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Sergey V. Smirnov, Nikolai V. Kondrashov,
Anna V. Petronevich

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Sergey V. Smirnov[1], Nikolai V. Kondrashov[2], Anna V. Petronevich[3]

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This paper establishes a reference chronology for the Russian economic cycle from the early 1980s to mid-2015. To detect peaks and troughs, we tested nine monthly indices as reference series, three methods of seasonal adjustments (X-12-ARIMA, TRAMO/SEATS, and CAMPLET), and four methods for dating cyclical turning points (local min/max, Bry-Boschan, Harding-Pagan, and Markov-Switching model). As these more or less formal methods led to different estimates, any sensible choice was possible only on the grounds of informal considerations. The final set of turning points looks plausible and separates expansions and contractions in an explicable manner, but further discussions are needed to establish a consensus between experts.

JEL Classification: E32.

Keywords: Economic Cycle, Turning Points, Recession, Russia.

[1] National Research University Higher School of Economics. «Development Center» Institute. Deputy Director; E-mail: svsmirnov@hse.ru

[2] National Research University Higher School of Economics. «Development Center» Institute. Leading Expert; E-mail: nkondrashov@hse.ru

[3] National Research University Higher School of Economics, Laboratory for Research in Inflation and Growth. Università Ca'Foscari Venezia. Université Paris 1 Panthéon-Sorbonne, Paris School of Economics. E-mail: apetronevich@gmail.com

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1 Introduction

Dating cyclical turning points is an issue that usually arises in two similar yet different situations. First, if the "true" historical set of peaks and troughs is known, then the quality of one or the other formal methods – with its capability to reproduce this historical set and to identify a new turning point in real time – is in focus. A lot of papers devoted to US business cycles are usually of this kind: they propose some new methods, new modifications of the old methods, compare several methods and so on (see Chaffin and Talley (1989), Stock and Watson (1993), Boldin (1994), Kim and Nelson (1998), Birchenhal et al. (1999), Filardo (1999), Layton and Katsuura (2001), Sarlan (2001), Sephton (2001), Camacho and Perez-Quiros (2002), Anas and Ferrara (2004), Peláez (2005) Chauvet and Hamilton (2006), Chauvet and Piger (2008), Hamilton (2011), Golosnoya and Hogrefe (2013), Liu and Moench (2014), and others). This comes as no surprise because reference dates as defined by the NBER's Business Cycle Committee are more or less commonly accepted. From time to time, some authors (e.g. McNees (1987), Boldin (1994), Romer (1994), Berge and Jordà (2011), Stock and Watson (2014)) express their doubts on the accuracy of *all* the NBER's estimates, but this has never had any practical outcome: as a rule all subsequent research still uses exactly the same peaks and troughs.

The second situation is typical for countries with no established and/or commonly recognized set of cyclical turning points. In this case, a researcher may use strictly the same methods for dating peaks and troughs, but he has no formal criterion to prove the accuracy of his estimates. As a rule, the precision of these data sets may be challenged. However, authors have no real alternative except to apply one or more methods to some time-series and to evaluate the results (see Layton (1997) for Australia, Mejía-Reyes (1999) for 7 countries in Latin America, Christoffersen (2000) for 4 Nordic countries, Rand and Tarp (2002) for 15 emerging countries, Artis et al. (2004) for Euro Zone, Bruno and Otranto for Italy (2004), Venter (2005) for South Africa, Andersson et al. (2006) for Sweden, Schirwitz (2009) for Germany, Polasek (2010) for Iceland, Poměnková (2010) for the Czech Republic, Alp et al. (2012) for Turkey, Cross and Bergevin (2012) for Canada, Fushing et al. (2013) for 22 OECD countries, Grossman et al. (2014) for 84 countries, Tsouma (2014) for Greece, Aastveit et al. (2015) for Norway, etc.). But what may one do if different methods give different results (which is always the reality of these situations)? As a matter of fact, one may recognize that formal results depend heavily on at least seven alternatives (items) with corresponding *a priori* choices. They are:

1) type of cycle (business cycle, growth or growth rate cycle);

2) frequency (monthly or quarterly);

3) general approach to dating cyclical turning points (special decisions of national or supranational dating committees[5]; extraction of unobservable cyclical factors from a multiplicity of various economic and financial indicators; using the concept of reference series);

4) set of time-series to be analyzed (GDP, industrial production, some composite coincident index, etc.);

5) data vintages (real-time or the latest revision);

6) method of seasonal adjustments (X-12 ARIMA, TRAMO/SEATS or some other);

7) method for detecting cyclical turning points (Bry-Boschan's, Harding-Pagan's, Markov-switching model or some other).

In theory, the superiority of any alternative choice is not obvious; various decisions may be justified. As a palliative, one may check several concepts, indicators and methods and then make his final decision relying not only on quantitative but rather on qualitative criteria. Of course, in this situation, there is not much sense in introducing a "more accurate" method for dating cyclical turning points: there are no "true" turning points to compare them with.

In Russia, there is no official or commonly recognized set of peaks and troughs.[6] Sometimes one or two turning points have been estimated *inter alia* (see, for example, Belyanova and Nikolaenko (2012), Smirnov (2014)). Only Belyanova and Nikolaenko (2013) were focused on dating turning points of the Russian economic cycle. Later on, we shall discuss their results in more detail and present some arguments for adopting them with caution. For now, we note only that the turning points proposed by OECD (2015) relate to the concept of growth (not business or economic) cycles, and that those proposed by ECRI (2015) are estimated using

[5] The NBER US Business Cycle Dating Committee; The CEPR Euro Area Business Cycle Dating Committee; the Brazilian Business Cycle Dating Committee (O Comitê de Datação de Ciclos Econômicos (CODACE); the Investigation Committee for Business Cycle Indicators and the President of ESRI (Japan); ISAE in Italy; KNSO in South Korea; , etc.

