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# The HSE ESI and the business cycle in the Russian economy

## Abstract

As the Russian economy is presently characterized by high uncertainty of doing business and a growing gap between opinions and actions of firms and decision makers, the importance of qualitative business surveys as a source of information is significantly rising. The paper investigates the ability of Russian business tendency surveys to identify business cycle turning points. For this purpose we have constructed an algorithm to build economic indicators which cover all information contained in the sectoral business surveys data. Identification of the turning points of these indicators allows us to track the stylized 'averaged' chronology of the business cycle. In addition, we have evaluated *ex post* the turning points in the GDP growth on the basis of the extracted cyclical component of the composite Economic Sentiment Indicator.

Keywords: business cycle, business tendency surveys, turning points, economic tracer, economic sentiment indicator

JEL classification: E32, C81, C82

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The paper was prepared within the framework of the Basic Research Program at the National Research University Higher School of Economics (HSE) and supported within the framework of the subsidy granted to the HSE by the Government of the Russian Federation for the implementation of the Global Competitiveness Program. Any opinions or claims contained in this paper do not necessarily reflect the view of National Research University Higher School of Economics.

## 1. Introduction

At present, the Russian economy is facing increasing uncertainty of doing business, and a gap between opinions and actions of firms and decision makers is growing. This is largely determined by unfavorable global context, the escalation of external shocks and risks, which challenge using relevant statistical methods to monitor and analyze the economy's performance.

Russia needs to change the economic model now more than ever. The reindustrialization process should reduce gradually the country's dependence on the resources-based growth and promote innovation activity. As nationwide structural and cyclical changes advance, the importance of business tendencies surveys (BTS) as a source of information substantially increases. Despite weaknesses of cognitive perception of reality by economic agents, this method of measuring their behavior and changing business sentiments is a recognized source of economic data in many countries worldwide. This information comes in hand before 'hard' quantitative data is available, and is statistically reliable.

In Russia, such research program was launched in 1993 in the framework of the TASIC program 'Statistics 2, 3, 5'. Since 1998 the regular large-scale sectoral BTS have been carried out by the Centre for Economic Analyses of the Government of the Russian Federation in co-operation with the Federal State Statistics Service of the Russian Federation (Rosstat). Since 2009 all methodological support and databases have been transferred to the Centre for Business Tendency Studies, the Institute for Statistical Studies and Economics of Knowledge, Higher School of Economics (HSE ISSEK CBTS).

The accumulated large-scale dynamics of such 'soft' statistics aggregating entrepreneurial assessments not only meets the increased demand of experts for economic data but also contributes to the expansion of managers and decision makers competencies. Such databases can combine real-time entrepreneurs' estimations of current and expected economic development in various sectors and reflect external shocks, internal barriers and their significant socio-economic consequences. The regular monitoring of economic agents' opinions allows collecting qualitative data on business and investment climate, business trends and environment, business confidence and economic sentiments.

The BTS program developed by HSE allows for measuring many sectoral development paths and short-term fluctuations, while traditional statistics is insufficient, not prompt enough or subject to frequent revisions. We define the main advantages of joint HSE–Rosstat BTS as:

- accumulated data set over a long time period;

- coverage of a wide range of regions, sectors and economic activities;
- frequency, promptness; synchronization and harmonization of programs;
- possibility of sectoral benchmarking;
- unified approach to data collection, data processing and database maintenance;
- availability of results;
- statistically significant compatibility of survey results with quantitative statistics;
- compliance with international standards and classifications.

We have found short-term indicators based on business surveys data useful in monitoring business cycles and forecasting turning points (Kitrar *et al*., 2003; Kitrar & Ostapkovich, 2013a; Kitrar & Ostapkovich, 2013b; Kitrar *et al*., 2014).

This study focuses on whether the aggregate dynamics of business confidence conforms to the real economic situation in Russia. We aim to determine to what extent business surveys data are sensitive to the phase alternating in the cyclical development of the national economy. For this purpose we have constructed an algorithm to build economic indicators which cover all information contained in the sectoral business surveys data. Identification of the turning points of these indicators allows us to track the stylized 'averaged' chronology of the business cycle. In particular, we

- define criteria for aggregating each BTS indicator in one of the composite blocks;
- develop an iterative procedure for building a structured set of composite indicators according to the direction, average duration and chronology of the phases of unobserved cyclical components;
- build an algorithm that tests the indicators for cyclical sensitivity through decomposition of their dynamics in the iterative procedure.

To demonstrate expected outcomes, we test the cyclical volatility of the composite indicator according to the proposed built-in algorithm. For this purpose we use the HSE Economic Sentiment Indicator (HSE ESI), which already exists in Russia and is almost harmonized with its European analogue, from Q1 1998 to Q2 2015. The results show a significant degree of compatibility and a leading nature of this composite BTS indicator with the cyclical component of GDP. Based on the extracted HSE ESI cyclical component, we retrospectively evaluate GDP turning points.

The empirical basis of the study is BTS data on assessments and expectations of economic agents in the industry, construction, trade, and

services, with stratified random sampling of about 25.000 observations from almost all regions of Russia.

## 2. Background

In international practice composite indicators are widely used for interpretation and presentation of generalized BTS information (European Commission, 2014a; OECD, 2003, 2008). We define a composite indicator (CI) as an aggregate quantitative measure of a non-quantitative information about economic phenomena like, for example, competitiveness, innovation and investment, integration and structural processes, economic sentiments, consumer confidence or business climate.

To convert BTS data into CIs it requires to select variables that:

- measure early stages of the production process (for example, changes in new orders or total order books);
- react quickly to changes in economic activity (e.g. finished products inventories);
- measure expectations (e.g. expected tendency of production).

