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A REAL-TIME HISTORICAL DATABASE OF MACROECONOMIC INDICATORS FOR RUSSIA

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Abstract

We compile a database that contains data vintages of a large collection of short-term economic indicators. The main result of the work is a database which is available as an electronic annex to this working paper. The Research and Forecasting Department of the Bank of Russia plans to update this database in the future. We also perform an illustrative analysis of the properties of the revisions for a number of indicators. The preliminary results indicate that the magnitude of the revisions is in many cases substantial.

Key words: data revisions, data vintages, database, Russia

JEL classification: C82, E01, E2

1. Introduction

Monetary policy decisions are made on the basis of a large set of economic indicators. However, the available data tend to be incomplete, given their different publication times, various lags and the substantial revisions that may follow. Many studies confirm that the resulting data uncertainty may be considerable and influence both the decision-making process and the evaluation of the relevance of the decisions made. Hence it is important to reconstruct the information available at the time policy decisions are made, rather than use the ex-post revised data available several years later (for example, see Orphanides 2001). This exercise is feasible only when all indicators are available as published in real time (i.e. their vintages). These datasets were reflective of economic sentiment at the time econometric models were being estimated or policy decisions were being made. Accordingly, it is these particular data which should be used to assess the quality of the models and the reliability of various indicators.

Many central banks and international financial institutions maintain historical databases of statistical indicators (for example, see Croushore and Stark 2001, Castle and Ellis 2002, Giannone et al. 2010, Lee et al. 2011, and Fernandez et al. 2011). Russian researchers also have explored this problem, although their work is primarily focused on analysis of GDP data revisions (Astafyeva and Turuntseva 2021). In our paper, we attempt to create a broader database of revisions to a large set of short-term economic indicators.

The key accomplishment of this research paper is the database, which is available at the Bank of Russia's website as an online appendix to this paper. The Research and Forecasting Department of the Bank of Russia plans to update this database in the future. The second section of the paper discusses the principles governing the creation and content of the database. The third section provides an illustrative analysis of certain properties of the revisions to a number of indicators. The preliminary results of this analysis suggest that in many cases the magnitude of the revisions to the indicators under study is considerable. This finding underlines the necessity to take these properties into account while employing the statistical indicators for analytical purposes, as well as to refine approaches to the publication of data in statistical analysis.

2. Vintages of Rosstat's short-term economic indicators

Vintage data are obtained from Rosstat's monthly informational and analytical materials 'Short-term Economic Indicators of the Russian Federation' (SEIs), which offer monthly, quarterly and annual data on the socioeconomic situation, including industrial, price, financial and social statistics¹. Given their availability in almost real time², these data serve as a source for current economic analysis and for building multiple macroeconomic models used both to analyse recent events and to make a variety of real-time decisions.

The relevance of these data is obvious.. However, in accordance with the state-of-the-art practices, the majority of indicators published are calculated in several stages. This means that the data published in the first stages are only estimates and are subject to subsequent revision over a long period of time, up to several years in some cases.

The various types of revision and adjustment may be significant and influence both the choice of model and the assessment of its quality (see, for example, Stark and Croushore 2001 and Mamedli and Shubitov 2021 for Russia) and therefore influence decision making. Unfortunately, Rosstat's website provides only a few recent SEI publications. Therefore, assessment of the impact of revisions in Russia should begin with the compilation of a database of vintages. This is the point we begin with. Having collected from various sources all SEIs from January 2001, we consolidated them into a single database of them and unified their format³:

- **Data were obtained from two sources: data saved by Vladimir Bessonov and data, saved by a Bank of Russia's contractor, which are loaded into the internal system of the Bank of Russia.**
- **Vintages missing from the internal system's databases were supplemented with Vladimir Bessonov's data.**
- **Overlapping data were compared and verified manually in cases of misalignment to resolve data conflicts.**
- **In the final stage, we conducted random manual verification and semi-automated accuracy verification for data transferred from Rosstat reports to the internal database.**

The list of indicators, their frequency, and the vintages in which they came up, as well as the publication format, are presented in a separate attachment to the database (the summary eng.xlsx file).

¹ [Short-term Economic Indicators of the Russian Federation](#) / Rosstat.