[6] And more, there is even a certain skepticism concerning the cyclicity of the modern Russian economy. Some academics differ between system, structural, external, and cyclical crises and hesitate to declare if there have been any cyclical (in this narrow sense) crises in Russia. See Poletaev and Savelieva (2001), Bessonov (2005), Entov (2009), Belyanova and Nikolaenko (2012, 2013).

unknown procedures and on an unknown statistical basis.[7] Hence, dating of turning points for the Russian cycle is still a relevant issue. It is only in this way that all other research and expertise focused on Russian cyclical fluctuations can gain a solid foundation. Dating historical turning points – the main purpose of this paper – should be the first step, followed by testing the cyclical behaviour of a wide range of indicators, the selection of leading, coincident and lagging indexes, the calculation of composite ones, and – the last and the most intriguing step - the forecasting of an oncoming turning point in real-time, etc.

In the next section, we discuss our own *a priori* choices for the seven alternatives mentioned above, and describe the exact time series used. In Section 3, we apply all the methods previously chosen to available time-series and discuss the results: their initial diversity, additional informal criteria for choosing the most appropriate options and the final set of Russian cyclical turning points. Section 4 concludes.

2 Backgrounds, methods, and data

2.1 Seven *a priori* choices

The first item we have to determine is which concept of cycle to choose: business (or economic), growth (mid-term fluctuations around the trend), or growth rate cycle. Each type of cycle has its own set of turning points and any empirical dating without this predetermined decision is obviously impossible[8]. In some sense, this choice is arbitrary. Economic theory usually alludes to *business cycles* (ups and downs in economic activity). The NBER's long empirical tradition for the US (it was inherited and supported by CEPR and CODACE for the Eurozone and Brazil) also follows this direction. However, an alternative approach based on monitoring *growth cycles* is also widely recognized; in particular, it has been used by the OECD for decades and for dozens of countries, including Russia. Analyses of *growth rate* cycles are less common but also exist, in China, for example (see Junli et al. (2014)). This diversity means that the choice is not a foregone conclusion and is rather optional. On the other hand, this does not mean that it is fully arbitrary. The choice should depend upon those changes in economic trajectory that are commonly considered as important. If fast economic growth is permanent (like in China for the last 40 years), even a decrease in tempos from a "very high" to a "high" level

[7] This doesn't mean that all of them are incorrect but at least one (the trough at January 1999) seems very strange.
[8] For the interrelations between turning points for cycles of different types see Zarnowitz and Ozyildirim (2002), p. 42.

may be felt as dangerous; in such a case the growth rate cycles may be the focus. If a slight positive trend is stable (many believe that this is typical for advanced economies), then an "excessive" or an "insufficient" growth would capture the attention, and the OECD's choice of growth cycles would be suitable. Finally, if a national economy is sensitive to political, financial, technological, and/or other kinds of internal and external shocks; if there is no reliable estimation of the trend or there is no stable trend at all (which is typical for emerging economies, according to Aguiar and Gopinath (2007)); then the concept of business or economic cycles will have priority.

In modern Russia there is no stable output trend and growth rates are volatile. Hence, growth cycles and growth rate cycles are not very appropriate. Though the straightforward concept of business cycles is also questionable because – remember the classical definition – "business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises" (Burns and Mitchel, 1946, p. 3). "Business enterprises" in the Russian economy is something that is more or less plausible for now, but certainly was not during the Soviet period (until 1991) and probably not in the transformation period either (at least, until the mid-1990s). Is it enough to deny or doubt cyclicity in Russia? We insist that it is not. There had been several recessions in Russia before the crash of the USSR and the long-run trajectory of the Russian economy is evidently a sequence of expansions and contractions (see Smirnov (2015) for details). Hence, the concept of economic (let's not name them "business") cycles is suitable for Russia. There are definitely some mid-term ups and downs in the levels of Russian economic activity and turning points just between them. Dating those turning points is just our goal.

The second item is about frequency. Our "strategic" long-term aim (but not the goal of this paper!) is to find leading indicators that are useful for predicting changes in the mid-term trajectory of the Russian economy in real time. Taking into account the 1.5-month publication lag of GDP (the most important quarterly macroeconomic indicator), the total delay in detecting a new turning point with GDP series may be more than four months (and even twice as much if one prefers to have information on two consecutive quarters). For monitoring economic activity in real time, this is too long, and one would surely prefer monthly (not quarterly) statistics.

Hence, the basic data set of turning points for Russia (as for any other country) should also be at least monthly.[9]

The third item concerns the general approach to dating turning points. Should the turning points be detected and declared by a special expert group ("dating committee")? Or, perhaps, by extracting common (cyclical) waves from multi-indicator data sets with statistical methods? Or, alternatively, by referring to several (supposedly) coincident indicators? In Russia, there is a dearth of experts in economic cycles and most of the time-series from available databases are too short. Hence, the first two opportunities are matters for the future. For now, referring to some coincident indicators is the only realistic way. Of course, there is some logical dissonance here: it is rather reasonable to consider an indicator to be a coincident if its turning points coincide with peaks and troughs of the total economy; but in our case just those peaks and troughs are unknown and have to be identified. The only way to exit this vicious circle is to date the Russian cyclical turning points with those indicators that are commonly considered as coincident.

Therefore, the fourth item is an outlining of a specific set of coincident indicators for Russia. Naturally, the first idea is to try four indicators commonly used as coincident in other countries. They are: a) employees on non-agricultural payrolls; b) real personal income; c) index of industrial production; and, d) manufacturing and trade sales. Belyanova and Nikolaenko (2013) is the only paper we know of that is specially focused on dating turning points for the Russian economic cycle, and it explores just this logic in seeking the Russian analogues of these four indicators. However, this is not an easy task. First, there are some statistical shortages. In particular, any information on manufacturing sales is now absent in Russia whereas all data on employment are very unreliable and subject to large revisions. Second, some of these indicators are scarcely coincident in Russia for economic reasons. Specifically, during recessions, Russian enterprises prefer to freeze or even cut wages and salaries rather than to fire employees (in market economies the opposite is usually true).[10] Besides, all "real" indicators adjusted for CPI are also not coincident (at least at peaks) because of significant devaluations that are usually lagging (due to the Russian Central Bank's unsuccessful efforts to avoid them). Those lagging

[9] One may object that the NBER not only has a monthly set of turning points but quarterly as well; and the CEPR has only quarterly set and not monthly one. But the NBER's quarterly set is rather auxiliary and the CEPR's set is caused by the absence of monthly information for some members of the Eurozone. In any case, in our opinion, a quarterly dating might be less suitable for real time analysis.

