



Multiregional I-O Model: Baseline Scenario and Checking of Results Accuracy



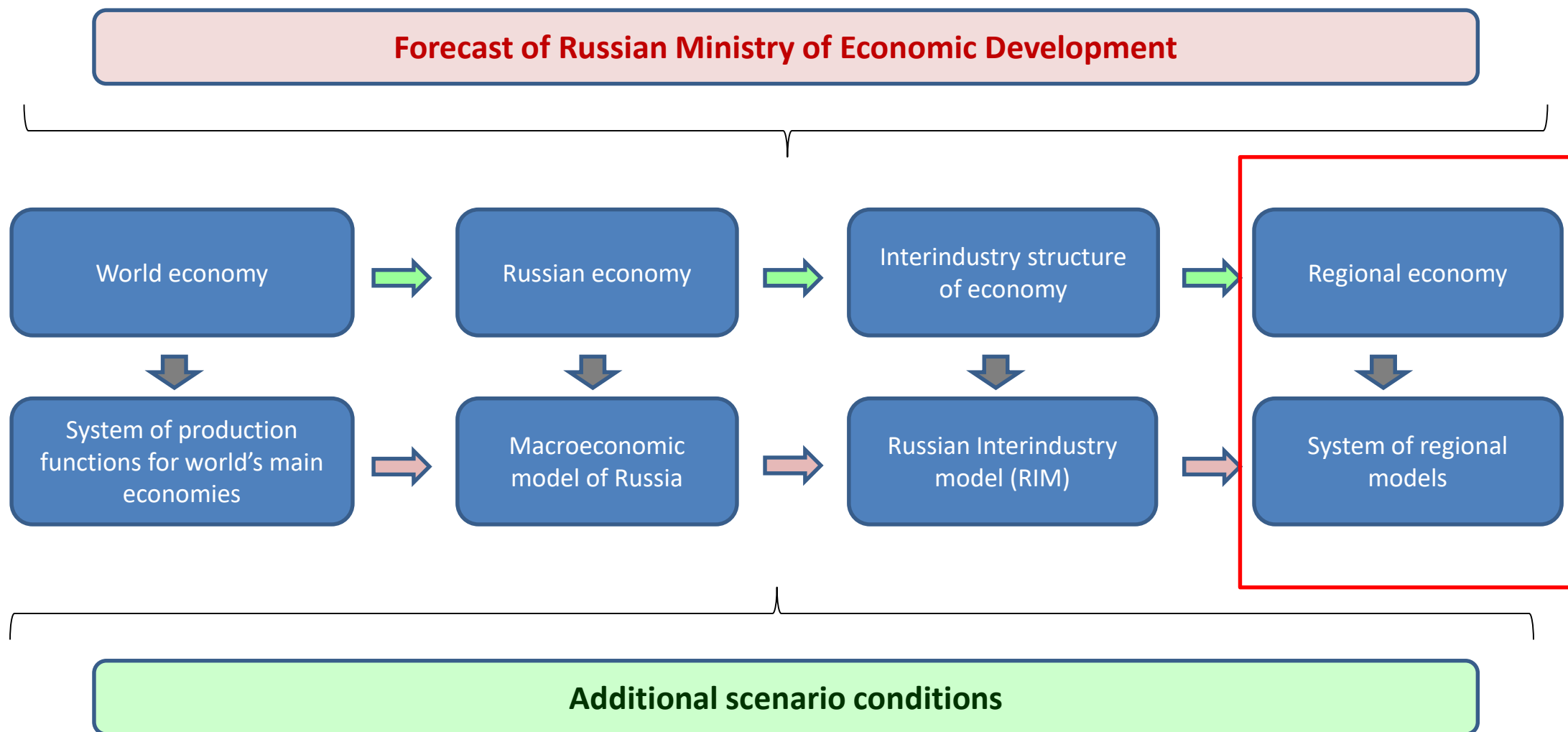
Main principles of regional economic dynamics forecasting

- The macroeconomic dynamic of Russia and external economic conditions are taken into account
- The system of interregional and interindustry interactions is used
- Taking into account the specific features of regional industry
- Balancing of indicators at country level, Federal Districts and regions

