Economic Forecasting Based on the Relationship between GDP and Real Money Supply

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Forecasts showing how the economy will be developing are very important both for the government and for all the economic agents, including citizens. In Russia, the common practice is to forecast based on price assumptions for hydrocarbons, primarily oil. Such an approach causes serious errors. This paper proposes a different approach driven by the close linkage between the GDP and the real money supply. By way of an example, forecast scenarios for Russia's GDP in 2017 are adduced. Options for using the proposed methodology in economic policy (including anti-crisis policy) are suggested[2].

Key words: Monetary Policy, Business Cycles, Forecasting and Prediction Methods, Energy and the Macroeconomy;

JEL classification: C53, C54, E37, E52, Q43

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[2] The paper in Russian was published 13.03.2017, https://mpra.ub.uni-muenchen.de/77475/.
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Ссылка: https://mpra.ub.uni-muenchen.de/77475/

The Flip Side of Forecasting GDP Based On Oil Prices

In Russia, GDP forecasts and those of other important macro-economic indicators are, more often than not, attributed to this or that status of oil prices. Such practice (provisionally, let us refer to it as "petroleum" based forecasting) is used both by expert organizations and the government. This approach causes serious errors.

Example One. Long term forecasts presupposed robust growth in the economy of Russia by an average of 6.4% a year at the prices over USD 91 per barrel (an example of such a forecast is given in table 1).

Table 1: It had been expected that at high oil prices, the economy of Russia would grow.

Initial Conditions and Macroeconomic Indicators of the Economy's Innovative Development Until the Year 2020 (Average for the period)				
	2007	2008 - 2010	2011 - 2015	2016 - 2020
Oil prices (global), USD per barrel	69.3	99	91	108
Gross Domestic Product, annual growth	8.1	6.8	6.4	6.3
Industrial Production, average annual growth	6.3	5.7	5.3	5.1

Source: Resolution of the Government of the Russian Federation dated November 17-th 2008 No. 1662-p (Annex 1). http://base.garant.ru/194365/

In 2013, the prices were higher than USD 100 per barrel, and, according to the logic of the forecast, the GDP should have grown at the rates even higher than 6.4%. However, in spite of the above logic, one could observe a slowdown of GDP growth, based on the year end results, it registered a mere 1.3%.

This is convincing illustration of the fact that high oil prices are far from bringing about automatic growth of the GDP.

Example Two. There are reverse examples, too, where low oil prices fail to result in automatic decline in the GDP. The 2015 forecasts were made by many experts based on the same scheme. Thus, in December 2014. Prof. Alexey Kudrin, ex-Vice Prime Minister and Finance Minister of the Government of the Russian Federation and currently (March 2017) head of the Center for Strategic Developments and a member of the Presidium of the Economic Council advising the President of the Russian Federation, had forecast that the GDP would decline "**by 4% and more"**, if oil prices dropped down to **USD 60** per barrel ("Kudrin Has Prophesized Fully Fledged Economic Crisis for Russia", report by Interfax). Similar forecasts were ventured by many other well-known organizations.

EBRD:

> *"Our forecast for Russia's economic growth for 2015 is **-4.8%;** we proceed from the assumption that the average oil price for the year is to amount to **$58** per barrel, while sanctions are to remain in force"*

Development Center of the Higher School of Economics

> *"Average decline in oil prices to **$50** in 2015 would lead to the lowering of export revenues still greater than under the "70 " scenario … In 2015, GDP is to shrink by **6-7%**...» (**author's note:** "70" scenario is the economic forecast at the price of 70 dollars per barrel)*

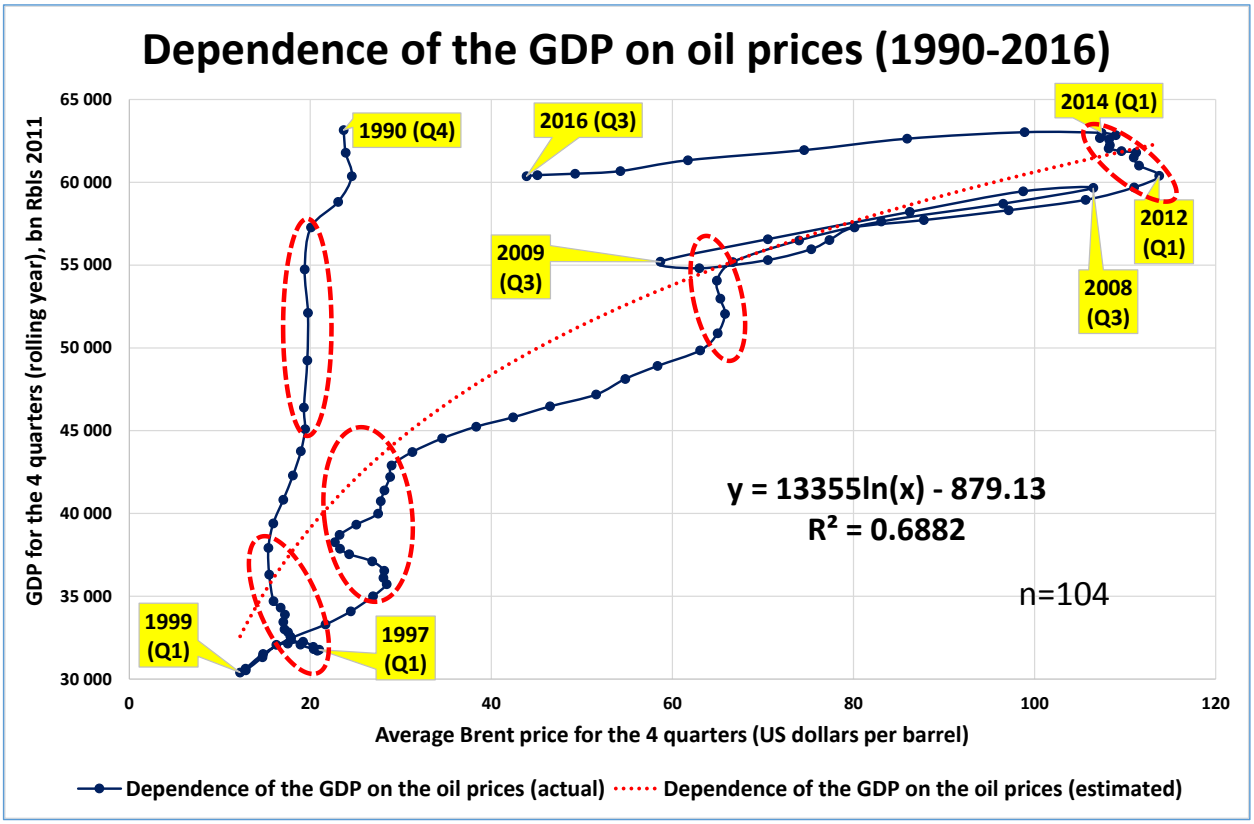
Gaidar Institute:

> *"Structural problems of the Russian economy compounded by the decline in oil prices and the sanctions will cause the GDP to decrease by **6.4** percent this year. The forecast by the experts of the Gaidar Institute and the Russian Academy of National Economy and Civil Service under the auspices of the President of the Russian Federation is based on the estimation of the oil price at **$55** per barrel during 2015-2016, which is a little better than assumed by the Russian authorities at $50 per barrel. Besides, projections of the economy's downturn this year exceed the forecast of the Ministry of Economic Development more than twice.*

Let us compare the actual result with the forecast. In December 2015, the oil prices fell down to **40 US dollars**/barrel, annual average prices (2015) made up **54 US dollars**/barrel. That is, they proved to be lower than the base level of the forecast GDP quoted above whereas the GDP, in spite of the logic of Kudrin's forecast and the forecasts of the authoritative organizations set out above turned out to be better rather than worse than their forecasts. According to the first (preliminary) evaluation by Rosstat (Russian Statistics Authority), the GDP in Russia in 2015 dropped down by **3.7%**, which is already considerably better than all the forecasts mentioned above. Following that, the projection of the downturn was first estimated as being down to **-3%**, and then down to **-2.8%**. "Petroleum" forecasting suffered a setback.

What is the root cause of the mistake? It lies in the fact that the above method of forecasting hinges on – overtly or covertly – the premise about a close linkage between the economic situation in Russia and oil prices. However, attempts to verify this dependence do not yield a satisfactory result. It is amply illustrated in figure 1.

Fig. 1. Dependence of the GDP on the oil prices is not of permanent nature. Economic growth did happen with the oil prices going down, and, vice versa, the GPD would decline when oil prices dramatically shot up (the areas highlighted in red dotted line are at odds with the "petroleum" theory of economic growth in the Russian Federation).



Sources: Rosstat, FRED, articles by A. Illarionov (statistics up to 1995), calculations by S. Blinov

The areas highlighted with red dotted line in figure 1 show the periods in which the GDP was growing with oil prices tumbling or it was plummeting with oil quotations on the rise. This graph explains why forecasting based on oil prices cannot be accurate: there is no close correlation between the GDP and oil prices. The GDP is often "insensitive" to oil prices. For example, it may represent the same value (60 trillion Rubles at the 2011 prices) both at the price of 110 US dollars a barrel and at the price below 50 US dollars per barrel (fig.1). And, vice versa, at the same oil prices (on the order of 20 US dollars per barrel), the GDP may be both 35 and 55 bn. Rubles at the 2011 prices (fig.1).