[10] See Gimpelson and Kapeliushnikov (2013) for more details on this important specificity of the Russian labour market.

devaluations have induced lagging inflation waves that shifted all "real" indicators to the right.[11] That is why we decided to date turning points with indicators in "physical units" (these are described in detail in the next section).

The fifth item is the choice between "real time" and "latest available" time series. In the context of this paper, the answer is evident. As our aim here was to date turning points in historical perspective, we preferred the latter (more precisely, as they were in August 2015). In the future, the final set of turning points should help to tune the system of leading indicators suitable for using in real time.

For the sixth and seventh items, we decided not to make a single choice but to test several options. For seasonal adjustments, we used three algorithms: X-12-ARIMA and TRAMO/SEATS (as they were implemented in the program *Demetra*) as well as the lesser-known CAMPLET (see Abeln and Jacobs (2015)). In the first two, a seasonal adjustment for any moment depends on the trajectory in future moments. For this reason, not only may a real time estimate at the right end be unreliable, but historical estimates near cyclical turning points (peaks and troughs) might be biased: a peak shifted to the left and a trough to the right (see Bessonov, Petronevich (2013) for details). CAMPLET is supposedly free of this shortcoming; therefore, it may be helpful for controlling this effect.[12]

As for a method for detecting cyclical turning points, we used four methods: simply taking local maximum/minimum of seasonally adjusted indices; the Bry-Boschan and the Harding-Pagan methods; Markov-switching model. We applied each of these methods to all the indicators available just after seasonally adjusting them with all the procedures mentioned.

2.2 The methods

At first glance, the most natural method for dating turning points is to choose local maximums as peaks and local minimums as troughs. If one defines the word "local" as being higher/lower than n-months before and n-months after (for example, for n = 6), then the calculations are all rather simple. The limitation is that any observed value of a reference

[11] This is the main reason for our caution about some turning points from Belyanova and Nikolaenko (2013).

[12] Until now, CAMPLET has not been broadly used and its practical properties are not known well. Nevertheless, we decided to use it just to have alternative point of view.

indicator is always a sum of a cyclical wave and a random factor (if we suppose that seasonality is removed in a proper way); if one is interested in cyclical peaks and troughs he has to extract this cyclical wave in advance. So, strictly speaking, this method of dating is not correct; however, we tried it as an obvious benchmark.

Bry and Boschan (1971) and Harding and Pagan (2002) proposed the methods for extracting cyclical waves from time-series with the help of specific smoothing algorithms, so the turning points are then detected on this extracted wave. As these methods are well known, there is no need to add anything except that we used their implementations in Grocer 1.5 in the Scilab 5.3.3 environment.

We compare the results of these three non-parametric methods to the results of the Markov Switching model proposed by Hamilton (1989). We use the basic specification of the form:

$$y_t = \mu_{S_t} + \varepsilon_t,$$

where t is the time period, y_t is the series under consideration, in growth rates, μ_{S_t} is the switching constant, $S_t = \{0;1\}$ is the Markov chain with constant transition probabilities indicating the phase of the cycle (0 corresponds to expansion, 1 to recession), and $\varepsilon_t \sim \mathrm{N}(0,\sigma_s^2)$ is the stochastic component. To insure the comparability with the output of the non-parametric methods, we also impose the restriction on the minimum duration of each phase (6 months).[13] The inference of the model comes in the form of the smoothed probability of recession $\Pr[S_t = 1 | I_T]$, where I_T is the information available at the last observed period T. We consider the economy to be in recession in period t if $\Pr[S_t = 1 | I_T] > 0.5$.

2.3 The data

Industry is usually a sector most sensitive to cyclical fluctuations; so, indices of industrial production are of special interest to us.

The first official monthly industrial index for Russia began in 1993. In 2003, the industrial classification used by Rosstat (the Russian State Statistical Committee) changed from

[13] This implies the use of the Markov chain of order 6 with restrictions on the transition probability matrix.

the so-called OKONH to OKVED (analogies of SIC and NACE, respectively) and a new index was begun; some time later, the old index was discontinued and the new one was re-estimated from 1999. The flaw of the official index is a lack of methodological information; this was the main reason for calculating alternative industrial indices based on official information on output (in physical units) of hundreds of industrial goods. This work has been done since the beginning of the 1990s; taken together, three indices constructed by the same group of researchers cover the whole period from 1990 until now. One additional non-official monthly index of industrial production begins in January 1981 and extends until December 1992. No other published information for Russian monthly industrial production is available.

All six industrial indices mentioned above, as well as their statistical sources, are listed in Table 1. There are also three indices of output of "basic activities" in the table. Two of them are official but for different industrial classifications (and hence, for different time periods); the third is non-official. The index for basic economic activities includes: industry, agriculture, construction, transportation, retail trade, and wholesale trade. The methodology for the construction of this aggregate has not been published (and therefore not known exactly), but its trajectory is definitely closer to the trajectory of the whole economy (or GDP) than the one for industry alone.

Table 1 Monthly indicators used as coincident for the Russian economic cycle, 1981-2015