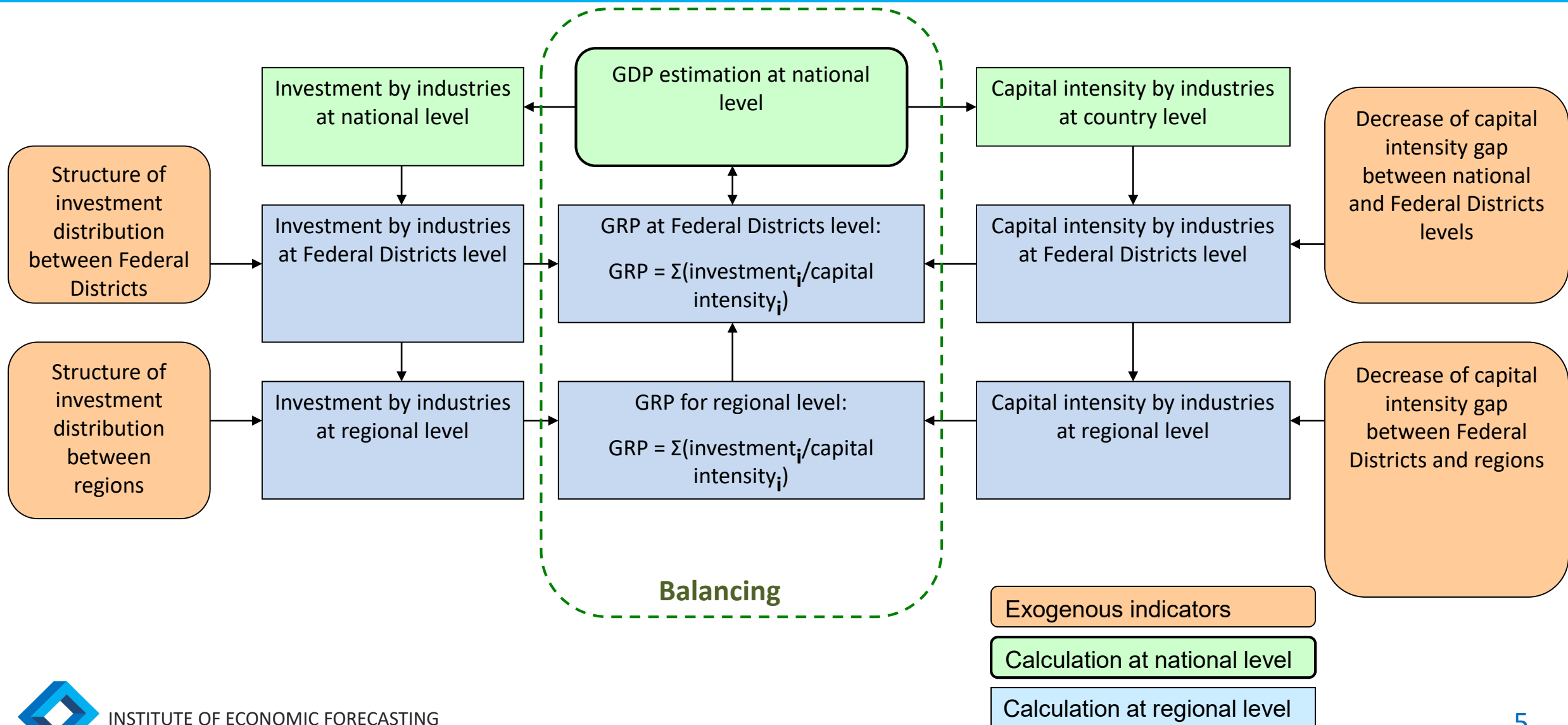




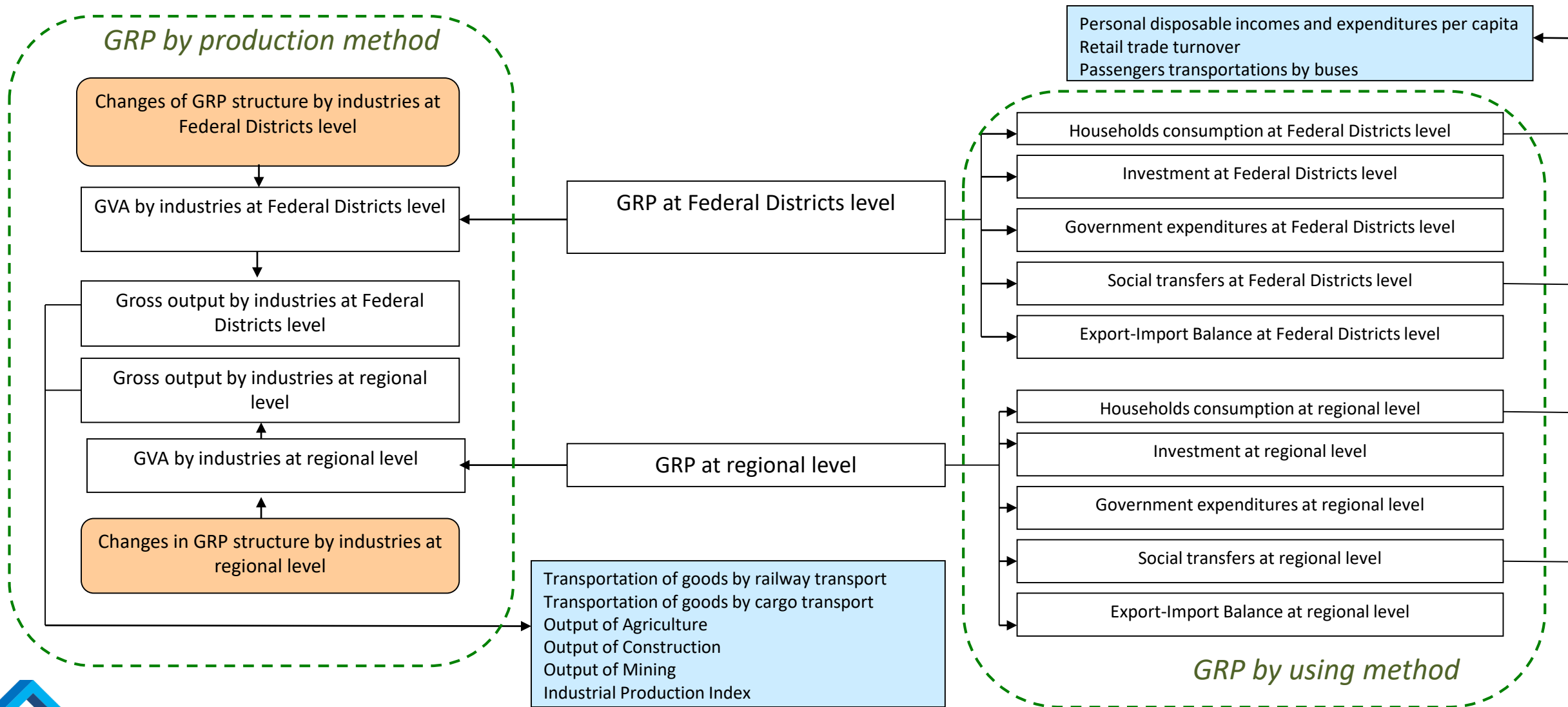
Stages of the forecast of the Russian economy development