As a rule, it is easy to extract a cyclical component of such time series because they do not contain long-term trend, as they in fact represent a deviation from it[1].

Moreover, such indicators are related to economic agents' judgements that are capable to record possible cyclical changes ahead of relevant statistical indicators. The Russian BTS data are available from a single source (Rosstat) and published regularly at the same time. This means that the CIs are not revised. Finally, we form all survey programs for Rosstat to capture information that is impossible to record using conventional methods of statistical observation – for example, capacity utilization, bottlenecks in production, level and change in sectoral economic activity, effects of external shocks and internal barriers. These advantages enhance significantly the information capacity of BTS data to identify the cyclical phases and turning points.

In our practice we make use of publications available at the European Commission website, which regularly publishes the methodology and time series of composite indices of economic sentiments, business confidence and business climate.

In Russia, the best known research on business cycles and composite indicators is done by the 'Centre of Development' Institute, Higher School of

[1] In the Russian BTS program, ordinal a three-option scale (up/unchanged/down) is used for all variables.

Economics (Smirnov, 2001, 2006, 2012) and Center for Business Tendency Surveys, Higher School of Economics (Kitrar & Ostapkovich, 2013b). Thus, in our study we are primarily guided by the fact that for a long time international community has tended to aggregate complex and partly undisclosed to quantitative statistics processes and behavioral patterns of economic agents into a single measure of national economic activity.

## 3. Basic algorithm for building composite indicators of cyclical nature

Let us consider the main stages of constructing CIs based on the BTS results for measuring economic activity fluctuations and turning points identification. The used approach basically presupposes building a flexible set of CIs, including the BTS results, at sectoral and national level. They are classified into three groups: coincident, leading and lagging indicators, depending on the direction and the timing of reference time series.

What is specific about the approach is a built-in algorithm that tests each CI and its components for cyclical sensitivity by decomposing their dynamics, extracting a short-cycle component with smooth amplitude and assessing its approximation to the reference indicator. This procedure is based on the OECD guidelines (European Commission, 2014a; OECD, 2008, 2012; Nilsson & Guidetti, 2008).

The construction procedure of CIs aims to cover relevant information on HSE business surveys as much as possible, regardless of their cyclical properties. Further, according to an integrated test, the cyclical sensitivity of CIs time series is checked in regard to the cyclical dynamics of the reference series. On this basis, the dates of turning points are estimated for all indicators that highly correlate with the reference series. Their 'average' values represent the desired chronology of both actual and expected changes in the cycle (Chauvet & Hamilton, 2005)[2].

In our opinion, the cyclical CIs for Russia may consist entirely of qualitative variables[3] if they have a high cyclical sensitivity and significant

[2] We consider this concept, which can be interpreted as a 'date then average' approach, more appropriate when the cyclical analysis is to be carried out using the set of composite indicators (not an integrated construction). The opposite method, proposed by Stock and Watson (2010), is 'average then date', which is prevalent in building the OECD single leading composite indicator.

[3] The most successful experience of using qualitative information in a short-term analysis is a system of cyclical composite indicators published by the European Commission as 'European Business Cycle Indicators' (European Commission, 2014b).

correlation with aggregate economic activity (expressed in GDP dynamics or other appropriate indicators).

Within the growth cycle concept, the main criteria to determine the sequence of steps in an iterative procedure of constructing a set of cyclical CIs are:

- correspondence to the cyclical nature of a reference macroeconomic indicator of aggregate economic activity in a specific sector or in the Russian economy as a whole (for example, the GDP index or the industrial production index);
- providing leading, coincident or lagging (so-called control) signals of turning points.

Ideally, we can obtain three CI clusters which would be able to:

- lead the trajectory of the reference indicators with a sufficient degree of probability in real time;
- provide evidence of the sustainable coincidence with the reference indicators trajectory;
- approximate the retrospective trajectory of the reference indicators, confirming or refuting the cyclical correspondence.

With this definition, we determine a generalized trajectory of the cyclical components of all analyzed time series, being adjusted deviations from the long-term trend. In this context, the reliability of the CI depends on theoretical assumptions about the cyclical nature of the selected potential variables and the statistical characteristics of their cyclical sensitivity.

The general logic of the assertions above leads to the following iterative procedure:

I. *Formation of the initial conditions* – the well-grounded selection of the reference indicator and qualitative indicators that can potentially form CI. It requires selecting qualitative BTS indicators which highly correlate with the growth rate of quantitative statistics. The main selection criteria are: economic feasibility and relevance, reliability of the statistical base, frequency, availability and timeliness of the information sources, broad coverage and long-time series, and absence of pronounced volatility in the dynamics.

II. *Statistical analysis of the reference series cyclical behavior:*

1. Decomposition of dynamics: the double use of the Hodrick-Prescott (HP) filter is recommended (Nilsson & Guidetti, 2008; Nilsson & Gyomai, 2011). In this study we investigate short-term growth cycles that most closely match the informational nature of BTS results. Therefore, we use chain growth rates (the relative value of each month/quarter to the corresponding

month/quarter of the previous year) as a reference quantitative series, because they correlate the best with time series of qualitative indicators. This reporting format presupposes that the basic fluctuations in both quantitative and qualitative series occur relative to long-term average values (e.g. = 0, = 100). However, the test for stationarity revealed that they have significant power at low frequencies (the augmented Dickey-Fuller test identified non-stationarity with high *p*-value). Filtering such unsteady low-frequency components allows the transformation of these series into a form with time-independent statistical properties when the expected value and variance of alternating sections of such series are close to the stable time-constant values. The proposed decomposition of dynamics makes the remaining high-frequency component more consistent with the short-term cyclical changes of the time series with an unsmoothed amplitude. In this study, the low-frequency component is defined as a medium-term cycle of a reference indicator (identification of a long-term cycle requires longer time series). This implies the need of:

- identification of the medium-term cycle (MC) with a frequency up to 15 years by using the HP filter for the first time;
- extraction of the unsmoothed short-term cyclical component (USC) – detrended reference series representing the growth cycle (due to revealed non-stationarity of raw series the obtained USC should be tested for cointegration with qualitative variables);
- smoothing the short-term cyclical component with the use of the HP filter for the second time.