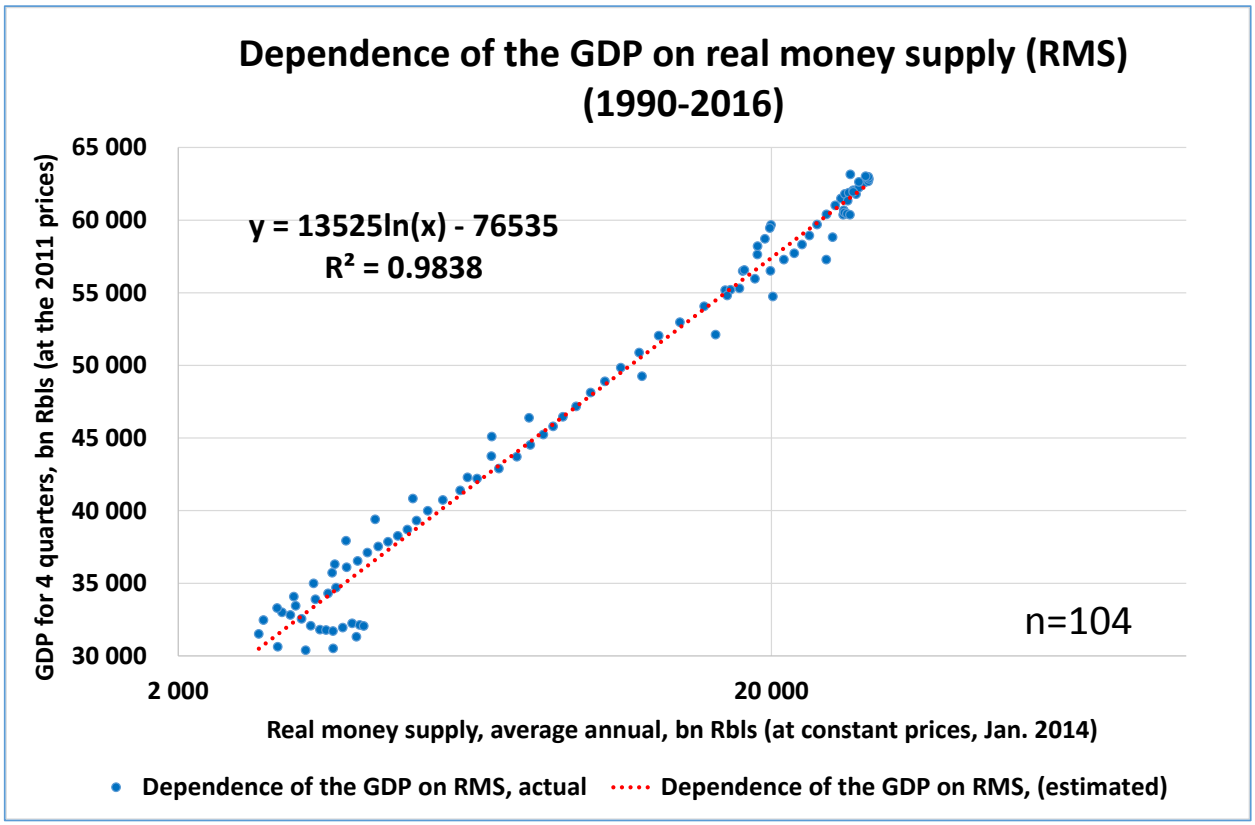
The conclusion is simple enough: forecasting based on some oil price scenarios cannot be recognized to be truthful and reliable.

Forecasting Based on Real Money Supply (RMS)

Thus, forecasting based on oil prices gives a huge error. However, there is another more reliable indicator. This indicator is the Real Money Supply (hereinafter referred to as RMS). RMS is calculated as monetary aggregate M2, adjusted for the level of consumer inflation.

When applied to the Russian economy, this indicator, unlike oil price quotations, has a more intimate connection with the GDP (see Blinov, 2015), which is illustrated vividly in figure 2.

Fig. 2. Russia's GDP is bound up very intimately with the real money supply indicator.



Sources: Central Bank of the Russian Federation, Rosstat, articles by A. Illarionov (statistics up to 1995), author's calculations. Note: real money supply scale is logarithmic.

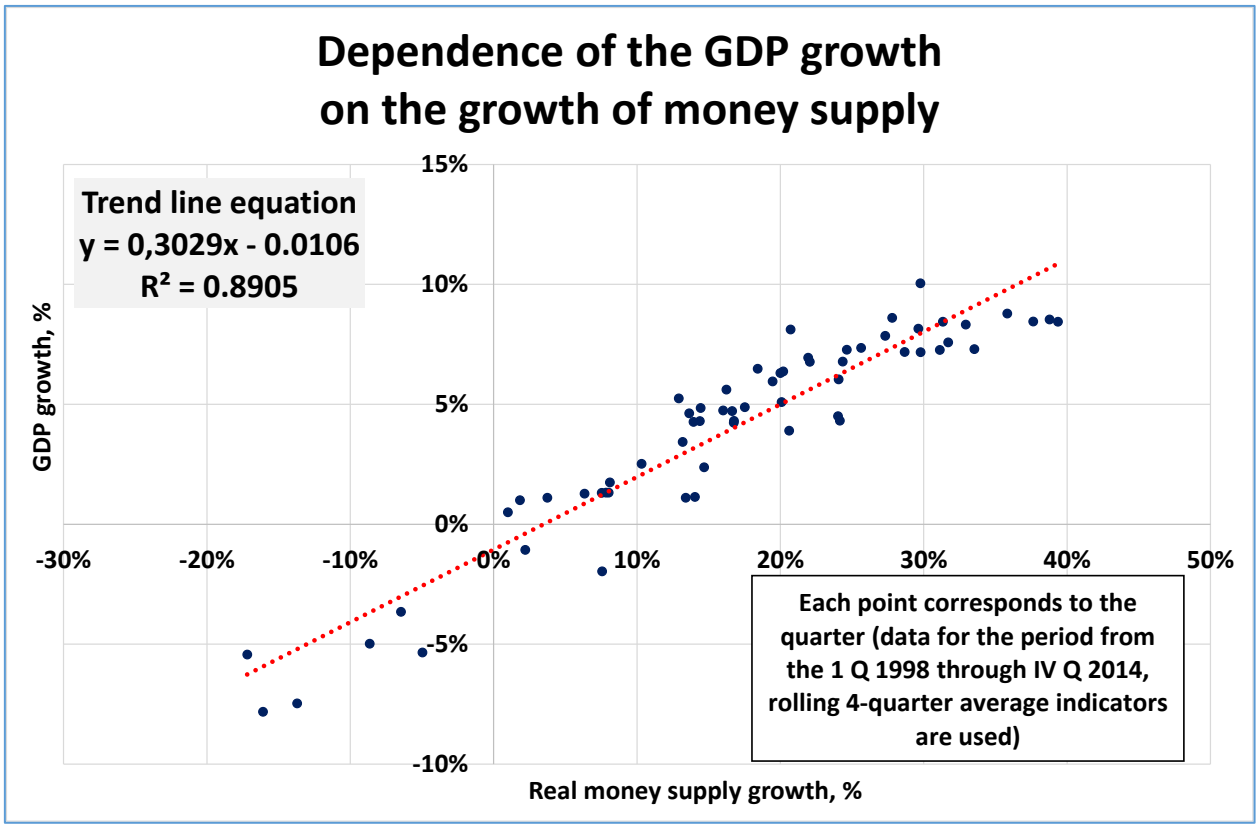
It is interesting to point out that if one is to look at the period beginning from the year 2000, that is from the time that Vladimir Putin was elected President of Russia, this dependence of the GDP on the RMS is still closer (see figure 4 below).