The scheme of interrelations of macroeconomic indicators (regional level)



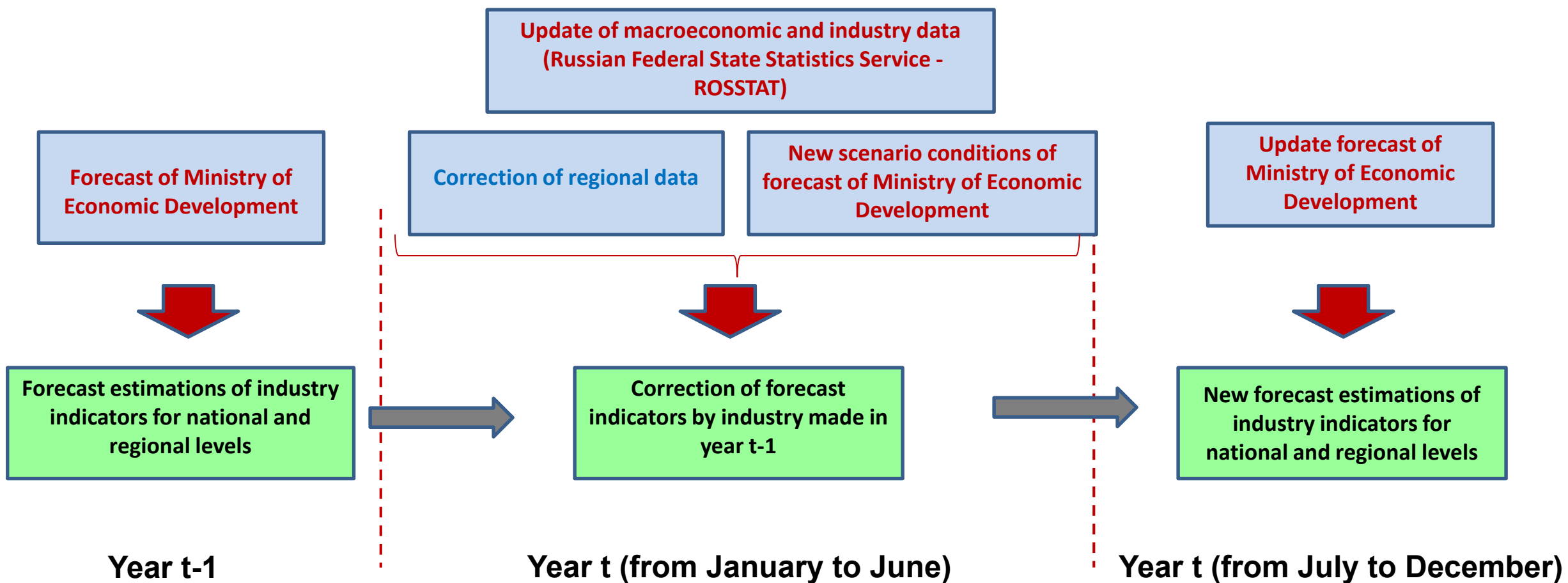
Evaluation of GRP by production method and GDP by using method