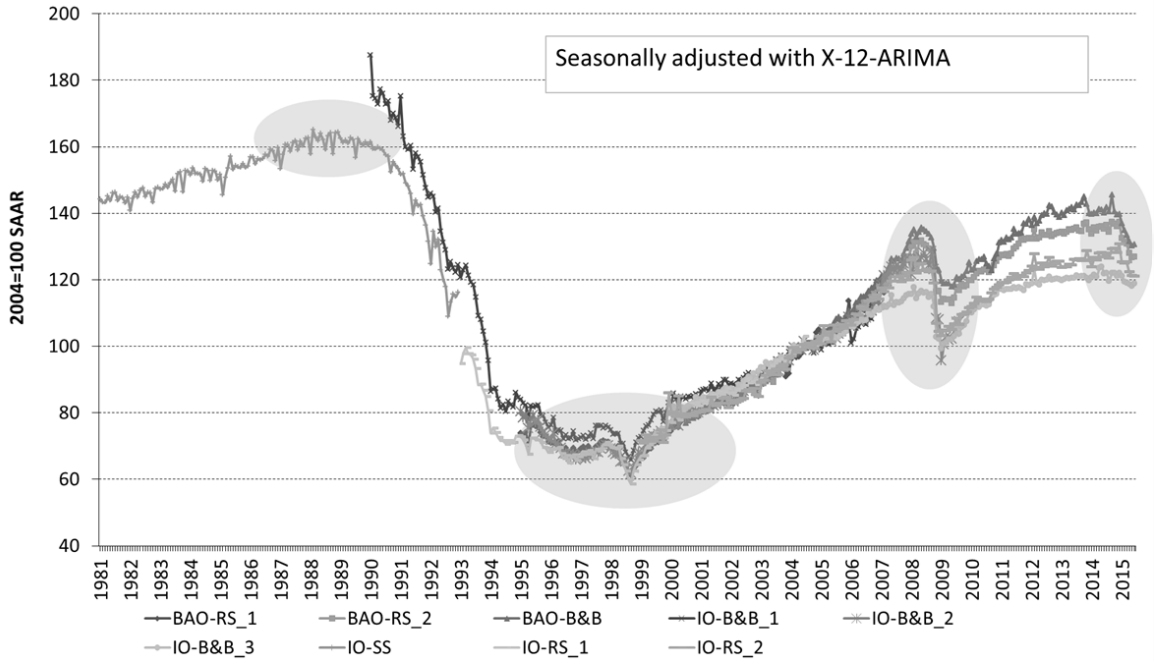
Short name	Time period	Source / characteristic
Industrial output (IO): weighted average of individual products' indices		
IO-RS_1*	01/1993-12/2004	Rosstat / Unknown number of industrial products
IO-RS_2	01/1999-06/2015	Rosstat / Unknown number of industrial products
IO-B&B_1*	01/1990-02/2007	Bessonov (2005) $^{+}$ / 126 industrial products
IO-B&B_2*	01/1995-08/2009	Bessonov (2005) $^{+}$ / 236 industrial products
IO-B&B_3	01/2000-06/2015	Baranov et. al (2011b) $^{+}$ / 302 industrial products
IO-SS*	01/1981-12/1992	Smirnov (2013) / 108 industrial products
Basic activities' output (BAO): weighted average of indices for six main sectors		
BAO-RS_1*	01/1995-06/2007	Rosstat / Unknown weights
BAO-RS_2	01/2003-06/2015	Rosstat / Unknown weights
BAO-B&B	01/2000-06/2015	Baranov et. al (2011a) $^{+}$

Notes: * – discontinued; + – time-series were kindly supplied for our research by the authors

Thus, monthly information on industrial production began in January 1981; monthly information on the output of basic activities began in January 1995. No single monthly indicator has existed for the whole period from the 1980s to the present. For this reason, we propose to use all the above-mentioned indices as coincident cyclical ones: each index for its own time frame. Results for each index should confirm or clarify the others.

Most of the listed indices are published in non-adjusted form; some of the others are seasonally adjusted with different procedures. To make our comparisons more accurate we adjusted all the indices for their seasonal variations ourselves and used three procedures for this. In general, the outputs of the seasonal adjustment procedures are alike but some differences in details do exist; as we will show later, this may be important while dating cyclical turning points.

All indices in their seasonally adjusted forms are shown in Figure 1 (grey ovals mark fragments of trajectories where turning points are possible).[14]



Note: For abbreviations and sources see Table 1.

Figure 1 Indices of Industrial Output (IO) and Basic Activities' Output (BAO), 1981–2015

[14] Only the indices adjusted with X-12-ARIMA are shown. The charts for TRAMO/SEATS and CAMPLET are available upon request. We did not perform the calendar adjustment since it requires (unavailable) time-series at much lower level of aggregation in order to generate reasonable results.

3 Dating Peaks and Troughs, 1981–2015

3.1 "Long-list" of turning points

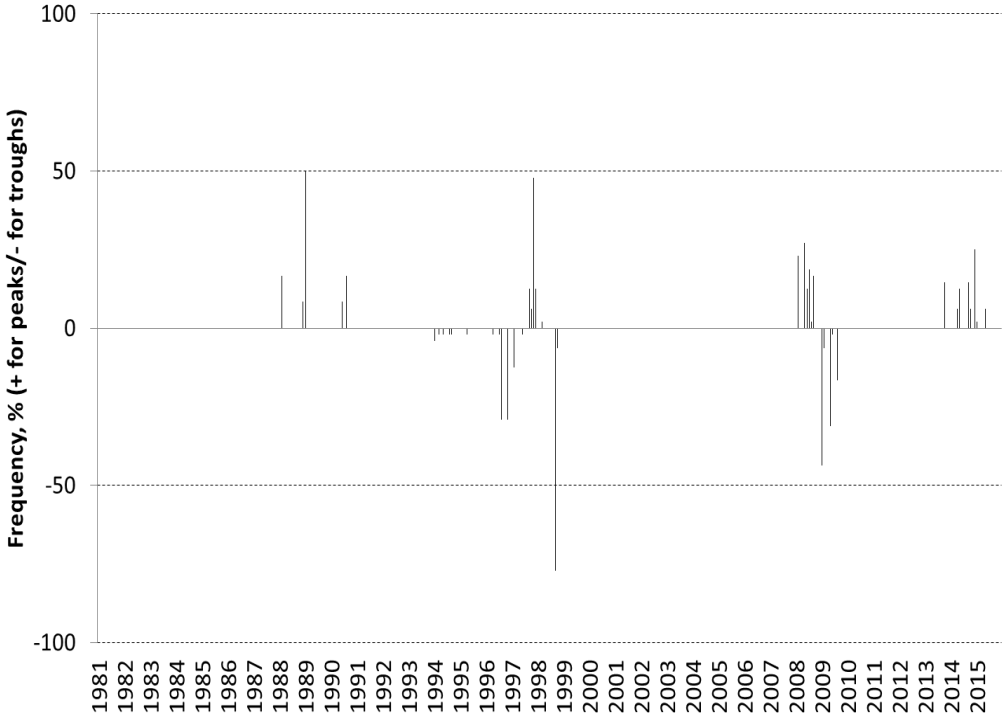
Of course, the picture is too variegated to date turning points in any simple way, but three conclusions are clear.