Such an intimate dependence between the real money supply (RMS) and the GDP allows forecasting of gross domestic product trends based on the trends that have unfolded in money supply. Below we are proposing two techniques of such forecasting.

Technique One: Linkage of Rates

Technique One is based on the interconnection between GDP growth rates and those of real money supply. The guiding idea of this technique is graphically represented in figure 3.

Fig. 3. The intimate connection between the RMS and the GDP enables forecasting of GDP rates based on the assumptions of real money supply growth rates



Source: "Dr. Kudrin's Mistake", Expert Magazine, issue No.23, 2015. Reference: http://expert.ru/expert/2015/23/oshibka-doktora-kudrina/media/266211/

The merit of this technique: it enables calculation of the GDP growth rates if a projection of real money supply rates is available. Thus, for example, if we assume that real money supply (average annual) grows by 10% a year, in that case, by inserting this value into the formula, set out in figure 3, we shall obtain the GDP growth rate projection of approximately 2%.

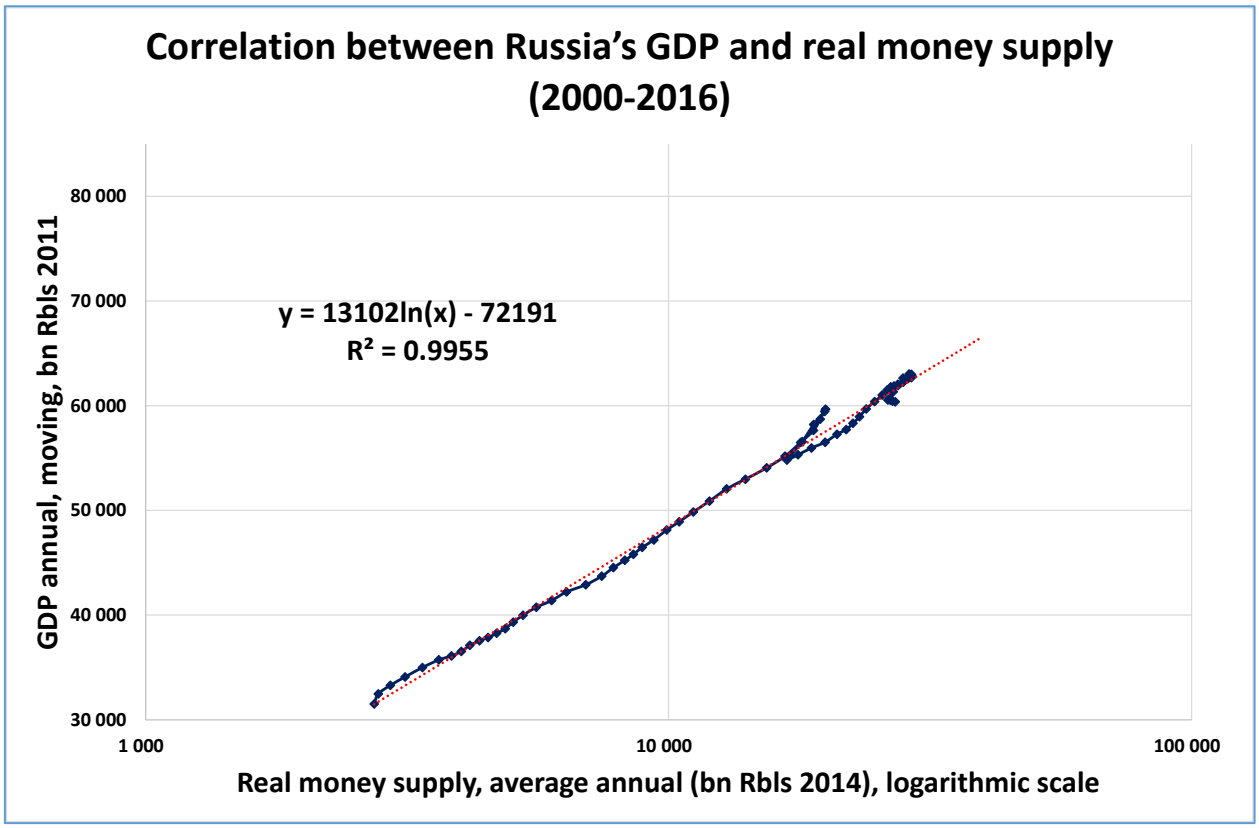
Referred to the demerits of the technique can be the fact that it has relatively lower accuracy (R-square 0.89) than the second technique described below.