² Most indicators are published approximately one month following the reporting period.

³ Publication formats, names and list of indicators changed over time. That is why consolidating the indicators into a single database and verifying it were the most labour-intensive stages of this study.

3. Analysis of properties of historical macroeconomic indicator revisions

To illustrate the key properties of Rosstat's revisions of various economic performance indicators, this paper discusses some of their descriptive characteristics: the frequency and magnitude of data revisions. For simplicity, we provide examples of annual growth rates⁴, although monthly growth indicators (which are also present in the database) better suit the needs of econometric modelling.

The frequency of revisions enables us to understand the time after the reporting period when data may be updated. This characteristic is calculated as the percentage of revised values (compared to the previous value) in the total number of observations from the available data releases from January 2001 through January 2019 over a horizon of up to five years (see Appendix 1). The total number of observations means the total number of all revised and unrevised values over the period under study.

For the vast majority of economic performance indicators, we clearly observe data revisions one month after the publication of the first release (Figure 1⁵). Thereafter, the share of revised values drops substantially. In the case of indicators such as real wages and volume of market services, this share falls very rapidly (almost immediately). Other indicators under study may be revised over several years.

The magnitude of revisions illustrates the size and direction of cumulative data revisions, with both upward and downward revisions possible over time. This characteristic is computed as the average of available data release revisions relative to the first estimate (in actual and absolute values) for the period from January 2001 to January 2019 over a five year horizon (see Appendix 1).

Cumulative data revisions suggest that growth rates of indicators are mainly revised upwards over time (Figure 2). Importantly, the vast majority of the indicators considered show a rather high magnitude of revision, except for real wages and the unemployment rate, for which there is almost no shift in estimates due to the specifics of their calculation methodologies.

Based on an analysis of the magnitude of revisions over four years (Figure 3), for example, we may come to a certain understanding of the degree to which the indicators under study are revised over the specified horizon, in order to use these estimates in forecasting. It is also possible to compare the magnitudes of the revision of various indicators with one another, using the ratio of the average revision (in absolute values) to the standard deviation (Figure 4). The categories that show the largest revisions were found for the cases of volume of market services, production of individual food products, money income, and industrial production. In the case of these indicators, this may suggest that the primary data available at the time of the first data release are subject to considerable adjustment as more complete information comes in.

⁴ Except for the unemployment indicator, which is provided in levels.

⁵ Figures 1–2 and 5–8 show time (in months) on the X axis beginning from the first estimate.

The evolution in the magnitude of revisions can also be analysed based on, for example, three annual rolling window subsamples (Figure 5). Importantly, revisions tend to improve (the magnitude drops) with time for indicators such as volume of market services, commercial freight turnover, export of goods, and import of goods. Investments in fixed capital and construction, on the contrary, show a trend towards increased magnitude.

It should also be noted that indicators are revised in different ways and the error is not systematic. This is indicated by the final revision correlation matrix (see Appendix 2). Therefore, overestimated or underestimated indicators should not permanently influence the revision of other data.

As regards GDP⁶, it is worth noting that revisions to this indicator may occur for up to three or four years (Figure 6). The magnitude of revisions relative to other indicators is much lower (over a four year horizon) and is about 0.5 pp for the absolute value average (Figure 7). GDP data revisions show a clear upward shift, with a rather broad range of values (Figure 8). Three out of four revisions were increases. This makes it possible to expect upward revisions in annual GDP growth estimates. At the same time, it also makes sense to consider various episodes of recession or overheating and determine the extent to which estimates are revised at such turning points of the cycle. It is probable that they are revised much more strongly than in normal times, which may be demonstrated by drastic shifts in estimates in uncertain times.

