obtained:

$$PT = 0,095 + 1,044 \cdot RF$$

where

RT - a composite index of the advanced development of the Republic of Tatarstan;
 RF - a composite index of the advanced development of the Russian Federation.

The statistical significance of the resulting equation is confirmed by a high level of indicators characterizing the suitability of using the obtained model (determination coefficient is 0.79; criteria are values less than a given significance level of 0.05).

A similar type of analysis was extrapolated to other regions of the Volga Federal District, the results of which are presented in [Fig. 3].

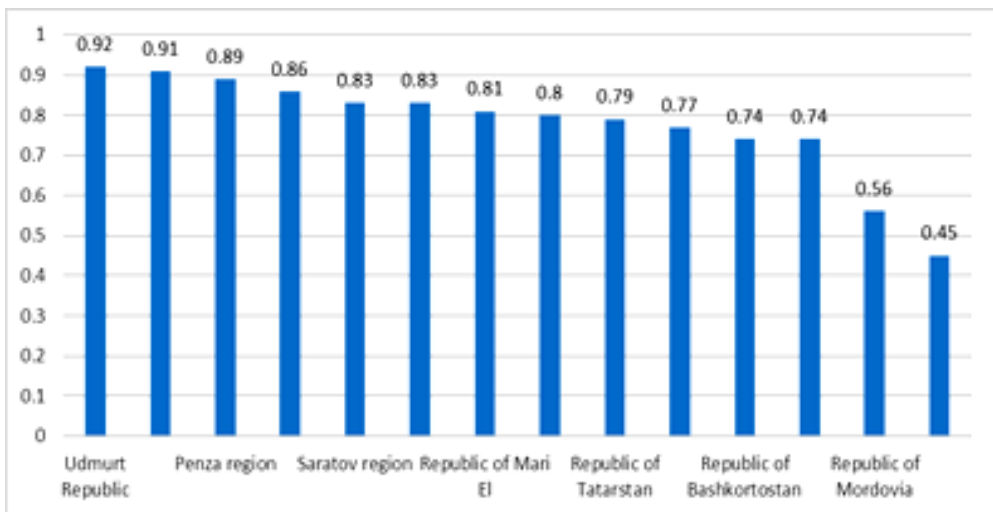


Fig. 3: Values of the coefficients of determination of regression equations that evaluate the relationship between the composite indices of the rapid development of the regions of the Volga Federal District and the Russian Federation.

SUMMARY

According to the results of the estimates, a very curious pattern is manifested - the higher the level of the socio-economic potential of the region (the Republic of Tatarstan, Samara region, Nizhny Novgorod region, etc.) - the less the dependence of the regional economic system on the generated macroeconomic cyclical fluctuations. It should be noted that such a pattern is very conditional. This fact can be explained by relying on the assumption that the higher the level of integration of the region into the system of global

reproduction chains is, the more transformed the system of generated expectations of regional economic agents becomes. That is, in fact, the regional economic system, developing in the wake of the national macroeconomic cycle, begins to generate its own, to some extent, autonomous development paths, which forms the dissonance effects between macro- and meso-economic cycles. Meanwhile, moderately globalized regions, relying entirely on the parameters of national economic growth drivers, demonstrate a higher convergence of their cyclic development paths with macro-cycles, which is confirmed by high levels of elasticity [Fig. 4].

CONCLUSION

Summing up the intermediate result of the methodological support of mechanisms for searching for interconnections between regional and national cycles we should state the existence of such interconnections. At the same time, their qualitative characteristics are very differentiated, depending on the level of integration of regional socio-economic systems into global reproduction processes. The revealed interconnections form a practical basis for the development of prognostic estimates of regional development as a result of phase shifts in macro-economic cycles.

The algorithm for identifying regional economic cycles developed in this study allows us not only to determine the comprehensive nature of the trajectories of the cyclical development of meso- and macro-economic systems, and on this basis to predict their further sinusoidal trends but also to determine the key factors affecting these cyclical fluctuations of regional economies, including inter cyclic interaction factor. This, in turn, forms a stable basis for the development of a set of state measures of "targeted" impact on trends in the socio-economic development of regional systems, considering the expected phase shifts of the generated macroeconomic cycles.

CONFLICT OF INTEREST

There is no conflict of interest.

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