2. Constructing the 'basic chronology' of the smoothed short-term reference cycle (SSC) – identifying turning points by using the simplified version of Bry-Boschan (1971) procedure. The criteria for dating the smoothed dynamics are:

- alternation of peaks and troughs;
- minimum duration of the cycle (if alternation from peak to peak or trough to trough is present) of 15 months;
- minimum duration of the cycle phase of 5 (6) months;
- identification of the maximum value (for peaks) or minimum value (for troughs) as a turning point if no explicit turning point comes up or no turning points alternate;
- exclusion of extreme points whose effect is short and completely reversible.

III. *Statistical analysis of time series of indicators that can potentially be aggregated in CI (including a test for their cyclical sensitivity):*

1. Statistical treatment of time series: seasonal adjustment, elimination of insignificant outliers, recovery of missing values, standardization (if necessary).

2. Decomposition of dynamics (the double use of the Hodrick-Prescott filter is recommended). Statistical studies of the accumulated BTS dynamics do not indicate stationarity, although indicators are already deviations from the long-term average according to their information content. Therefore, pre-filtering unsteady components should be done to identify a short-term cycle (first with an unsmoothed amplitude) in the maximum accordance with the trajectory of similar components in the reference series. The lack of stationarity in BTS series and the possible presence of long-term fluctuation, not related to the short-term cycle, are largely due to the increasing optimism or pessimism in the economic agents behavior that is dominant at specific time intervals. In this item we recommend the same steps as those described above for the reference series decomposition.

3. Assessing the cyclical correspondence of the smoothed short-term cycle (SSC) of the selected indicators with the SSC of the reference series:

- finding significant cross-correlation coefficients;
- classifying the indicators according to leading, coinciding or lagging turning points of the reference SSC;
- 'primary dating' of the SSC for all selected and classified indicators;
- final selection of indicators for aggregation.

The main selection criteria are as follows:

- significant cross-correlation statistics (provides evidence about the cyclical sensitivity and consistency with the cyclic path of aggregate economic activity, which is represented by the reference time series);
- the benchmark for this type of structuring indicators is the analysis of time periods (months, quarters) with the maximum cross-correlation coefficients;
- the highest possible correspondence of 'primary dates' with basic chronology of the cycle (using the simplified Bry-Boschan procedure).

We recommend performing the built-in algorithm (see Table 1) for testing not only potential qualitative components for aggregation but also for CI, including those built in the framework of the harmonized European system of business and consumer surveys. It is expedient to test CI for cyclical sensitivity to determine the feasibility to include them in the system of relevant composite short-term cyclical indicators.

Table 1. The built-in algorithm for testing the BTS indicators dynamics $X(t)$ to further include them into the system of short-term cyclical indicators after step-by-step assessment jointly with the reference indicator dynamics $Y(t)$.

| | |
|---|---|
| Step 1 | Selection of the type of the compared indicators $X(t)$ and $Y(t)$ (possible representation of $X(t)$ – raw balances; $Y(t)$ – index):<br>1.1. Graphical comparison of $X(t)$ and $Y(t)$.<br>1.2. Calculation of the $X(t)$ and $Y(t)$ cross-correlation coefficients. |
| Result | Choosing potential CI components and reference series. |
| Step 2 | Decomposition of the selected time series $X(t)$ and $Y(t)$: estimation of medium-term cycle (MC) and unsmoothed short-term cycles (USC):<br>2.1. Extraction of the 8-, 10- and 15-year MC for $X(t)$ and $Y(t)$: first HP filtering.<br>2.2. Graphical comparison (common X-axis) of 8-, 10- and 15-year MC $X(t)$ and $Y(t)$ with initial $X(t)$ and $Y(t)$.<br>2.3. Graphical comparison of USC $X(t)$ and $Y(t)$ with different MCs (8, 10, 15 years).<br>2.4. Calculation of cross-correlation coefficients of $X(t)$ and its USC with various MCs (8, 10, 15 years).<br>2.5. Calculation of cross-correlation coefficients of $Y(t)$ and its USC with various MCs (8, 10, 15 years).<br>2.6. Joint cross-correlation of USC $X(t)$ and USC $Y(t)$ with various MCs (8, 10, 15 years).<br>2.7. Test for cointegration of USC $X(t)$ and USC $Y(t)$ with selected MCs. |
| Result | Selection of the desired MC and USC for $X(t)$ and $Y(t)$. |
| Step 3 | Selecting the smoothing short-term cycle (SSC) for $X(t)$ and $Y(t)$:<br>3.1. Smoothing the USC amplitude for $X(t)$ and $Y(t)$: the second HP filtering to extract short cycles (18, 24 and 30 months).<br>3.2. Graphical comparison of the smoothed short-term cyclical components (SSC) $X(t)$ and $Y(t)$ with different periods of smoothing (18, 24 and 30 months).<br>3.3. Joint cross-correlation of SSC $X(t)$ and SSC $Y(t)$ at different smoothed amplitudes (18, 24 and 30 months): SSC $Y(t)$ at 18-month smoothing with SSC $X(t)$ at 18-, 24- and 30-month smoothing, etc. |
| Result: | Selection of the most comparable SSC $X(t)$ and $Y(t)$ and their graphical representation. |

IV. *Generation of final results:*

1. Identifying the cyclical phases and the average turning points dates for the each group of the indicators.

2. Secondary dating of the SSC of structured indicators followed by the determination of the average dates of turning points for each group of the indicators.