The need to revise macroeconomic indicators may arise both within the framework of an established methodology (as new information comes in) and as a result of substantial changes in the methodology, reported by Rosstat. As an example, we decided to look at the industrial production index (considering the relatively significant changes in its calculation methodology over the past years). We made several calculations for this indicator: when the change in the methodology and the base year was considered a revision and when it was not considered a revision. Once we excluded the revisions due to change in methodology and the base year specified in the Rosstat reports, the properties of industrial production revisions showed far lower magnitude and frequency. This additional calculation eliminated revisions for the following releases:

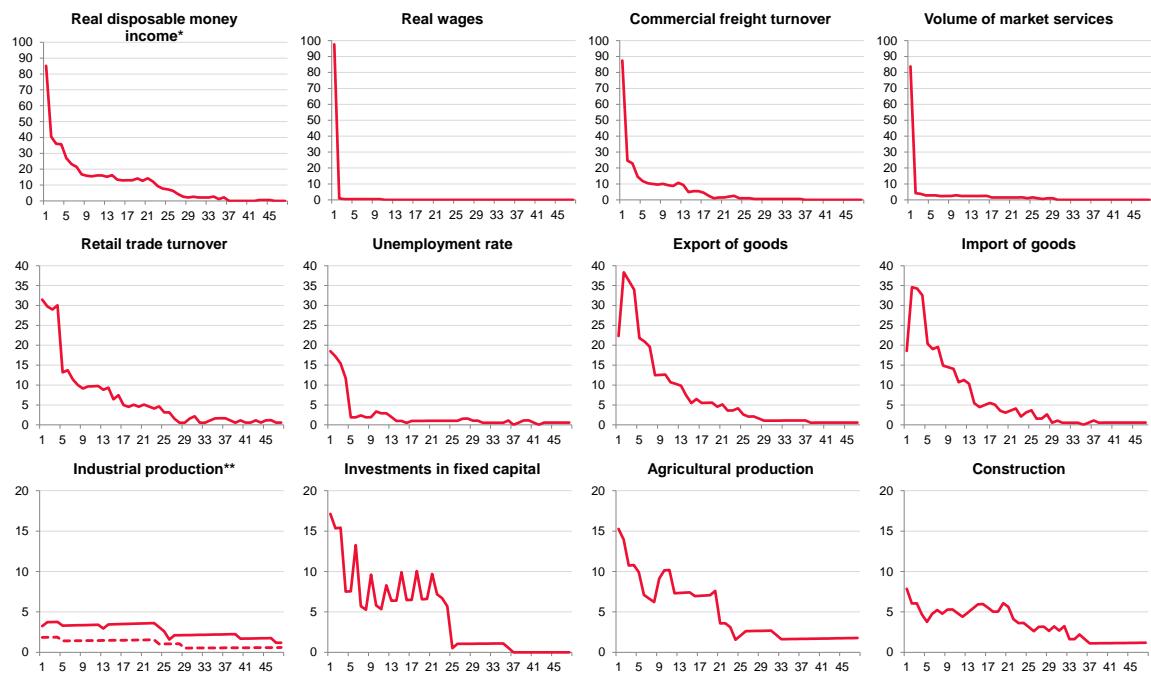
1. *Release of January 2005⁷ – OKVED classifier; base year 2002. Differences arise between the December 2004 release and the data for the period starting from January 2004.*
2. *Release of February 2005 – OKVED classifier; base year 2002. Differences arise between the December 2004 release and the data for the period starting from January 2003.*
3. *Release of May 2005 – OKVED classifier; base year 2002. Differences arise between the December 2004 release and the data for the period starting from January 2002.*

⁶ In this paper, GDP movements are shown in YoY terms. More in-depth analysis of GDP movements (QoQ) will be the focus of a separate study.

⁷ Through the December 2004 release, Industrial production calculation was based on the OKONKh classifier.

4. *Release of May 2010 – OKVED classifier; base year 2008. Differences arise between the December 2009 – April 2010 releases and the data for the period starting from July 2006.*
5. *Release of January 2014 – OKVED classifier; base year 2010. Differences arise between the December 2013 release and the data for the period starting from January 2009.*
6. *Release of January 2017 – OKVED 2 classifier; base year 2010. Differences arise between the December 2016 release and the data for the period starting from January 2015.*
7. *Release of January 2020 – OKVED 2 classifier; base year 2018. Our calculations exclude this year.*