First (and most important), any turning point for Russia may be sought only inside four time intervals (they are marked with grey ovals): a) at the end of the 1980s; b) from the middle to the end of the 1990s; c) somewhere in the period 2007–2009; and d) somewhere in the period 2013–2015. All turning points lying in other time spans (if any) should be considered false. In particular, the very end of the 1980s and the first half of the 1990s was a definite contraction, related to the crash of the planned economy and the ensuing transformation of the economic system. Most of the 1980s and the first half of the 2000s, on the other hand, were definite expansions, with no cyclical turning points in either.

Second, dating the latest peak (that is, the beginning of the current recession) is especially difficult because of the preceding long stagnation. And it is completely impossible to date the latest trough correctly just now: even if it happened somewhere in the past (for example, in the summer of 2015), too little time has passed since then.

And third, each of the four "suspicious" time intervals has its own set of time-series available. We propose to test each of them one by one.

Therefore, our "long-list" of preliminary estimates (plausible peaks and troughs) refers to nine indicators (six for industrial and three for basic activities' output), each handled with three procedures of seasonal adjustment and four methods of dating turning points. Some months occur in this list several times. If the frequency is equal to zero, then the corresponding month never appears in the list of potential turning points. If the frequency is equal to 100 (for peaks) or -100 (for troughs), then all of the indicators, the procedures for seasonal adjustments, and the methods of dating turning points point strictly in one direction. The frequencies for each month are plotted at Figure 2.



Note: See text for explanations
Source: Appendix

Figure 2 Appearances in the "Long-list" of Peaks and Troughs, Frequency

3.2 Qualitative considerations and choices

There are four preliminary findings from the "long-list" of possible turning points (see Appendix):

First, not all of the methods recognized all of the turning points, and thus all of the historical Russian cycles. For example, for many indicators the Markov-Switching model does not detect the peak and the trough in the second half of the 1990s, nor the peak in 2014. For several options it does not even consider September 1998 (which is the global minimum for all indicators used) as a trough. This is because the estimates of the Markov-Switching model depend on the values of all observations in a time-series. So, for the series that underwent substantial volatility during the transition crisis in the first half of the 1990s, the expansion of 1997 seems not like a separate cyclical phase but as a part of a more general wave. Similarly, for the series that fell significantly in 2008–09, the current downturn does not seem serious enough yet to be considered as a new recession.

Second, while there are no doubts among Russian experts about the current contraction (everybody agrees that somewhere in the end of 2014 or in the beginning of 2015 the Russian economy slipped down into recession) some doubts do exist about the recovery in 1997. In our opinion, those doubts are baseless, because this expansion is seen from the annual data for real GDP (+1.4%) or industrial production (+1.0%) as well as from the trajectories of financial indicators (in 1997, there were steady tendencies of rising stock prices and of declining interest rates). But if there had been an expansion somewhere in 1997, then there was a trough in the beginning and a peak at the end! Hence, our task is to date them.

Third, the peaks/troughs of the time series seasonally adjusted with X-12 ARIMA or TRAMO/SEATS are sometimes actually shifted to the left/right for several months relative to the turning points of the same time series adjusted with CAMPLET. This may mean that the first two give biased estimates of cyclical turning points. Conversely, this may also mean that CAMPLET gives biased estimates. We believe that this issue deserves special consideration; here we will assume that the time series adjusted with CAMPLET could give the earliest estimates for peaks and the latest for troughs.

And fourth, there is no turning point (even the trough of September 1998) which had a frequency equal to 100 and was thus indisputable. In most instances, various combinations of indicators, procedures of seasonal adjustment and methods of dating gave slightly different results, and we had to choose between them. It was not an easy task, because other available economic and financial indicators with evident cyclical fluctuations (stock-market indices, interest and exchange rates, level of international exchange reserves, number of imported autos, etc.) were no help: they are usually leading or lagging, not coincident. Therefore, we had to make our choices using only our two groups of indicators (basic activities' and industrial output).

In order to avoid complete arbitrariness we followed three criteria:

a) if levels of the same indicator at two moments differed less than 1.5% we usually preferred the later one;

b) estimates derived from the trajectory of basic activities are "more important" for us than those from industry alone (we believe that basic activities are "closer" to the whole economy);

c) turning points derived from monthly time-series (basic activities' and industrial output) had to be in accord with turning points derived from quarterly real GDP;

d) In short, all alternatives ever detected are shown in Table 2, along with our final choice and its justification.