- GDP by economic activity
- GDP by expenditure (household consumption, public consumption, capital formation, net export)
- Gross output by industry (industrial economic activities)
- Personal incomes and expenditures
- Employment
- Balance of Electricity production and use
- Other indicators



Update and correction of forecast results



Method of evaluation of “tolerant” levels of errors

Tolerant level of forecast error = RST + AVERAGE (K1; K2; K3; K4), where:

RST – indicator defining accuracy of statistic data (difference between the first and the last estimations for each indicator for the same period published by ROSSTAT)

K1 и K2 – the volatility of the estimated indicators on reporting data for 2008-2018:

$K1 = (\text{maximum} - \text{average}) / \text{average}$

$K2 = (\text{average} - \text{minimum}) / \text{average}$

K3 for 1 year – value of error for the first estimated year (for model version of 2016)

K3 for 2 years – value of error for the second estimated year (for model version of 2016)

K4 for 1 year – value of error for the first estimated year (for model version of 2017)

K4 for 2 years – value of error for the second estimated year (for model version of 2017)

	RST	K1	K2	K3	K3	K4	K4	Acceptable error level (for the 1 st estimated year)	Acceptable error level (for the 2 nd estimated year)
Retail trade turnover, real growth % to the previous year	-0,6 p.p.	1,7 p.p.	2,5 p.p.	1 p.p.	11 p.p. (not included in estimation)	1,6 p.p.	5 p.p.	1,0 p.p.	2,4 p.p.



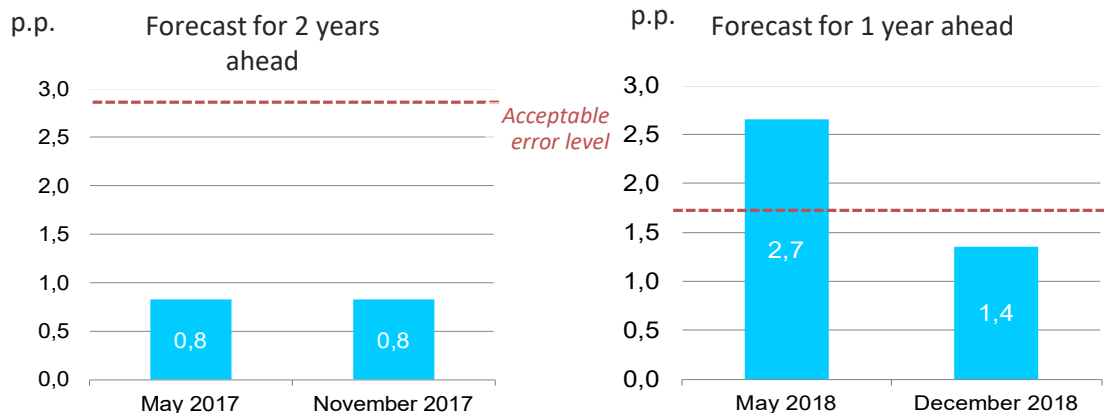
Acceptable level of forecasting accuracy

	Acceptable error level (for the 1 st estimated year)	Acceptable error level (for the 2 nd estimated year)
Real disposal income of population	1,6 p.p.	2,9 p.p.
Retail trade turnover	1,0 p.p.	2,3 p.p.
Output of Agriculture	1,0 p.p.	1,8 p.p.
Output of Mining	1,1 p.p.	1,1 p.p.
Output of Construction	1,4 p.p.	1,8 p.p.
Population, mln. Persons	1,3%	1,4 %
Passengers transportations by buses	2,8 p.p.	2,8 p.p.
Transportation of goods by railway transport	1,4%	1,4%



Real disposal income of population (growth rate in % to the previous year, forecast at national level)