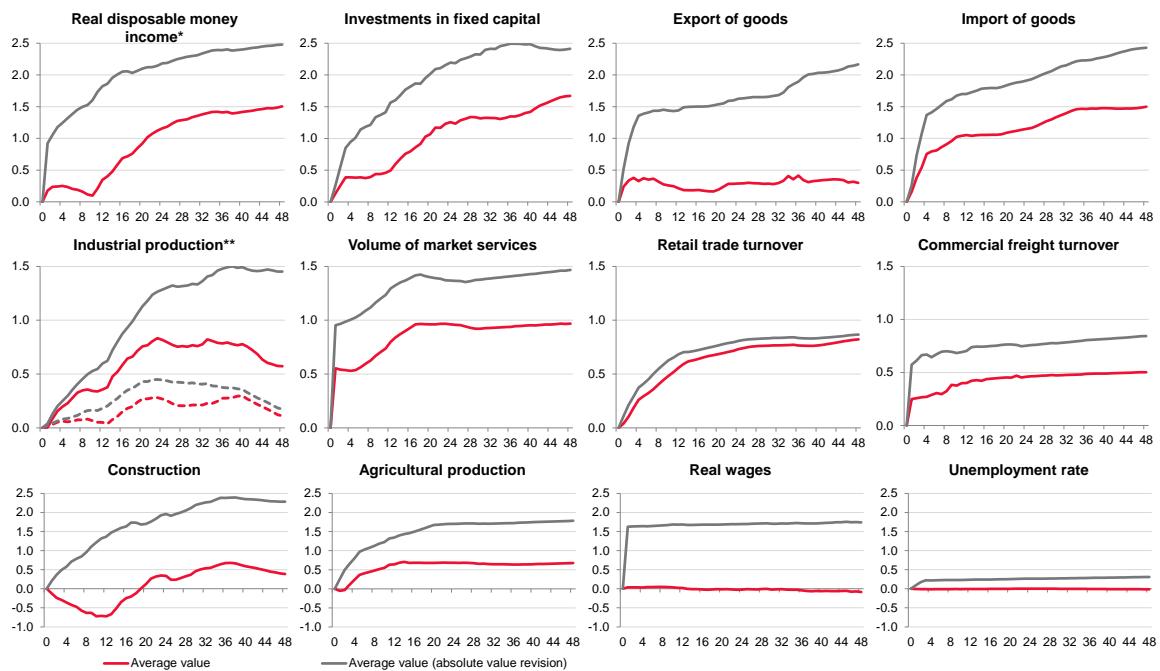
Revisions due to changes in methodology also occurred with other indicators. For example, the methodology for the calculation of money income was updated in April 2019, resulting in a switch from monthly to quarterly publications of this indicator. In April 2016, investments in fixed capital data began to be published on a quarterly basis, and the classifier was changed to OKVED 2 in 2017. When dealing with Rosstat data, researchers should be aware of these nuances and be knowledgeable about the corresponding methodology for the calculation of the indicators under study.

Figure 1. Frequency of revisions, %

* Real disposable money income is calculated based on the old methodology.

** Dotted line: revisions were not considered in the case of a switch to new methodologies or bases for calculation.

Sources: Rosstat, R&F Department calculations.

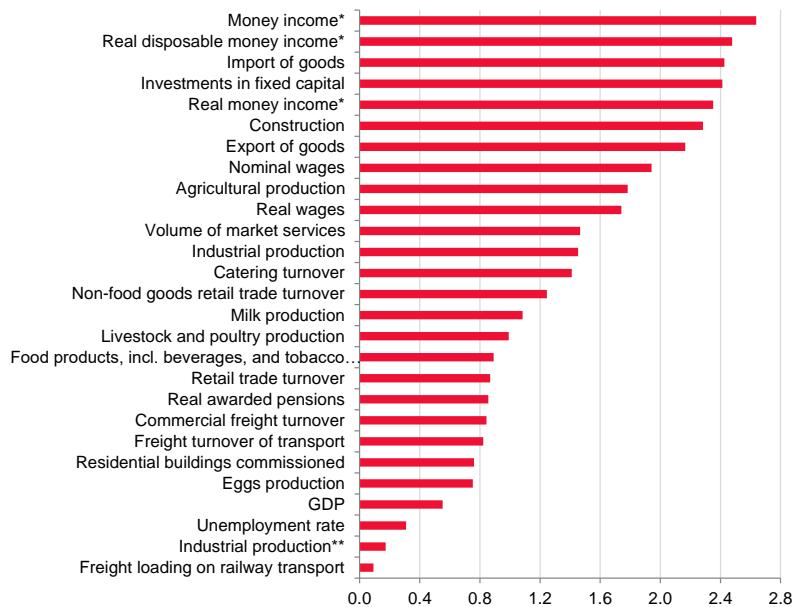
Figure 2. Magnitude of revisions, pp for YoY growth rates

* Real disposable money income is calculated based on the old methodology.

