Harmonization of Economic Cycles: Methods of Statistic Research and Econometric Modeling

Zarova, Elena
Samara State University of Economics, Statistics Department
ulitsa Sovetskoi Armii 141
Samara 443090, Russia
E-mail: zarova@sseu.ru

Cyclic development is the general economic law having its own peculiarity in the systems of various levels and various time periods. Finding the way out of the global economic financial crisis means it is necessary to analyze not only its reasons but inevitable consequences as well – short-term economic upturns and recessions.

In theory there is a point of view that all types of economic cycles correlate with each other and the long wave of the crisis influences the cycles with shorter phase length. In addition the characteristics of each wave are mostly determined by the peculiarities of the passage of shorter length cycles, composing this wave. Inherently, the observed fluctuations of economic activity are the result of integrated wave functions with different fluctuation periods. The raising phase of the big cycle (long wave) hits its peak when the cycles of shorter length are reaching the same state.

The result of harmonizing the cycles with different length and scale is the effect of their so-called "morphological nesting" – the nesting of lower rank cycles into the bigger ones.

Short-term economic cycles (phase length – from several months to half a year) have a more significant impact on the economy on a regional level than on a national level. Thus, there is a demand both in developing the theoretical grounds of studying short-term economic cycles on a regional level, and methods of their analysis and modeling as the toolkit for forecasting highly dynamic economic cycles in the region.

The author sets the target to examine the interaction of cyclical changes in a special aspect. Statistical evaluation of direct and reverse influence of cyclical fluctuations on the levels of Russian Federation (RF) region – Russia in general – and EU countries is presented on the basis of the values of the monthly indices of physical volume of production and producers' prices due to the types of economic activity, business activity indices, conjuncture expectations, exchange rates and indices of real salary and population income in EU countries, Russia and RF regions.

Distinguishing and quantitative evaluation of statistical regularities in this aspect is the necessary tool for foreseeing the objective risks of international collaboration.

Theoretical and methodological proof of the evaluation and forecast of short-term economic cycles should be compatible with the methods of middle- and long-term forecasting, supplement them with the procedures having corrective character and providing the actualization of long-term forecasts taking into account short-term changes of the forecasted parameters and the cyclic character as well.

The development of the theoretical basis and methodical complex of distinguishing, analyzing and forecasting the cyclical changes of short-term parameters in the economy of the region assumes that the following complex problems should be solved:

1. Theoretical proof of the concept of short-term economic cycles on regional level;
2. Developing the methods of evaluating the cyclic changes of the indices of the development of region's economy in short-term time intervals;
3. Distinguishing the leading indices of All-Russia and regional levels that make it possible to foresee the change of the phases of short-term economic cycles in the region;

4. Development and approbation of the methods of forming the composite leading index (CLI) as a tool of forecasting short-term increases and decreases in post-crisis period of RF region economic development (after coming through the lowest turning point of global crisis);

5. Harmonization of cyclic dynamics estimations in short-term period with middle- and long-term forecasts of social and economic development.

The object of the research is the economy of Samara region, highly dynamic processes of the region's development having the periodic character with high-frequency time phases and amplitude significant for yearly development results.

Samara region is an administrative region of Russian Federation with highly developed oil and gas, aerospace and automobile clusters on its territory. Due to the data of the National Census 2010, the population of Samara region is 3.3 million people.

The scientific novelty of the suggested approach is that it for the first suggests and tests evaluation, analysis and forecast methods of short-term cycles in the economy of the region on the basis of leading indices system and the complex of mathematical and statistical methods. The necessity and possibility to harmonize discrete middle and long-term forecasts with the calculated values and foreseeing short-term cyclic fluctuations of the parameters of region's development are suggested.

Three variants of calculating the composite leading index are suggested in order to find solutions to the above mentioned problems. They differ from each other by sensitivity degree of the final figure to the forthcoming turning points and the change of stages in short-term cycles of the region's economy.

The first variant is based on calculating the simple average of the monthly increase of leading indices due to factual data and the assumption to save this value in the forecasted period.

The second method suggests the calculation of composite leading index due to the formula of mean weighted quantity from individual leading indices taking into account the set lags (l1) and their reaction to the change of the dynamics of the sample index of economic cycle.