The deviation of the forecast made by IEF RAS for 2018 from actual data

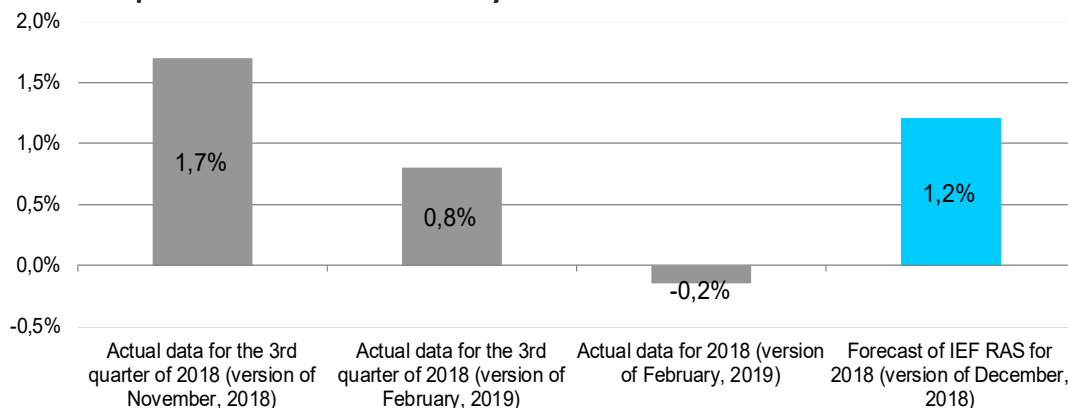


Acceptable error level

The quality of forecasting is acceptable: forecast error was below the acceptable level for each version of model, except for the forecast version of May, 2018.

High forecast in May 2018 was based on the reporting data: in February-April 2018 the disposable income increased by 4% year to year.

Comparison of forecast made by IEF RAS and actual data of ROSSTAT

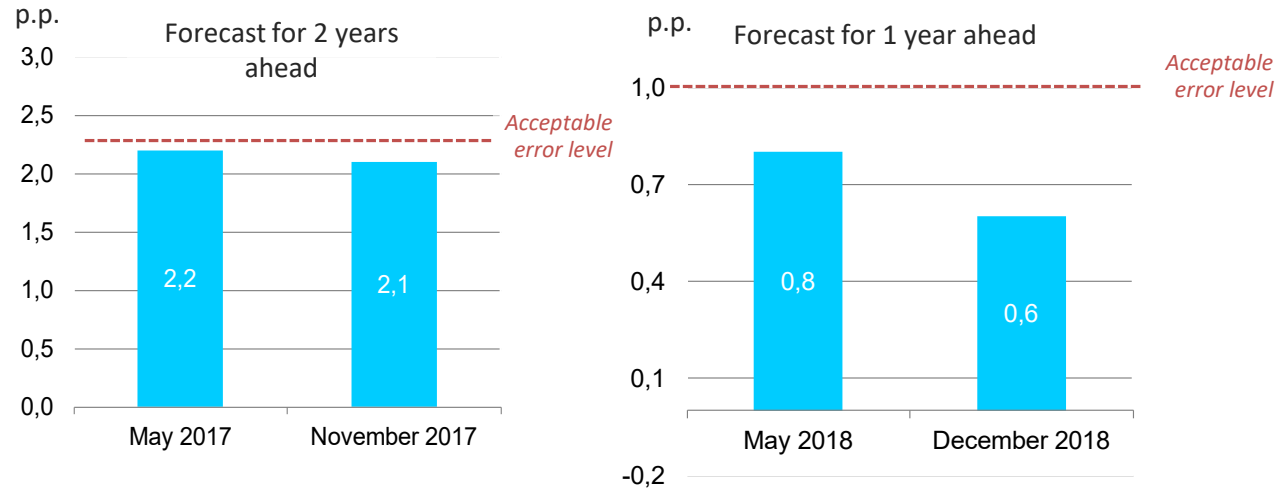


Forecast error was caused by the incorrect statistics for January-September, 2018 (income dynamics data were revised by ROSSTAT in February 2019 decreasing by 0.9 p.p).



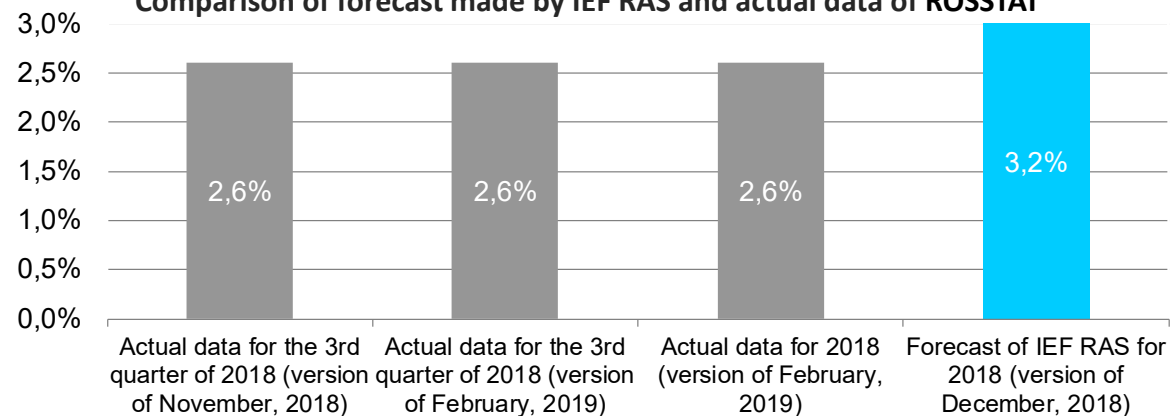
Retail trade turnover (real growth rate in % to the previous year, forecast at national level)

The deviation of the forecast made by IEF RAS for 2018 from actual data



For the dynamics of retail turnover the forecast quality remains stably high: forecast deviation from ROSSTAT report data for 2018 was below the acceptable level, decreasing at each iteration.