Table 2 Turning points for the Russian economic cycle, 1981–2015

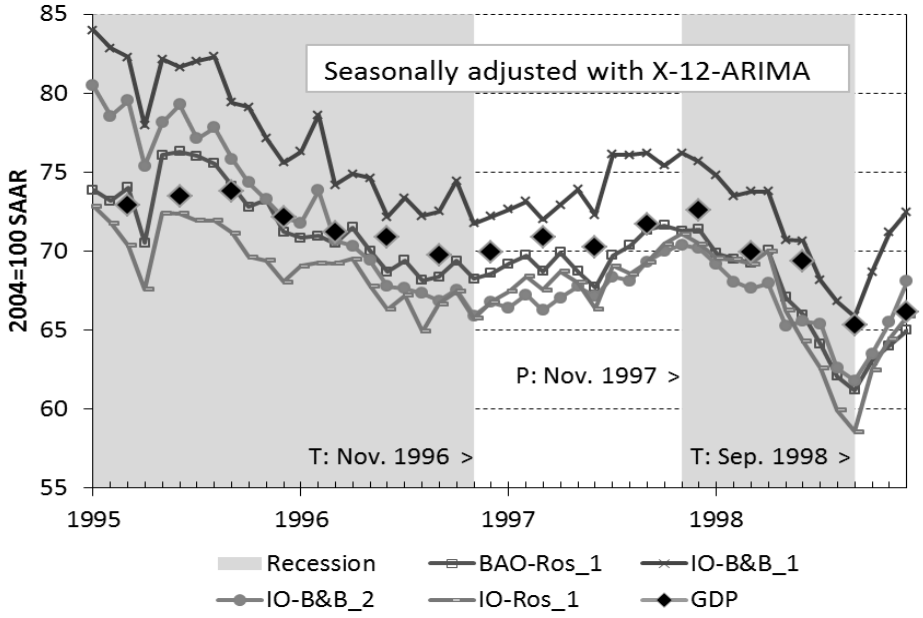
Turning point*	Possible variants	Our choice	Comments
Peak	02/88; 12/88; 01/89; 06/90; 08/90	Jan. 1989	As there is only one monthly index available for the 1980s, the reliability of this turning point is not very high. We believe Feb. 1988 to be "too early" for the peak and understand this month as an "outlier" rather than as a turning point. We also do not fully trust in MSM results; we consider June and August 1990 as "too late" for the peak. December 1988 and January 1989 seem the most probable candidates for this peak. As there is no other economic information on this period of time, we chose January 1989 simply on the grounds of its highest frequency (50%) in the "long-list" (December 1988 has the frequency of 8.3%). January 1989 is the local maximum for the time series seasonally adjusted with TRAMO/SEATS and CAMPLET and 1.5% lower than the maximum (in February 1988) of the series adjusted with X-12-ARIMA.
Trough	01/94; 03/94; 04/95; 08/96; 11/96; 06/97	Nov. 1996	The leading contenders for the role of cyclical trough are August and November 1996: their frequencies are both equal to 29.2%. All other months we consider as evidently false troughs. Between August and November 1996 we chose the latter because: a) November 1996 is just a local minimum for several time-series; for others it corresponds to the levels of indices which are only slightly more than respective local minimums; b) the trough for quarterly GDP definitely took place in the fourth quarter of1996; November 1996 is "nearer" to this estimate than August 1996.
Peak	09/97, 10/97; 11/97; 12/97; 03/98	Nov. 1997	The absolute leader for the role of cyclical peak is November 1997 (its frequency in the "long-list" is 47.9%. Besides that, November 1997: a) is just the local maximum for several time-series; for others it corresponds to the levels of indices which are only slightly less than respective local maximums; b) the peak for quarterly GDP definitely took place in the fourth quarter of 1997; November 1997 is quite consistent with this.

Turning point*	Possible variants	Our choice	Comments
Trough	09/98; 10/98	Sep. 1998	Almost all indices and all methods pointed to September 1998 as a trough (its frequency is equal to 77.1%). As it is just one month later than the default on the Russian government bonds this estimate looks very reasonable. It also corresponds well to the quarterly trajectory of GDP (minimum in the third quarter of 1997).
Peak	02/08; 05/08; 06/08; 07/08; 09/08	May 2008	There are several months with almost equal frequencies in the "long-list". But February 2008 is a trough for only one index of industrial production, all other indices definitely have other troughs; hence, we rejected this month. Among other months, May 2008, July 2008, and September 2008 are the most popular. We preferred May 2008 because: a) July was detected only with MSM that is considered as a method giving the utmost late estimate of a trough; b) basic activities' indices which are closer to the whole economy than the industry alone usually pointed to May; c) the peak for quarterly GDP definitely took place in the second quarter of 2008. Besides the peak in May 2008, one should consider September 2008 as a "brink of a precipice" (until now, many have thought that the recession in Russia began only after the Lehman Brothers' bankruptcy in September 2008).
Trough	01/09; 02/09; 05/09; 06/09; 08/09	May 2009	January 2009 has the highest frequency (43.8%) in the "long-list" but this time the trajectories of indices for industrial output and for basic activities' output are evidently different. For the second group of indices (which are nearer to GDP) May 2009 is the most popular. As the trough for quarterly GDP definitely took place in the second quarter of 2009, we chose May 2009 as a monthly trough for the whole Russian economy.
Peak	10/13; 04/14; 05/14; 09/14, 10/14; 12/14; 01/15	Dec. 2014	Because of a long stagnation, the range of months for the possible peak is very broad: from October 2013 until January 2015; 5 out of 12 months in 2014 are met in the "long-list". The index BAO-B&B certainly began falling in the end of 2013 but its trajectory is definitely differ from the trajectory of real GDP (for some reason this indicator is rather leading this time). As the peak for GDP was observed in the fourth quarter of 2014, the most probable months for this peak are October and December 2014. We chose the latter of these two for three reasons: a) December 2014 has the highest frequency (25%) in the long-list"; b) in January 2015 the decline of most indicators became greater than it had typically been for the preceding stagnation; c) all indicators in December were only 0.5% (or less) lower than their local maximums.

Source: Appendix

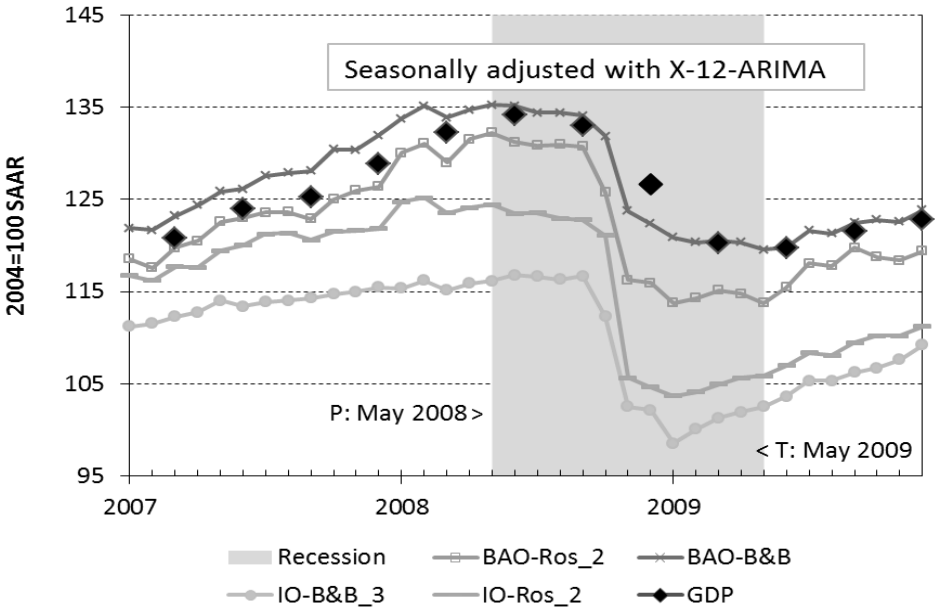
3.3 Final set of cyclical turning points

All appropriate indicators for periods 1995–1998, 2007–2009, and 2013–2015 along with detected turning points are shown in Figures 3–5 (the areas from peaks to troughs, that are recessions, are coloured with grey).