There are references in statistics literature that there is no need to give the grounds to special weighted coefficients for averaging the values of leading indices. However in this situation the effect of self-weighting takes place, and consequently, free leading index will mostly depend on private indices with big amplitude of cyclic fluctuations that is characteristic to micro level indices.

In order to eliminate the effect of self-weighting it is necessary to define the weight depending on the degree of statistic relations (the values of pair correlation coefficients) between the private indices and sample cyclicity index.

The third method is in defining the composite leading index as the calculated value of the sample index of economic cycle.

The calculated value of the sample index is set on the basis of multiple regression models of linear and power form.

While implementing every method it is necessary to take into account the pair correlation dependences between the sample index of economic cycles and particular leading indices, as well as the necessity to eliminate the possible effect of multicollinearity.

To create the system of leading indices on the region's level, the principle of "cycle nesting" should be taken into account, it presumes the "export" and "import" of regional cyclicity.

On the basis of comparing the lower turning points of trend-cyclic curves of the sample index (the index of the physical volume of industrial production) and the corresponding points of trend-cyclic components of initial indices, the author reveals the leading indices of short-term economic cycles in Samara region – 43 from 250 indices theoretically considered as the leading indices.

The conclusion is made that the set leading indices with different prediction periods point to the turning points of the sample index of short-term cycles. The indices of "the earliest disclosure" are regional indices of business activity and the indices of enterprises debts (especially for suppliers and budgets of all levels).

It is proved that leading indices can have both an immediate interrelation with the index - its cyclicity is evaluated, and an indirect one - by the complimentary and substitute links at the market.

The crisis wave of changing producer's prices for the main types of industrial production and tariffs on freight service in the examined region came 1-2 months earlier than in Russian Federation in general. The main reason is that Samara region is the region with a relatively more developed market economic system, characterized by the openness to the external economic environment and, in comparison to other regions, a smaller degree of administrative impact of regional government structures on the market response of economic subjects to the macroeconomic impulses.

Therefore, we have sustainable statistic evaluation of the "export" of cyclic price changes in the oil and gas complex of Samara region in EU countries.

The main modeling method is developing and evaluating the parameters of simultaneous regression equations with cyclic components.

The method of harmonizing the forecasted short-term economic cycles on the basis of the leading indicators system with the methodology of discrete long-term forecasting is suggested as the basis for calculating the statistic programs of development on the regional level.

The quantitative regularities discovered by econometric modeling are well-matched to the peculiarities of 2008-2009 crisis. They allow the creation of the information signal of the interrelated economic "behavior" of the regional systems in different phases of middle and short-term economic cycles which are provoked by the global financial crisis.

This ripple effect, i.e. the sequence of crises with smaller "depth" as a result of the most acute crisis over a long time period, demands the special attention and research of statisticians in the modern post-crisis period.

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ABSTRACT

Short-term economic cycles (phase length from several months to half a year) have a more significant impact on the economy on a regional level than on a national level. Thus, there is a demand both in developing the theoretical grounds of studying short-term economic cycles on a regional level and methods of their analysis and modeling as the toolkit for forecasting highly dynamic economic cycles in the region. The object of the research is the economy of Samara region - an industrial and agricultural developed region of the European part of Russia, independent administrative subject of the Russian Federation. According to the data of the recent population census in 2010, the region's population exceeds 3.2 million people. The subject of the research - highly dynamic processes of the region's development having the periodic character with high-frequency time phases and amplitude significant for yearly development results. The scientific novelty of the author's approach is that it suggests and tests evaluation, analysis and forecast methods of short-term cycles in the economy of the region on the basis of leading indices system and the complex of mathematical and statistical methods. The author suggests three variants of calculating composite leading index that differ from each other by sensitivity degree of the final figure to the forthcoming turning points and the change of stages in short-term cycles of the region's economy. The phenomenon of harmonization of economic cycles with different phases (long, medium and short-term) results in multiplication or

leveling of their negative economic consequences. The aim of the research was to reveal the leading indices of short-term cycles on a regional level and analyze statistical regularity of Samara and Russia oil production cycling changes impact on the economic indices of European countries. Econometric modeling and forecasting methods were used on the basis of integrating trend and cycling components of different time series. The composite leading index of cycling process in Samara region was designed as a weighted average of trend-cycling magnitudes of leading indices: structure-dynamic indices of Samara region, other regions, Russia in general and other countries.