** Dotted line: revisions were not considered in the case of a switch to new methodologies or bases for calculation.

Sources: Rosstat, R&F Department calculations.

**Figure 3. Average revision (in absolute values) 48 months after first release,
pp for YoY growth rates**



* Real disposable money income is calculated based on the old methodology.

** Industrial production: revisions were not considered in the case of a switch to new methodologies or bases for calculation.

Sources: Rosstat, R&F Department calculations.

**Figure 4. Average revision (in absolute values) / standard deviation 48 months after first release,
pp for YoY growth rates**

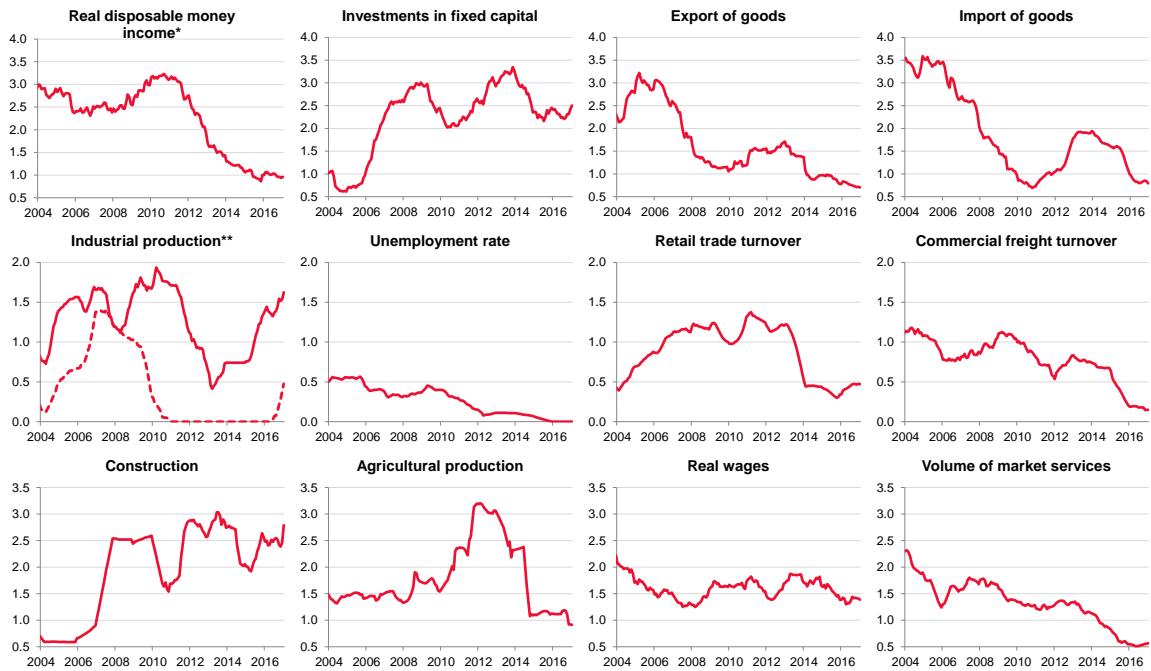


* Real disposable money income is calculated based on the old methodology.

** Industrial production: revisions were not considered in the case of a switch to new methodologies or bases for calculation.

Sources: Rosstat, R&F Department calculations.