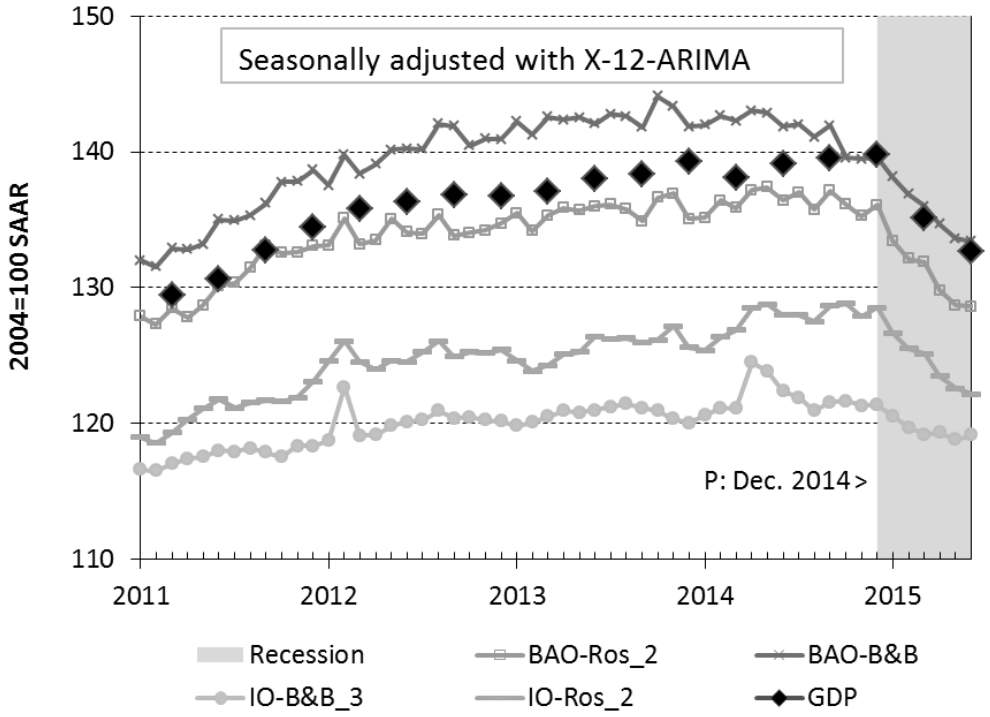
Note: P – peak; T – trough
Sources: See Table 1 and 2

Figure 3 Turning Points of the Russian Economic Cycle in the 1990s



Note: P – peak; T – trough
Sources: See Table 1 and 2

Figure 4 Turning Points of the Russian Economic Cycle in 2008–2009



Note: P – peak; T – trough
Sources: See Table 1 and 2

Figure 5 Turning Points of the Russian Economic Cycle in 2013–2015

The final set of turning points corresponds to the following phases of the Russian economic cycle:

– *The beginning of the 1980s – January 1989:* long expansion after short recession in 1979 (there are no monthly time-series for 1979–1980 but annual data point to 1979 as a year of contraction);[15] this period of growth ended as the drivers of the Soviet planned economy had been exhausted;

– *February 1989 – November 1996:* there were two stages of this extra-long (8 years) Great Russian Depression. The first one – the death throes of the planned economy – lasted until December 1992 (de jure dissolution of the USSR). The second one was a painful transformation from planned to market economy. The trough of November 1996 was

[15] See Smirnov (2015) for details.

preceded by Boris Yeltsin winning a second presidential term in the July election, which made any return to a planned system impossible and therefore stimulated business activity. Naturally, there were no turning points between the two stages of this contraction;

– *December 1996 – November 1997:* short recovery interrupted by the South East Asian financial crisis;

– *December 1997 – September 1998:* sharp contraction caused by capital outflow from emerging markets; it ended one month later than the default on the Russian Government's bonds and notes;

– *October 1998 – May 2008:* long expansion initially driven by the almost fourfold devaluation and by extraordinary growth of oil prices and consumer credits afterwards;

– *June 2008 – May 2009:* recession caused by the world financial crisis, especially after the Lehman Brothers' bankruptcy;

– *May 2009 – December 2014:* this post-crisis recovery evolved into stagnation in 2012 as the period of oil prices consistently rising had ended;

– *January 2015 – ???:* contraction caused by wide oppression of the entrepreneurial spirit and worsened by the decline of oil prices, trade and financial sanctions from the West as well as self-sanctions on imports.

The overall characteristics of the Russian economic cycle for the last 35 years are summarized in Table 3.

Table 3 Durations of the identified Russian economic cycles and/or phases, in months

Reference Dates		Contraction	Expansion	Cycle	
Peak	Trough	(peak to trough)	(previous trough to this peak)	(trough from previous trough)	(peak from previous peak)

Jan. 1989	Nov. 1996	94	≈109^{+}	≈203^{+}	-
Nov. 1997	Sep. 1998	10	12	22	24
May 2008	May 2009	12	116	128	126
Dec. 2014	na	na	68	na	80

Note: + – rough estimate based on an assumption that this phase of expansion began in January 1980 (1979 was a recession year); na – not available

Of course, "three and a half pairs" of peaks and troughs are not enough to make definite conclusions about the profile of the Russian economic cycle. We may only adduce the average lengths of the US post-war contractions (11 months) and expansions (59 months). If we exclude the prolonged Russian expansion in the 1980s (the end of the planned economy) and the Great Russian Depression (the prolonged transition crisis up to the middle of the 1990s), the average duration of Russian recessions will be close to the American ones, and the average duration of Russian expansions will be slightly longer than the American ones. Current developments may confirm or destroy this hypothesis.