3. Normalization (standardization) of the indicators selected for aggregation: setting their SSC to the same amplitude[4].

Aggregation through various models of averaging the normalized SSC, presented in the form of standardized indices[5].

## 4. Decomposition and joint analysis of the growth cycles of the Economic Sentiment Indicator and GDP

We investigate the dynamics of the composite Economic Sentiment Indicator (HSE ESI) for its cyclical sensitivity and statistically significant consistency with the short-term cyclical trajectory, phases and turning points of the aggregate economic activity, represented by the reference statistics – the real GDP index. The empirical study is conducted according to the algorithm described above and covers period from Q1 1998 to Q4 2014.

The HSE ESI is a composite indicator that combines the dynamics of the BTS results, which cover about 22.000 industrial, construction, retail trade, and service firms as well as 5.000 consumers. The total contribution of these sectors to the domestic gross value added is about 70%. To calculate HSE ESI, we select 12 indicators according to EC guidelines[6], which reflect economic fluctuations in Russia the most adequately and promptly:

- in industry: current order books, production expectations and level of finished products inventories;
- in construction: current order books and employment expectations;
- in retail trade: current and expected business situation, level of stocks;

[4] For normalizing time series we propose to subtract the average value from SSC of each *X(t).* The difference is divided by the mean absolute deviation of the series and 100 is added to this value. The result is dimensionless and comparable with each other SSC of all *X(t).* Level 100 is equal to the long-term equilibrium level; values above indicate a positive deviation from equilibrium, and the values below 100 – a negative deviation.

[5] Steps 3 and 4 are performed only to create a single composite indicator from a set of indicators classified with respect to the timing of the phase.

[6] In the European Union a similar index – Economic Sentiment Indicator (ESI) – is calculated by the Directorate General for Economic and Financial Affairs of the European Commission since 1985 (European Commission, 2014a).

– in services: current and expected demand, current business situation;
– consumer confidence.

In order to harmonize HSE ESI with international standards and allow for international comparison we use an iterative aggregation procedure, virtually identical to the European system of similar indicators. It includes standardization and average weighted aggregation of selected components and normalization CI with the average for the period =100 and a standard deviation of 10. As a result, the HSE ESI values about 100 mean the 'normal' (neutral) sentiment in business environment, notably higher than 100 – favorable and optimistic, markedly below 100 – depressive, crisis mood. Considering the timeliness of HSE ESI (1.5-2 months before publication of the GDP official statistics), its analysis can be very useful for short-term assessing the Russian economic development.

We empirically study HSE ESI and GDP, and test their cyclical sensitivity. We estimated short-term cyclical components with a smoothed amplitude (SSC) of both CI and the reference indicator.

According to the described above algorithm, the first step of the procedure is graphical comparison of HSE ESI and GDP, and calculation of the cross-correlation coefficients. They revealed statistically significant, stable comovement, with the correlation coefficient of 0.886 coincident and of 0.820 with the one-quarter lead. As mentioned above, the augmented Dickey-Fuller test identified non-stationarity of these variables with *p*-value 0.73 for GDP growth and 0.58 for HSE ESI that requires checking the final indicators for cointegration. Figure 1 represents the joint dynamics of HSE ESI (seasonally adjusted) and the real GDP index (yoy) for the period Q1 1998 – Q4 2014.

Then, we decomposed the analyzed time series by estimating medium-term cycle (MC) and unsmoothed short-term cycles (USC) with the use of the HP filter for the first time. Parameter $\lambda$ was equal to 677.130; 1649.327 and 8330.659 for medium-term cycles of 8, 10 and 15 years[7]. Figures 2-5 show the results of this iteration: identified MC and USC of HSE ESI and GDP.

[7] Estimation of 8, 10 and 15 year cycles as a medium-term ones is based on duration of the accumulated BTS results.

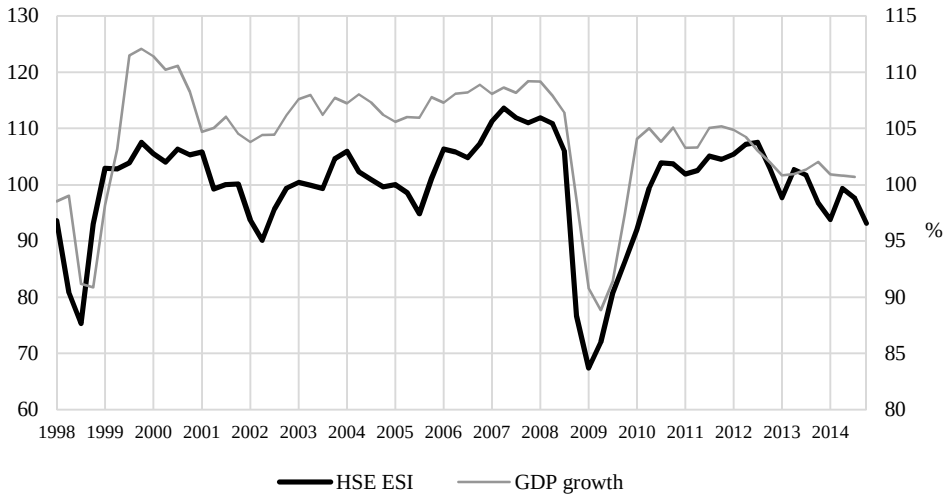


Figure 1. Economic sentiment indicator (HSE ESI, the left scale) and the yearly real GDP growth rate (the right scale, Rosstat data).