Figure 5. Average revision (in absolute values) after 24 months, on three-year rolling window subsamples, pp for YoY growth rates

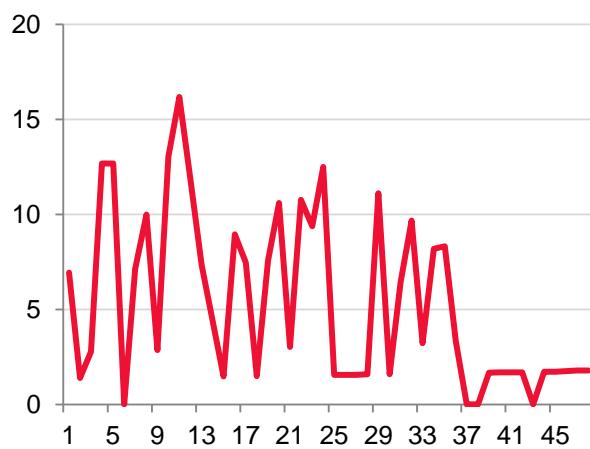


* Real disposable money income is calculated based on the old methodology.

** Dotted line: revisions were not considered in the case of a switch to new methodologies or bases for calculation.

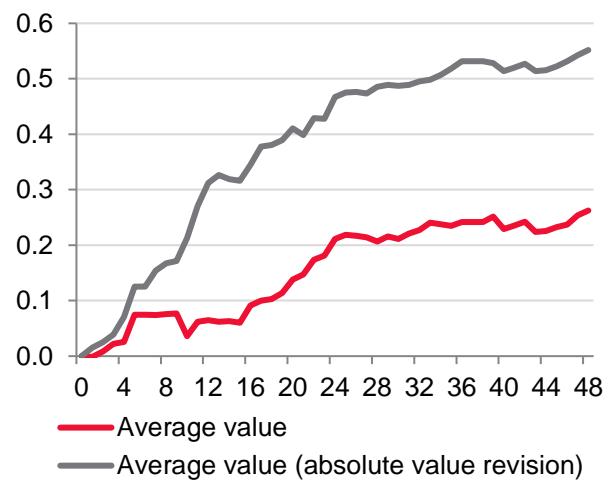
Sources: Rosstat, R&F Department calculations.

Figure 6. Frequency of GDP revisions, %



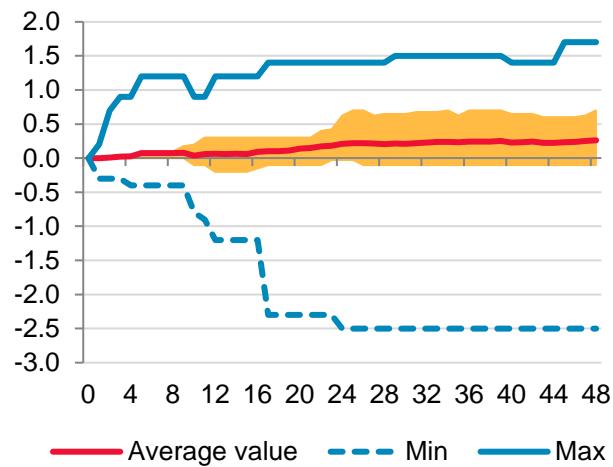
Sources: Rosstat, R&F Department calculations.

Figure 7. Magnitude of GDP revisions, pp for YoY growth rates



Sources: Rosstat, R&F Department calculations.

**Figure 8. Distribution of GDP revisions,
pp for YoY growth rates**



Note. The shaded area constitutes the 25th to 75th percentiles.

Sources: Rosstat, R&F Department calculations.

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Appendix 1. Properties of revisions of macroeconomic indicators after 1, 3, 12, and 60 months