Technique Two. Linkage Between the RMS and the GDP Values in Monetary Terms

The second technique is based on the interconnection between the volumes of the GDP at constant prices and the amounts of real money supply. This interconnection is graphically depicted above, in figure 2.

This technique allows more accurate forecasts to be made as the interconnection of the indicators in this case is closer (R-square **0.98**). Moreover, if we are to use the dependence which has been observable for the last 16 years (since 2000) only, accuracy will be still higher (R-square **0.9955**), which is clearly shown in figure 4.

Fig. 4. Starting from 2000, interconnection between the RMS and the GDP became still closer.



Source: Rosstat, Central Bank of the Russian Federation, calculations by S. Blinov

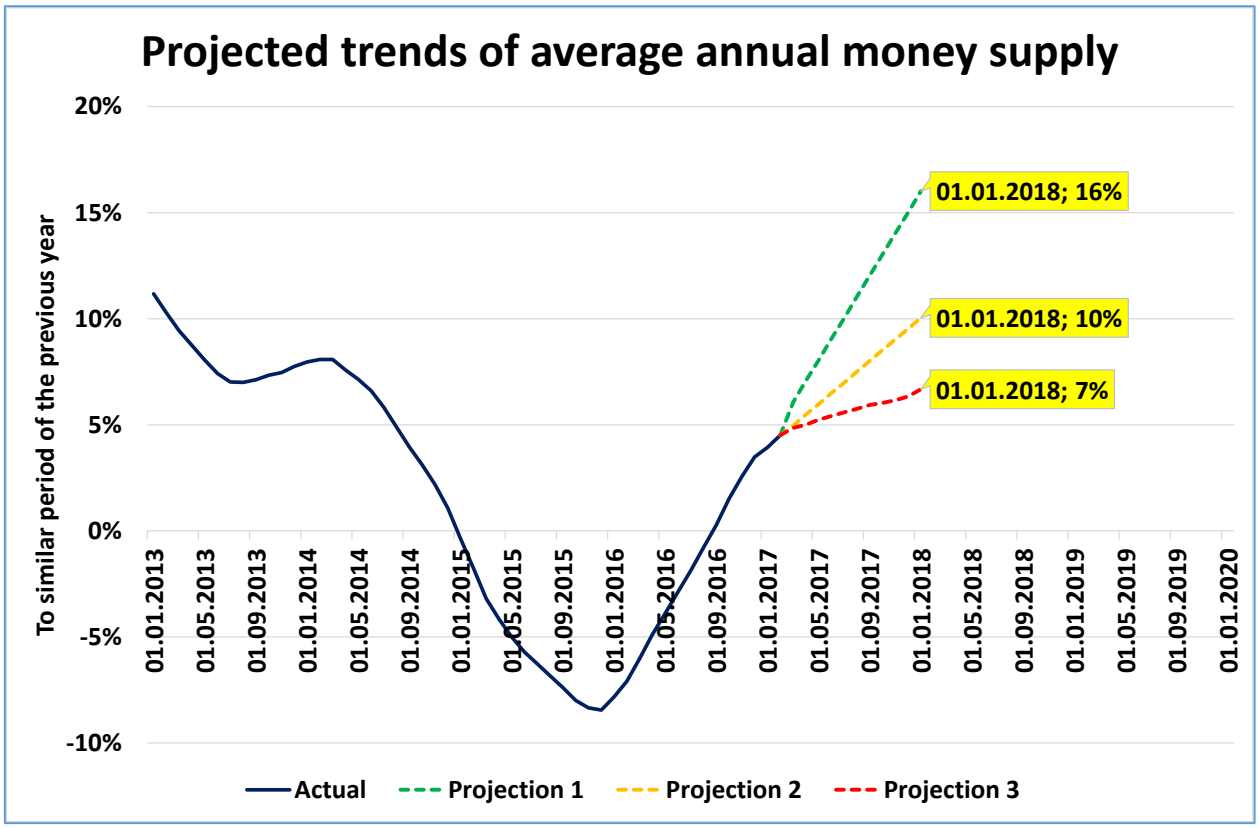
Referred to (unessential) demerits of the second technique can be the need to carry out a large volume of calculations.

Preparing Data for Calculations

As input data for both techniques, projections of real money supply are needed (RMS rates for the first technique and the RMS values at constant prices for the second technique) in average annual terms.

For the GDP projection, in accordance with the first technique, the author has prepared three scenarios of real money supply trends (figure 5).