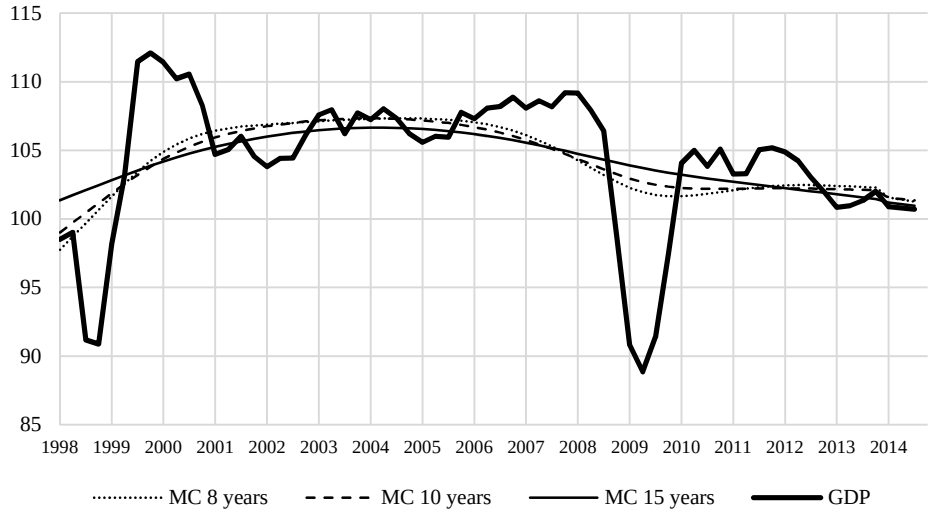


Figure 2. Medium-term cycle (MC) of the real GDP growth rate.

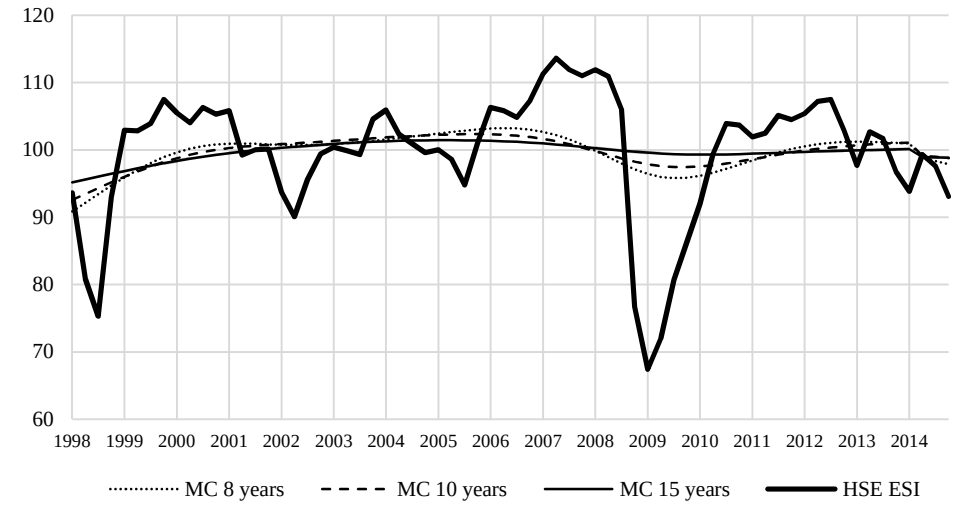


Figure 3. Medium-term cycle (MC) of HSE ESI.

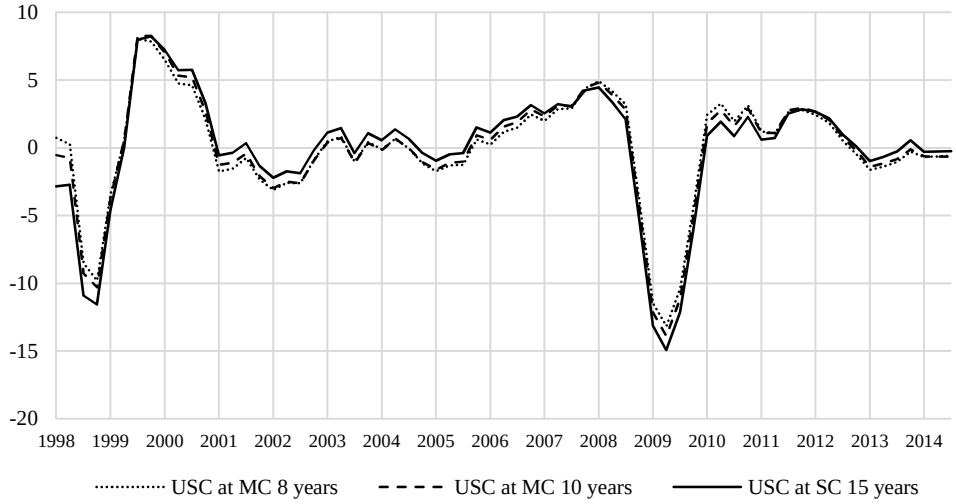


Figure 4. Unsmoothed short-term cycle (USC) of the real GDP growth rate.