4 Conclusions

Since the trajectory of the Russian economy may be described as a sequence of expansions and contractions, the practical task of discerning cyclical turning points in real time arises. The first step in reaching this goal is the dating of turning points for historical time-series at monthly intervals. We took this step and proposed the set of peaks and troughs that looks explainable and interpretable. Now it may be used for analyses of cyclical fluctuations of a multitude of economic and financial indicators and in particular, searching for leading indicators and estimating their predictive powers while approaching a cyclical turning point.

At the same time, the proposed set of turning points is not indisputable. Almost any peak or trough (except, possibly, the trough of September 1998) may be shifted 2–3 months to the left (or to the right) without losing meaningfulness and plausibility. Different reference indicators, different procedures for seasonal adjustments, and different formal methods for detecting turning points – all of these produce slightly different estimates of turning points. What is more, this variability cannot be fully removed with more sophisticated methods, because really significant uncertainty and diversity always exist in initial statistical information. We believe that the way out of this confusing situation would be to have more refined qualitative analyses of economic

tendencies, not more refined formal methods. If the proposed set of turning points is adequate, then the detected peaks and troughs would introduce a reasonable order in the chaos of the manifold fluctuations of indicators; a differentiation between leading, lagging, and coincident indicators would look reasonable.

We believe that in any country a simple consensus among experts is the most important argument in dating cyclical turning points. All formal procedures and methods are only instruments to form individual estimates made by experts and to provide them with some arguments for a common discussion. The ideal solution for these discussions would be an authoritative Business Cycle Dating Committee. Today, this seems unrealistic for Russia because there are too few experts in the field of Russian cycles. On the other hand, an exchange of expert opinions may take less straightforward forms; for example, the form of consecutive publications. We hope to make an important step in this direction.

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Appendix. “Long-list” of Russian Peaks and Troughs, 1981–2015

Short name of index	Time-span	TP	Local max/min			Bry-Boschan			Harding-Pagan^{+}			Markov-Switching		
			X-12	T/S	C	X-12	T/S	C	X-12	T/S	C	X-12	T/S	C
The end of the 1980s														
IO-SS	01/81-12/92	P	02/88	01/89	01/89	12/88	01/89	01/89	02/88	01/89	01/89	06/90	08/90	08/90
Second half of the 1990s														
IO-RS_1	01/93-12/04	T	08/96	08/96	08/96	08/96	08/96	08/96	04/95	08/96	08/96	01/94	01/94	03/94
		P	11/97	11/97	11/97	11/97	11/97	11/97	11/97	11/97	11/97	03/98	-	-
		T	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	-	-
IO-B&B_1	01/90-02/07	T	11/96	11/96	02/97	11/96	11/96	02/97	11/96	08/96	02/97	09/94	05/94	08/94
		P	09/97	11/97	11/97	09/97	11/97	11/97	09/97	11/97	11/97	-	-	-
		T	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	-	-	-
IO-B&B_2	01/95-08/09	T	11/96	11/96	02/97	11/96	11/96	02/97	11/96	11/96	02/97	-	-	07/96
		P	10/97	11/97	11/97	11/97	11/97	11/97	11/97	11/97	11/97	-	-	-
		T	09/98	09/98	10/98	09/98	09/98	10/98	09/98	09/98	10/98	-	-	-
BAO-RS_1	01/95-06/07	T	06/97	11/96	08/96	08/96	11/96	08/96	-	11/96	08/96	04/96	08/96	-
		P	10/97	09/97	12/97	10/97	09/97	12/97	-	09/97	12/97	12/97	12/97	12/97
		T	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98	09/98
2007-2009 & 2013-2015														
IO-RS_2	01/99-10/14	P	02/08	02/08	02/08	02/08	02/08	02/08	02/08	02/08	02/08	07/08	07/08	07/08
		T	01/09	01/09/	08/09	01/09	01/09	08/09	01/09	01/09	08/09	01/09	01/09	01/09
		P	12/14	10/14	12/14	12/14	10/14	12/14	12/14	10/14	12/14	-	-	12/14

Short name of index	Time-span	TP	Local max/min			Bry-Boschan			Harding-Pagan^{+}			Markov-Switching		
			X-12	T/S	C	X-12	T/S	C	X-12	T/S	C	X-12	T/S	C
IO-B&B_3	01/00-10/14	P	05/08	06/08	06/08	02/08	06/08	06/08	02/08	06/08	06/08	07/08	07/08	08/08
		T	01/09	01/09	05/09	01/09	01/09	08/09	01/09	01/09	08/09	01/09	01/09	02/09
		P	05/14	04/14	05/14	05/14	04/14	05/14	05/14	04/14	05/14	-	-	-
BAO-RS_2	01/03-10/14	P	05/08	05/08	09/08	05/08	05/08	09/08	05/08	05/08	09/08	07/08	07/08	09/08
		T	05/09	05/09	05/09	05/09	01/09	05/09	05/09	01/09	05/09	01/09	01/09	05/09
		P	09/14	05/14	12/14	09/14	05/14	12/14	09/14	05/14	12/14	12/14	-	12/14
BAO-B&B	01/00-10/14	P	05/08	05/08	09/08	05/08	05/08	09/08	05/08	05/08	09/08	07/08	07/08	09/08
		T	05/09	05/09	08/09	05/09	05/09	08/09	05/09	05/09	08/09	02/09	02/09	06/09
		P	09/14	10/13	10/13	10/13	10/13	10/13	09/14	10/13	10/13	09/14	09/14	01/15

Notes: For full names of the indices and sources see Table 3; All dates are written in the MM/YY format; TP – turning point; P – peak; T – trough; X-12 – X-12 Arima; T/S – Tramo/Seats; C – CAMPLET; + – There were several false turning points for periods of stagnation; they are not shown in the table.

Sergey V. Smirnov

National Research University Higher School of Economics (Moscow, Russia). “Development Center” Institute. Deputy Director; E-mail: svsmirnov@hse.ru

Nikolai V. Kondrashov

National Research University Higher School of Economics. «Development Center» Institute. Leading Expert; E-mail: nkondrashov@hse.ru

Anna V. Petronevich

National Research University Higher School of Economics, Laboratory for Research in Inflation and Growth. Università Ca’Foscari Venezia. Université Paris 1 Panthéon-Sorbonne, Paris School of Economics. E-mail: apetronevich@gmail.com.