Fig. 5. Three options of money supply trends in 2017

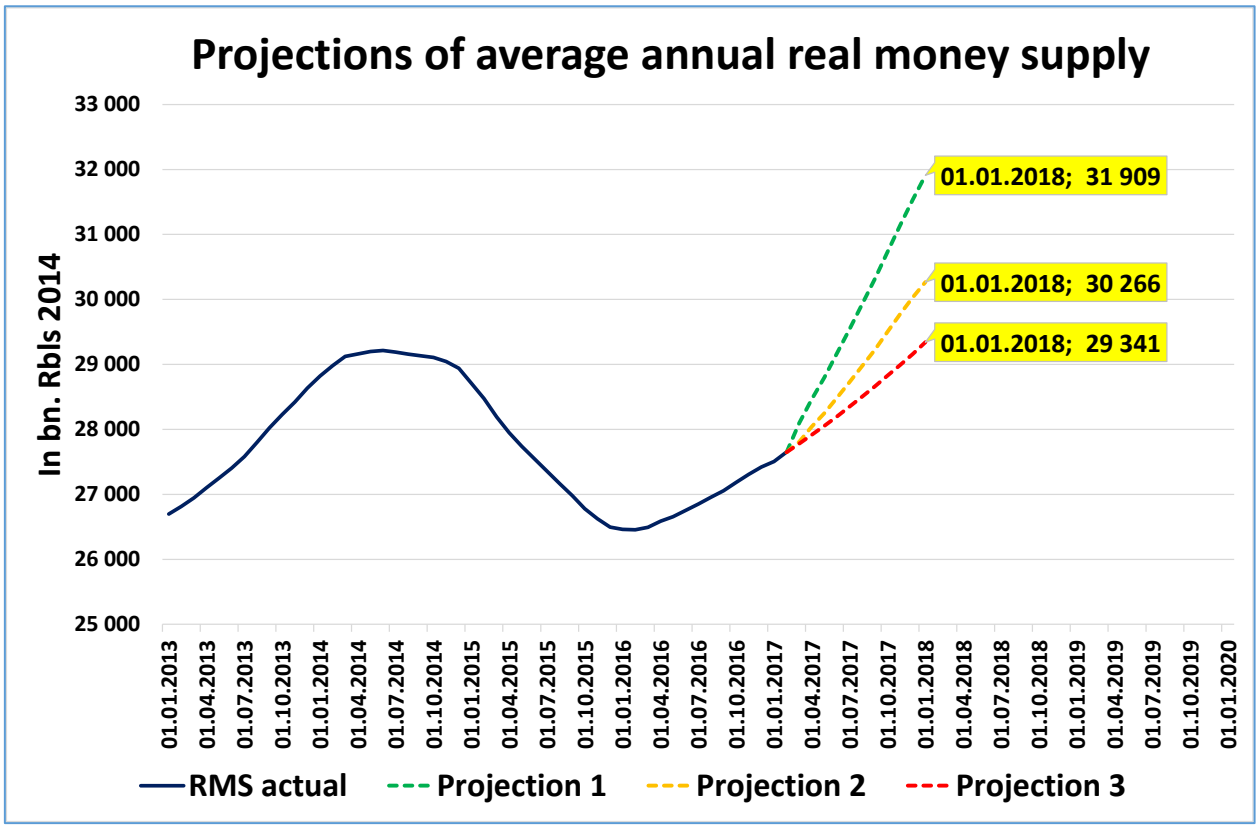


Sources: Central Bank of the Russian Federation, Rosstat, calculations by S.Blinov

Appendix 1 shows on which input assumptions these projections are based.

For the GDP projection per the second technique, three values of average annual real money supply were calculated as of the end of 2017. For them to be calculated, actual values of the indicator as at the beginning of 2017 (as at 01.01.2017) and expected trends were used, as calculated above and shown in figure 5. Results of the calculations are depicted in figure 6.

Fig. 6. Three options of the forecasts of the average annual RMS as at the end of 2017.



Source: Central Bank of the Russian Federation, Rosstat, calculations by S. Blinov.

As can be seen from this diagram, now the average annual RMS is below pre-crisis maximum. According to the most pessimistic scenario, by the end of 2017, it will have reached this maximum, while, according to the most optimistic one, it will have noticeably exceeded it.

GDP Projections for the Year 2017

Therefore, we have input data, necessary for calculations and two techniques for forecasting the GDP. The forecast computed in accordance with the first technique is given in table 2.

Table 2. Forecast of GDP Rates in Russia in 2017 in accordance with the First Technique.

	Growth rate of average annual real money supply	**GDP growth in 2017 (forecast)**
2017, projection 1	16%	**3.79%**
2017, projection 2	10%	**1.98%**
2017, projection 3	7%	**0.96%**
GDP growth rate has been calculated per the following formula $y = 0.3029 * x - 0.0106$		
x – growth rate of average annual real money supply		
y – GDP growth rate		

Source: author's calculations.

The forecast calculated in accordance with the second technique is set out in table 3.

Table 3. Forecast of the GDP in Russia in 2017 in accordance with the second technique.

	RMS average annual actual as at the end of 2016, bn. Rbls (at the 2014 prices)	Estimated GDP 2016, bn Rbls (at the 2011 prices)	Projection option	RMS average annual forecast as at the end of 2017, bn. Rbls (at the 2014 prices)	Estimated GDP 2017, bn. Rbls (at the 2011 prices)	GDP growth in 2017 (forecast)
1	27 504	61 739	Projection 1	31 909	63 685	**3.15%**
2	27 504	61 739	Projection 2	30 266	62 992	**2.03%**
3	27 504	61 739	Projection 3	29 341	62 586	**1.37%**
RMS – real money supply						
GDP has been calculated per formula ***y*** =13102*ln***(*x*)** - 72191, where						
x – RMS average annual as at the end of 2017 year						
y – GDP 2017						

Source: author's calculations

Results of the calculations in accordance with both techniques are summed up in table 4.

Table 4. Russia's GDP Forecast in 2017 per both Techniques.