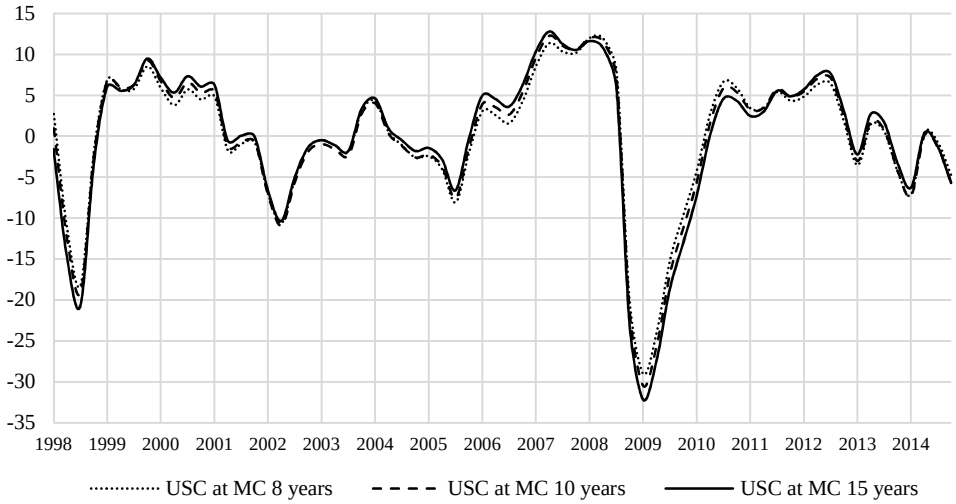


Figure 5. Unsmoothed short-term cycle (USC) of HSE ESI.

The joint decomposition of HSE ESI and the real GDP index and the results of the cross-correlation analysis allow for the identification of the cyclical components that are the most significant for subsequent comparison. These components are USCs, which are the residual left after separating 15-year-long MC from the series. This way, we obtained the highest coincident cross-correlation coefficients (0.989 for HSE ESI, and 0.943 for the GDP index). Based on the results of the cross-correlation analysis of USCs of HSE ESI and GDP, we chose USCs without the 15-year-long cycle removed for the subsequent comparative analysis[8].

Due to non-stationarity of initial data, USCs with eliminated 15-year-long cycle of HSE ESI and the GDP index were tested for cointegration. The results of unrestricted cointegration rank test indicated cointegration of these time series (see Table 2). The test results confirm a long-term equilibrium between the variables, which allows us to draw conclusions about conformity of these indicators cyclical profile based on the correlation coefficients. This also suggests possible inclusion of these variables in regression models for short-term forecasting. Construction of

[8] These steps of the testing algorithm associated with identification of the length of the medium-term cycles are appropriate mainly in primary decomposition of the retrospective dynamics of each indicator. During subsequent identification of short-term cycles phases at the ends of time series, this step can be omitted, while dynamics should be controlled periodically.

forecasting models using HSE ESI and other business tendency surveys indicators is left for our future work, and it is beyond the scope of this study.

Table 2. Unrestricted cointegration rank test (trace)

| Hypothesized no. of CE(s) | Eigen value | Trace statistic | 0.05 critical value | Prob.** |
|---|---|---|---|---|
| None* | 0.476419 | 53.13748 | 15.49471 | 0.0000 |
| At most 1* | 0.146194 | 10.43135 | 3.841466 | 0.0012 |
| Trace test indicates 2 cointegrating equations at the 0.05 level | | | | |

* denotes rejection of the hypothesis at the 0.05 level
** MacKinnon-Haug-Michelis (1999) p-values

The next step is the selection of the most comparable smoothing short-term cycle (USC). By Hodrick-Prescott filtering for the second time (parameter λ was equal to 1; 2.914; 6.854), we obtained smoothed short-term cycles (SSCs) of the analyzed series with filtration of the 18-, 24- and 30-month amplitude. Figures 6 and 7 show these components extracted from the original time series by primary filtration of 15-year-long cycles and subsequent smoothing the amplitude corresponding to the specified short-term cycles.

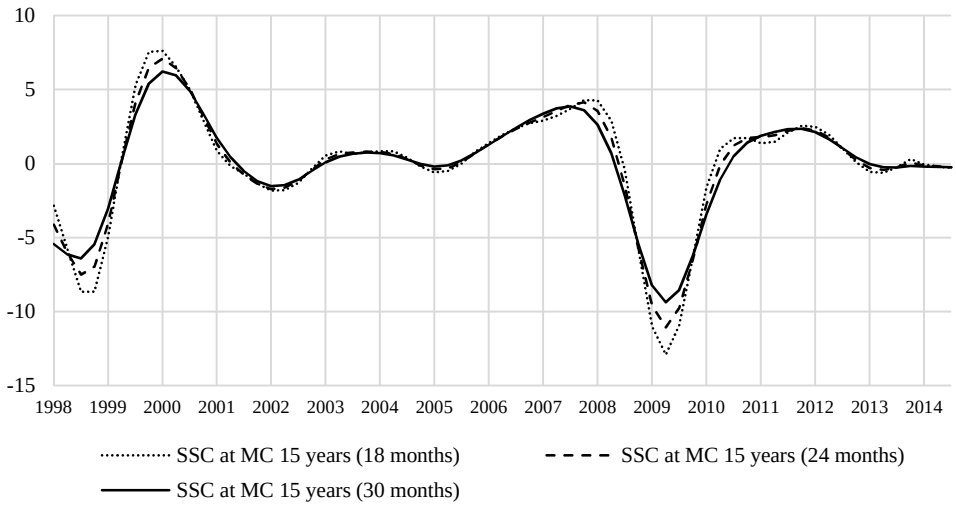


Figure 6. Smoothed short-term cycle (SSC) of the real GDP growth rate.