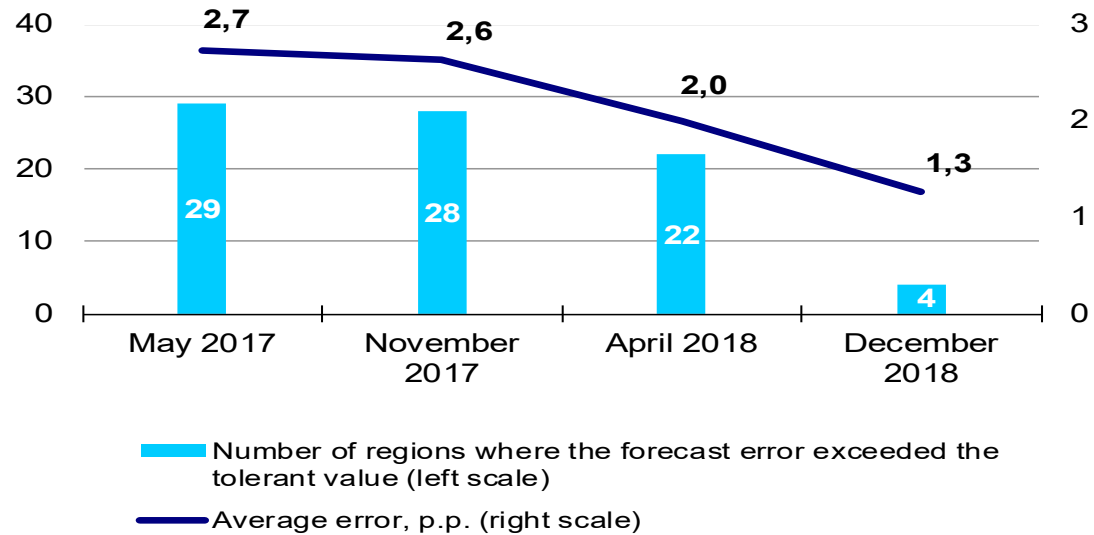
Comparison of forecast made by IEF RAS and actual data of ROSSTAT



Forecast error was caused by the deviation of the exogenous parameters of the dollar-to-ruble exchange rate and inflation from the actual value for 2018.



Retail trade turnover (real growth rate in % to the previous year, forecast at regional level)



The forecast quality was increasing at each iteration: the latest version of the model contains only 4 regions with forecast error beyond the acceptable level.

The average error decreased by 1.3 p.p.

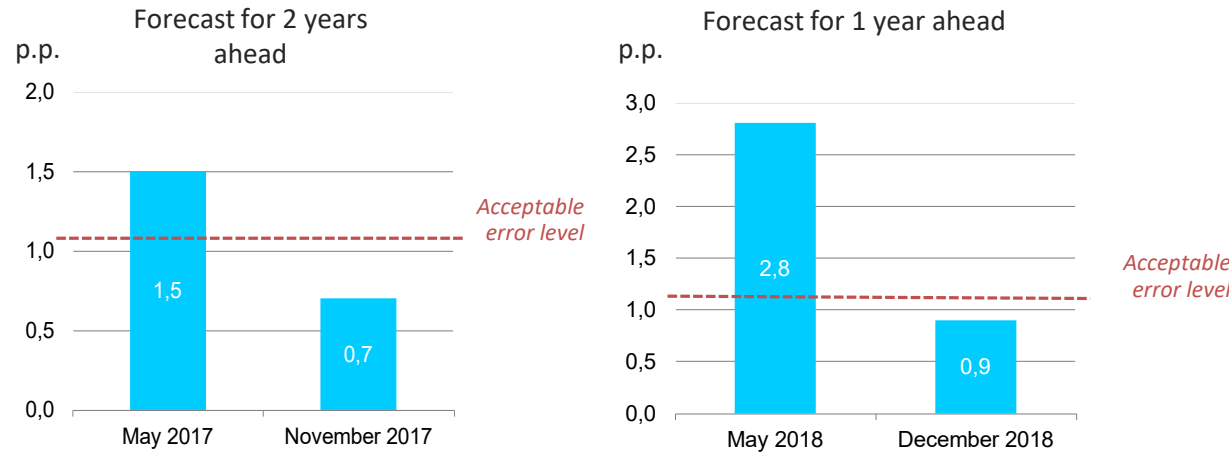
The regions where the error exceeded the acceptable level accounted only to 4% from the total value of the retail turnover in Russia