	Influencing factor	Projection of GDP rates 2017 (% of 2016)		Projection of GDP 2017, bn Rbls (at the 2011 prices)
	Average annual real money supply as at the end of 2017, % growth per year	Technique 1	Technique 2	Technique 2
Projection 1	16%	**3.79%**	**3.15%**	63 685
Projection 2	10%	**1.98%**	**2.03%**	62 992
Projection 3	7%	**0.96%**	**1.37%**	62 586

Source: author's calculations.

The result of the forecast is as follows: if the growth rates of the average annual real money supply (RMS) by the end of 2017 have reached 16%, the GDP growth in Russia will constitute more than 3%.

Summary of Findings

What conclusions can be made based on the proposed techniques and from the forecasts obtained on their basis?

Regarding Projection of Russia's GDP in the Year 2017

1. **Results are close**. The projections of GDP growth rates in 2017 for both techniques are close enough with variations being in the range of 0.65 percentage point (see table 4).
2. **Second Technique is more accurate**. Given that the second technique is based on a closer interconnection between the RMS and the GDP, forecasts based on the use of this technique is expected to be more accurate.
3. **GDP growth is likely to be more than 3%**. The results of the calculations go to show that the GDP growth in Russia by more than 3% in 2017 is quite realistic. Let us emphasize that the majority of experts do not anticipate such growth.

Is the Technique Applicable To Other Countries?

The forecasting methodology based on the correlation between the RMS and the GDP is not confirmed for Russia only but in many other countries, too (see Blinov, 2015 c and Blinov, 2017), including those countries which are not dependent on oil market situation (or commodities market, for that matter). The forecasting underlying which are oil prices, naturally, is not characterized by such universality.

When Does Oil Price Rise "Help" Economic Growth?

Comparison of the two forecasting methods enables the following conclusion to be drawn: oil price rises result in economic growth only if they are transformed into RMS growth. Otherwise (as it, for example, was the case during the 1990-s in Russia) oil price hikes do not produce economic growth. The building up of real money supply is somewhat similar to the method by means of which the Russian economy "digests" export revenues with a benefit for the economy itself.

At the same time, as history shows (the areas highlighted in red dotted line in figure 1 and lack of such areas in figure 2), RMS can be effectively ramped up even in the case of bad oil market situation which, in principle, permits the Russian economy not to be dependent on oil prices.

Using Forecast Results in the Economic Policy, Primarily Anti-Crisis Policy

However, the main conclusion of the present study does not refer so much to forecasting as to application of the findings obtained in the economic policy on the whole, and to the turnaround policy, in particular.

The forecasts resting on these or those oil prices are akin to attempts to predict "weather" as the oil prices are an indicator beyond the control of the Russian government.

The forecasts driven by the real money supply indicators are more like the "operating manual", as real money supply is quite a controllable indicator, which depends on these or those actions taken by the government and the Central Bank. This means that this particular prognosis (unlike the "oil prognosis") is more reminiscent of a metaphoric instruction on how to use the "knob" controlling a climatic unit. This knob is in the hands of the Central Bank and the Finance Ministry. By ramping up the growth rate of real money supply, they can reach the required growth rates of the GDP. In other words, the economic climate in Russia is far more dependent on their actions than on the market situation of the global commodity markets.

To reword the above statement, this prognosis can be used as "an appeal for action", for example such an appeal as this: **for the GDP to grow by 3% or more in 2017, you need to ensure that real money supply in average annual terms grows by more than 16%**.

P.S. This particular article demonstrates the possibility of practically applying theoretical findings expounded in the article "Real Money and Economic Growth" (Blinov, 2015 c)

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Annex 1. Input Assumptions for Establishing RMS Forecasts

Fig. 7. Projection 1 proceeds from the assumption that the tendency for speeding up RMS rates which has taken shape since 2016 will continue