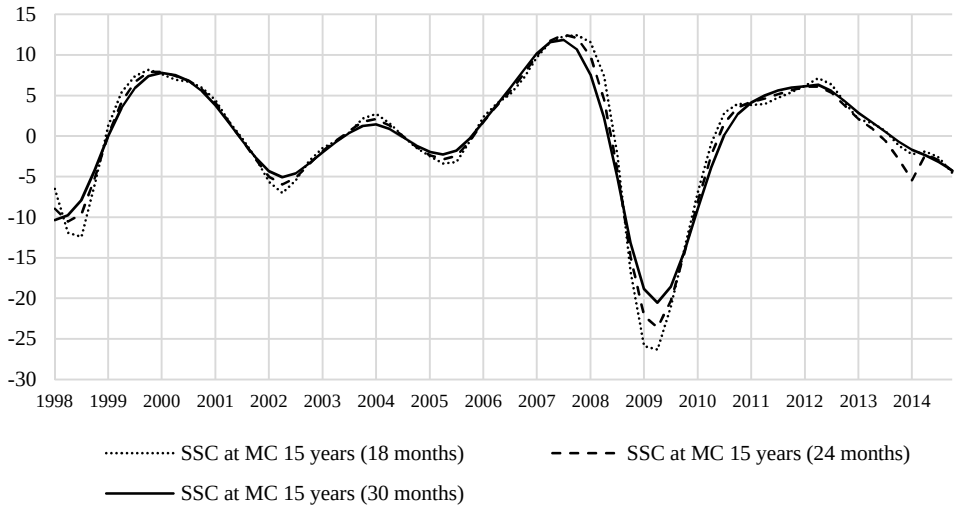


Figure 7. Smoothed short-term cycle (SSC) of HSE ESI.

Then, we calculate the cross-correlation coefficient for SSCs of HSE ESI and the GDP index to find the most stable in time and statistically significant comovement. For the period Q1 1998 – Q4 2014, the cyclical fluctuations within a short interval (on average 2.5 years), with the separated impact of the 15-year-long medium-term cycle, is the most obvious.

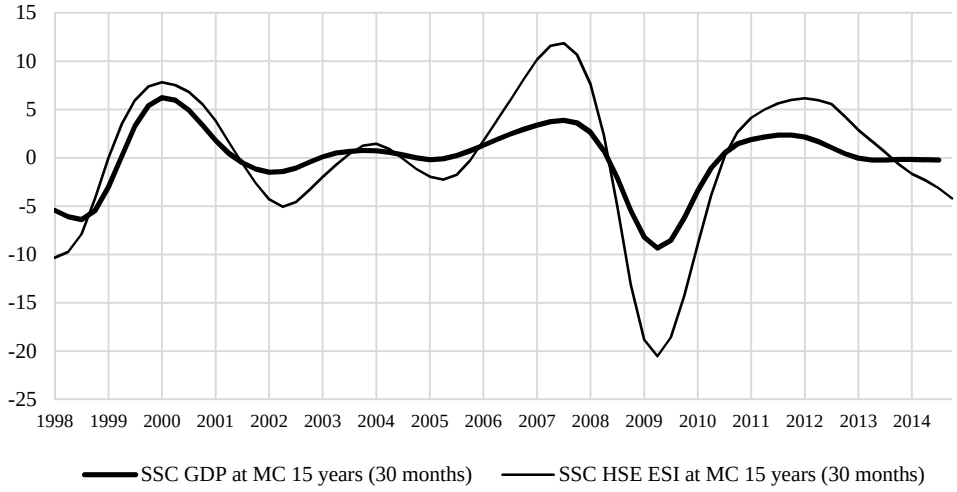


Figure 8. Smoothed short-term cycle (SSC) in the HSE ESI and the GDP growth.

This conclusion is drawn by the highest correlations, statistically significant for coincident and leading up to 2 quarters comovement of SSCs of HSE ESI and GDP: lag (0) with the correlation coefficient of 0.941; lag (-1) with 0.892; and lag (-2) with 0.720.

Finally, we have detected turning points of the smoothed short-term cycle using the Bry-Boschan method (Table 3).

Table 3. Indication of the short-term growth cycles, their phases and turning points in the dynamics of GDP and HSE ESI for the period Q1 1998 – Q4 2014.

| Cycles | Phases | GDP growth | | | | | HSE ESI | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Dates of turning points* | | | *Duration (quarters)* | | *Dates of turning points* | | | *Duration (quarters)* | |
| | | *Peak* | *Trough* | *Peak* | *Phases* | *Cycles* | *Peak* | *Trough* | *Peak* | *Phases* | *Cycles* |
| I | down | Q2 1997* | - | Q1 2000 | 5* | 11 | Q2 1997 | - | Q1 2000 | 3 | 11 |
| | up | - | Q3 1998 | - | 6 | | - | Q1 1998 | - | 8 | |
| II | down | Q1 2000 | - | IV Q 2003 | 8 | 15 | Q1 2000 | - | Q1 2004 | 9 | 16 |
| | up | - | Q2 2002 | - | 7 | | - | Q2 2002 | - | 7 | |
| III | down | IV Q 2003 | - | Q3 2007 | 6 | 15 | Q1 2004 | - | Q3 2007 | 5 | 14 |
| | up | - | Q2 2005 | - | 9 | | - | Q2 2005 | - | 9 | |
| IV | down | Q3 2007 | - | Q3 2011 | 7 | 16 | Q3 2007 | - | Q1 2012 | 8 | 19 |
| | up | - | Q2 2009 | - | 9 | | - | Q2 2009 | - | 11 | |
| V | down | Q4 2011 | Q4 2013 | - | 13 | - | Q1 2012 | Q1 2014 | - | 12 | - |

* provisionally

The results of the joint procedures for smoothing the amplitude of short-term cyclical components, cross-correlation and dating of turning points mainly provide evidence about:

- the leading cyclical nature of HSE ESI;
- for the period of Q1 1998 – Q4 2014, the predominance in the dynamics of the reference indicator (GDP growth) and the composite indicator (HSE ESI) of the 15-year-long medium-term cycles and

2.5-year-long (on average) short-term cycles. They include four peaks and four troughs with eight phases of different duration (from 9 to 33 months). Maximum deceleration (27 months) is in the cycle II with a peak in Q1 2000 and a trough in Q2 2002;

- the ninth deceleration phase in the growth cycle V began in Q1 2012, after the rapid increase in economic sentiments (according to the BTS data). This phase is in progress now.