Number of regions for which the forecast was made	80
Number of regions for which the forecast exceeded the actual value	43
Number of regions for which the forecast was lower than the actual value	37
Number of regions for which the forecast exceeded the actual value by more than the acceptable error level	1
Number of regions for which the forecast was lower than the actual value by more than the acceptable error level	3
Number of regions for which ROSSTAT's actual statistics for January-October 2018 were revised	29



(real growth rate in % to the previous year, forecast for national level)

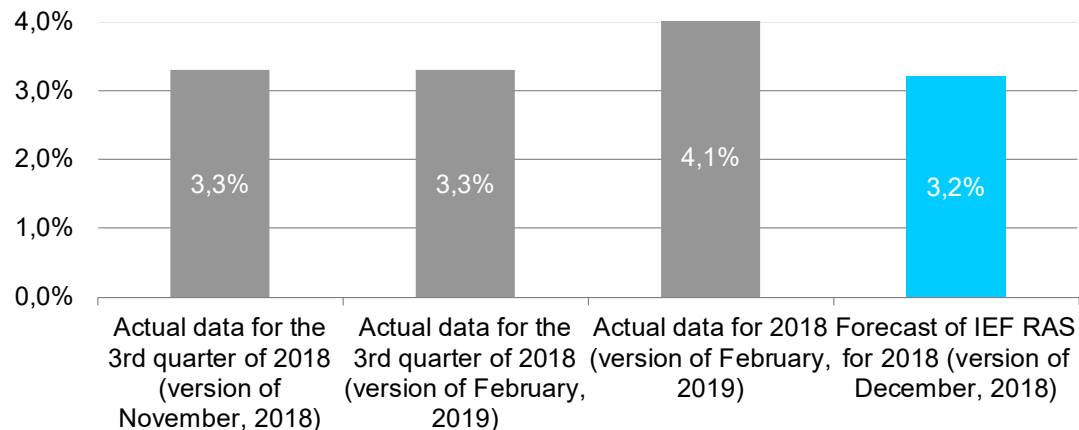
The deviation of the forecast made by IEF RAS for 2018 from actual data



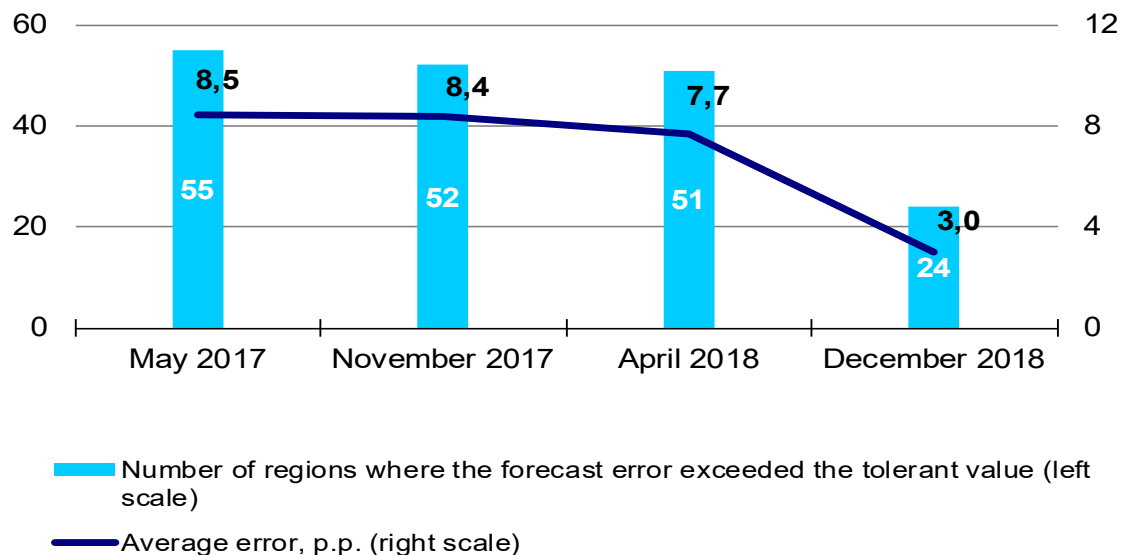
The forecast quality is considered acceptable: the forecast deviation from ROSSTAT report for the year 2018 was below the acceptable level in the latest version of the model.