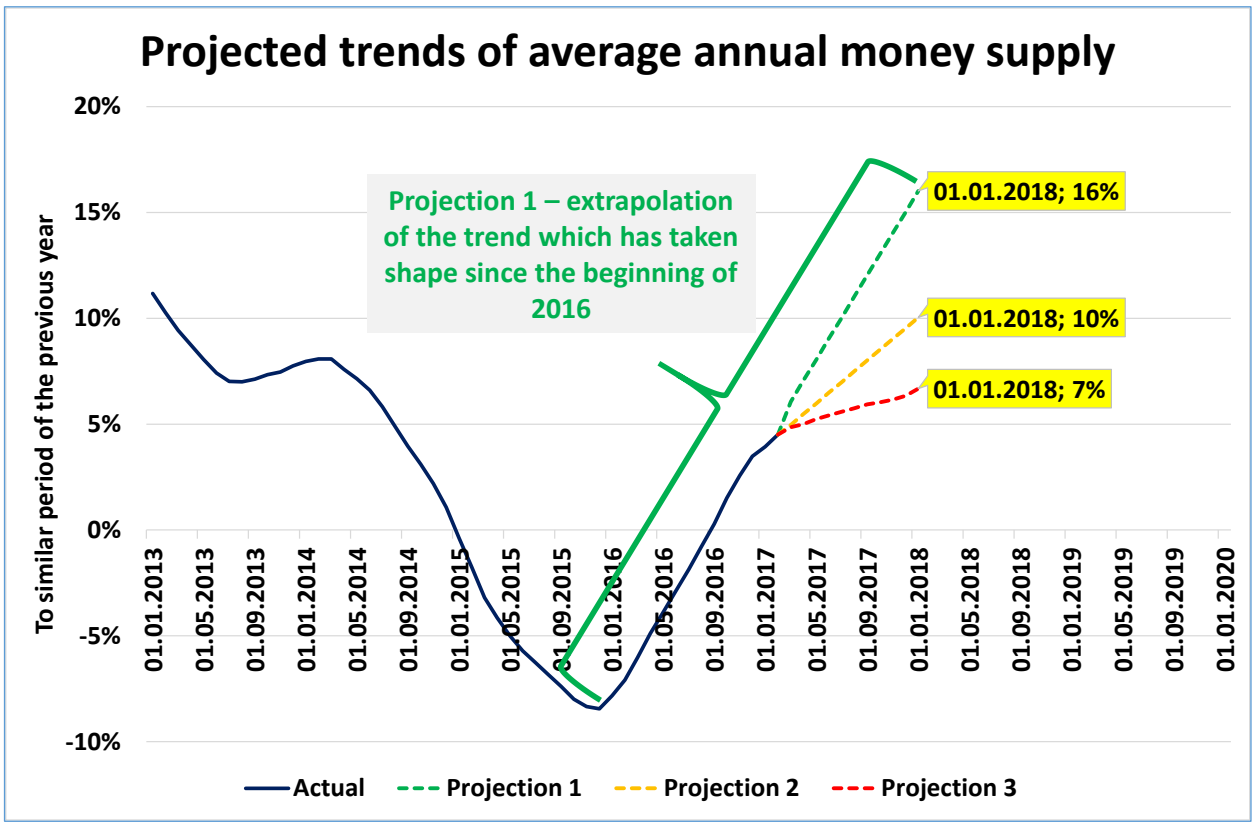

Fig. 8. Projection 2 proceeds from the assumption that the tendency for speeding up RMS growth rates which has taken shape since December 2016 will continue

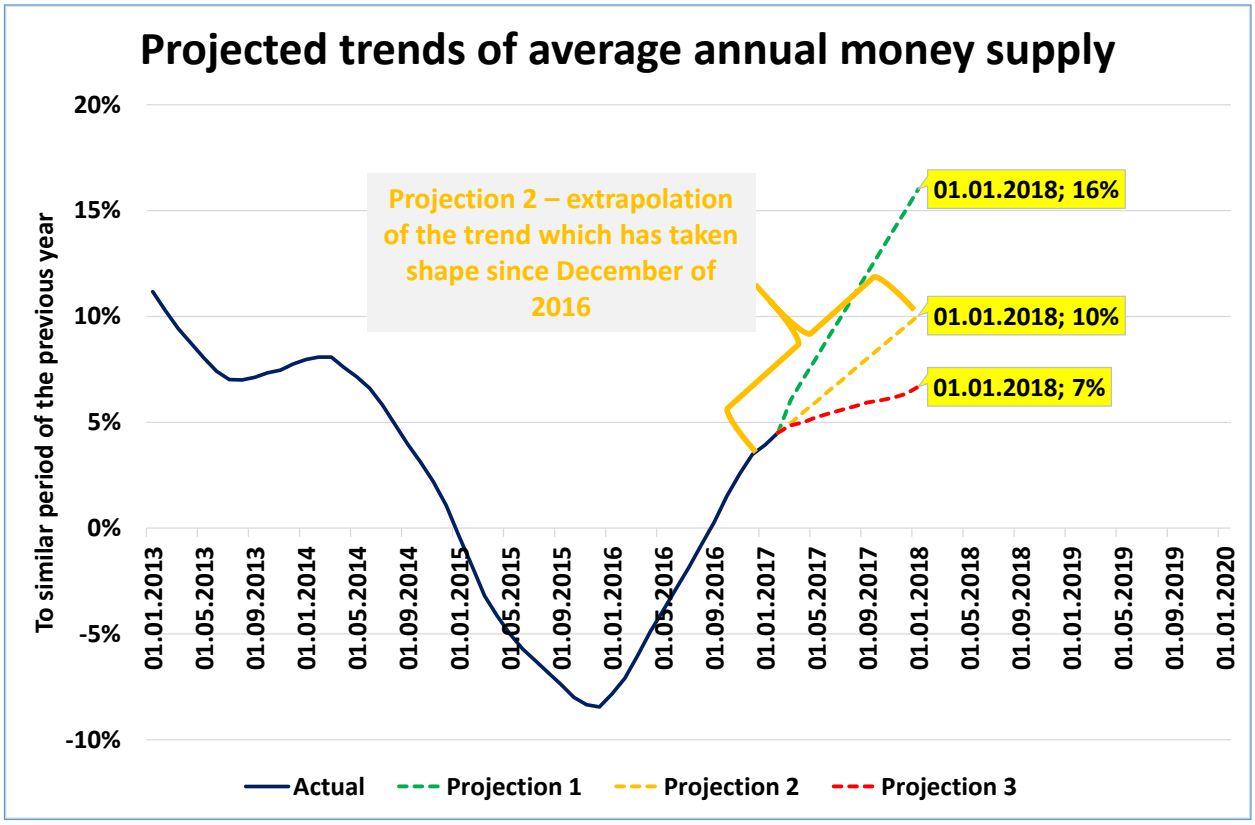

Fig. 9. Projection 3 is based on extrapolation of the rates of the monthly RMS values rather than average annual rates. After that, average annual rates are calculated based on the monthly values.