In addition, we constructed a tracer to visualize the cyclical character of HSE ESI (Figure 9), especially in the last phase of deceleration (Gayer, 2008; European Commission, 2014b). The Y-axis in such a graphical representation characterizes the level values of time series corresponding to the growth rate, whereas the X-axis shows their quarterly changes (in absolute terms). Thus, the tracer displays both the level and change in the dynamics of the short-term cycle of the business surveys indicators, with the four quadrants corresponding to the following four phases of the cycle:

- quadrant I (upper right; expansion phase) – intensive growth of the indicator at an above-average level (for HSE ESI, this is a phase of high optimism);
- quadrant II (upper left; downswing phase, rotation to recession, growth retardation) – reduced growth of the indicator at an above-average level (for HSE ESI, this is a phase of increasing pessimism);
- quadrant III (lower left; contraction phase, recession, sharp reduction) – decline of the indicator at a below-average level (for HSE ESI, this is a phase of depression, crisis of sentiments);
- quadrant IV (lower right; upswing phase, recovery, upturn) – growth of the indicator at a below-average level (for HSE ESI, a phase of increasing optimism).

The four tracer quadrants correspond to the four cyclic phases and are crossed counter-clockwise. The cyclical peaks are located in the top center of the graph area, whereas the cyclical troughs are situated in the bottom center. In this study, the tracer is constructed to visualize the short-term growth cycles with neutralized influence of the medium-term cycle (15-year long) and the smoothed amplitude to eliminate oscillations.

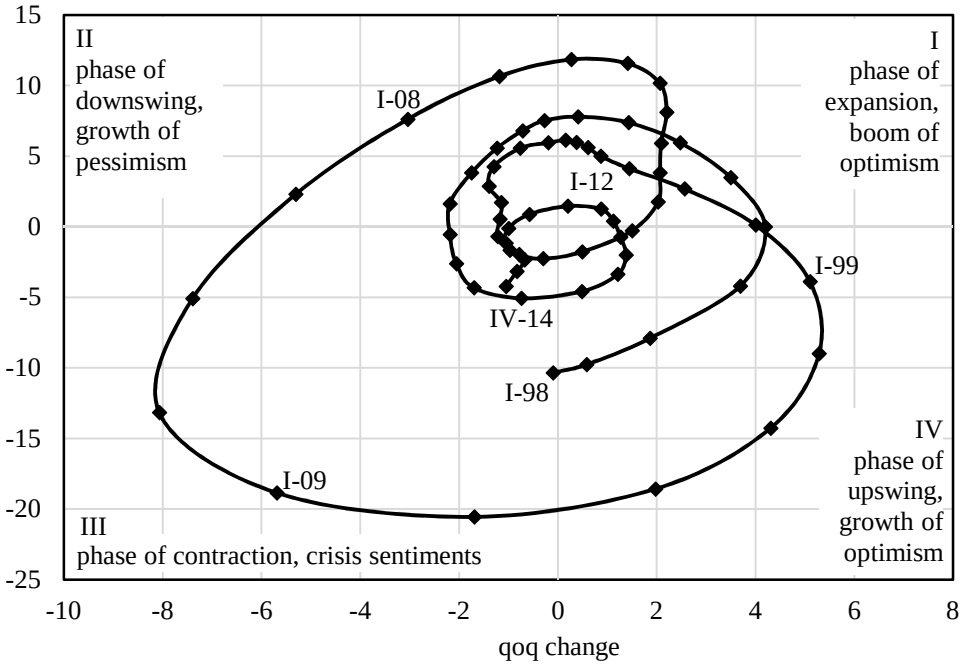


Figure 9. Tracer of the short- term cyclical component of HSE ESI (Q1 1998 – Q4 2014).

The tracer of the HSE ESI short-term cycle recorded almost synchronously all turning points of the GDP short-term cycle. After the beginning of 2012, the HSE ESI cycle entered the downward phase, demonstrating the stable slowdown with equal intensity, characterized by pessimistic economic sentiments of Russian entrepreneurs and consumers. In the beginning of 2014, HSE ESI started to recover, indicating a possible increase of optimism. In the middle of 2014 business and consumer confidence dropped again, and the tracer turned in the opposite direction – economic contraction.

## 5. Conclusions

The paper explores the ability of Russian BTS results to track the cyclical development of the national economy. The study is focused on the issue: whether the aggregate indicator of business and consumer confidence in Russia conforms to the real economic situation?

First, we constructed an integrated algorithm to test potential qualitative components for aggregation in CI that cover as much as possible all information contained in the sectoral business surveys results. This algorithm

can also be used to test CI for the cyclical sensitivity. Such testing is expedient to determine the feasibility of including CI in the national system of relevant composite short-term cyclical indicators.

Second, by using this algorithm, we investigated the dynamics of the composite economic sentiments indicator (HSE ESI) for its cyclical sensitivity and statistically significant consistency with the short-term cyclical trajectory of aggregate economic activity, represented by the real GDP index. The results allowed us to draw the conclusion of HSE ESI and GDP cyclical comovement in the period from Q1 1998 to Q4 2014 and leading nature of HSE ESI. This makes HSE ESI an indicator of turning points and phases of the GDP growth cycle.

Finally, we visualized the results with the tracer of the short-term cycle of HSE ESI. The tracer recorded almost synchronously all turning points of the short-term GDP cycle. The study shows that Russian business surveys data is capable to measure efficiently the cyclical development of the national real economy.

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