Forecast error was caused by the increased volatility of the indicator. For example, at the 4th quarter of 2018 the output increased by 7.2% year to year, this is an absolute record for the last 15 years. Though, the dynamics during the 1st six months did not exceed 2%.

Comparison of forecast made by IEF RAS and actual data of ROSSTAT



(real growth rate in % to the previous year, forecast at regional level)



At regional level the forecast quality increased: the forecast version dated December 2018 shows a decrease in the average error and the number of regions for which the error exceeded the acceptable level.

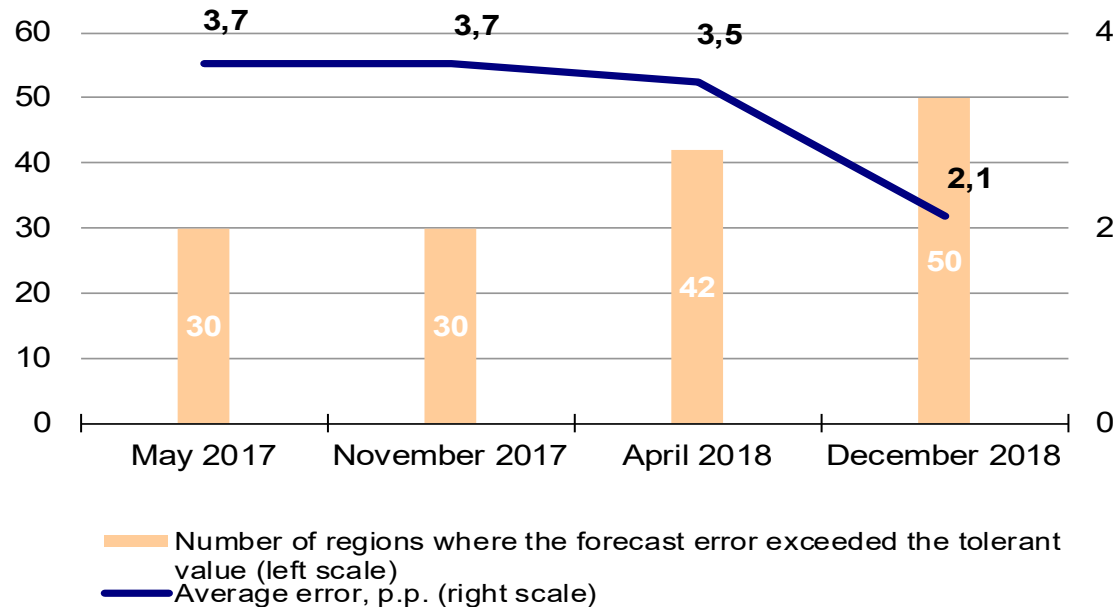
Despite a significant number of regions where the error exceed the acceptable level, totally they account for less than 17% of the total output of Mining for the Russian Federation in general.

1/3 part of the error occurred in 7 regions which total output of the mining sector amounts to 0.1% of the total Russian output. It is a small value of mining in these regions causes the high volatility of this indicator and high forecast deviation from the fact.

Number of regions for which the forecast was made	75
Number of regions for which the forecast was equal to the actual value	3
Number of regions for which the forecast exceeded the actual value	37
Number of regions for which the forecast was lower than the actual value	35
Number of regions for which the forecast exceeded the actual value by more than the acceptable error level	11
Number of regions for which the forecast was lower than the actual value by more than the acceptable error level	13



Industrial output index (real growth rate in % to the previous year, forecast at regional level)



Limits for forecast deviations from the actual data were not defined for the industrial production index.

However, a decrease in the average error indicates that the quality of the forecast has been improved.

In general, for 4 iterations the forecast quality has been improved in 73 regions. 25% of the average error occurred in 7 regions, where the total industrial production volume amounts to 6% of the total national output. Small production volume in most of these regions leads to the high volatility of the indicator.

Number of regions for which the forecast was made	80
Number of regions for which the forecast was equal to the actual value	25
Number of regions for which the forecast exceeded the actual value	55
Number of regions for which the forecast exceeded the actual value in more than two forecast versions	25
Number of regions for which the forecast was lower than the actual value in more than two forecast versions	48

- Multilevel system of the regional development allows obtaining the forecasts development for each of the federal districts and regions balanced at all levels
- Complexity of model system gave us the idea to check the forecast accuracy in order to improve the results in next model version
- Checking forecast accuracy requires a lot of efforts especially for the regional forecasts due to their amount. However, this procedure did allow us to improve the results
- The main problem that we faced – inaccuracy of the current statistics of ROSSTAT: the data was re-estimated for a number of indicators, while in some cases the changes were of a fundamental nature (for example, an increase in the dynamics of construction output by 6 p.p.). Nevertheless, we expect it is a temporary problem caused by the changes in the statistical methods



Thanks for your attention!