Indicators / number of months after first release	Frequency of revisions, %				Average revision, pp				Average revision / standard deviation, pp				Average revision (in absolute values), pp				Average revision (in absolute values) standard deviation, pp			
	1	3	12	60	1	3	12	60	1	3	12	60	1	3	12	60	1	3	12	60
GDP	6.9	2.8	11.8	1.9	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.6	0.0	0.0	0.1	0.1
Industrial production	3.2	3.7	3.4	0.6	0.0	0.2	0.4	0.5	0.0	0.0	0.1	0.1	0.0	0.2	0.6	1.5	0.0	0.0	0.1	0.3
Industrial production**	1.9	1.9	1.5	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0
Agriculture production	15.3	10.7	7.3	1.9	0.0	0.1	0.6	0.6	0.0	0.0	0.1	0.1	0.3	0.7	1.3	1.8	0.0	0.1	0.2	0.2
Livestock and poultry production	25.5	20.1	37.6	1.3	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.7	1.0	0.0	0.1	0.2	0.3
Milk production	31.0	27.1	45.9	0.6	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.8	1.1	0.0	0.1	0.3	0.4
Eggs production	25.9	21.0	26.8	1.3	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.8	0.0	0.1	0.3	0.3
Freight turnover of transport	87.0	18.7	12.7	0.0	0.3	0.3	0.4	0.6	0.1	0.1	0.1	0.1	0.6	0.6	0.7	0.9	0.1	0.1	0.1	0.2
Commercial freight turnover	87.5	22.9	10.7	0.0	0.2	0.3	0.4	0.5	0.0	0.1	0.1	0.1	0.6	0.7	0.7	0.9	0.1	0.1	0.1	0.2
Freight loading on railway transport	10.2	0.9	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Investments in fixed capital	17.1	15.4	8.3	0.0	0.1	0.4	0.5	1.7	0.0	0.0	0.0	0.2	0.3	0.8	1.6	2.5	0.0	0.1	0.2	0.2
Construction	7.9	6.1	4.4	0.6	-0.1	-0.3	-0.7	0.4	0.0	0.0	-0.1	0.0	0.2	0.5	1.4	2.3	0.0	0.1	0.1	0.2
Residential buildings commissioned	1.9	5.1	6.8	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	0.7	0.0	0.0	0.0	0.0
Export of goods	22.3	36.2	10.3	0.6	0.2	0.4	0.2	0.4	0.0	0.0	0.0	0.0	0.5	1.2	1.4	2.3	0.0	0.0	0.1	0.1
Import of goods	18.6	34.3	11.3	0.6	0.2	0.5	1.1	1.5	0.0	0.0	0.0	0.1	0.3	1.1	1.7	2.6	0.0	0.0	0.1	0.1
Retail trade turnover	31.5	29.0	9.8	0.0	0.0	0.2	0.6	0.9	0.0	0.0	0.1	0.1	0.1	0.3	0.7	0.9	0.0	0.0	0.1	0.1
Food products, incl. beverages, and tobacco retail trade turnover	31.0	28.0	9.8	0.0	0.0	0.1	0.4	0.8	0.0	0.0	0.1	0.1	0.1	0.3	0.6	0.9	0.0	0.0	0.1	0.2
Non-food goods retail trade turnover	32.9	29.9	10.7	0.0	0.1	0.3	0.7	0.9	0.0	0.0	0.1	0.1	0.2	0.4	0.9	1.3	0.0	0.0	0.1	0.2
Catering turnover	31.9	27.6	8.3	0.6	0.1	0.1	0.4	1.0	0.0	0.0	0.1	0.1	0.2	0.6	0.9	1.4	0.0	0.1	0.1	0.2
Volume of market services	83.8	3.7	2.4	0.0	0.6	0.5	0.8	1.0	0.1	0.1	0.2	0.3	1.0	1.0	1.3	1.5	0.3	0.3	0.3	0.4
Unemployment rate	18.5	15.4	2.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.1	0.2	0.2	0.2
Nominal wages	98.1	0.5	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	1.8	1.8	1.9	2.0	0.2	0.2	0.2	0.2
Real wages	97.7	0.5	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	1.6	1.6	1.7	1.8	0.2	0.2	0.2	0.2
Real awarded pensions	16.2	0.9	0.5	0.0	0.5	0.5	0.6	0.8	0.1	0.1	0.1	0.1	0.6	0.6	0.7	0.9	0.1	0.1	0.1	0.1
Money income*	86.6	39.3	16.6	0.6	0.1	0.3	0.6	1.8	0.0	0.0	0.1	0.2	0.9	1.2	1.9	2.8	0.1	0.1	0.2	0.3
Real money income*	85.2	38.8	16.6	0.0	0.1	0.2	0.6	1.6	0.0	0.0	0.1	0.2	0.8	1.1	1.7	2.5	0.1	0.2	0.2	0.3
Real disposable money income*	85.2	36.0	16.1	0.0	0.2	0.2	0.3	1.6	0.0	0.0	0.0	0.2	0.9	1.2	1.8	2.6	0.1	0.2	0.3	0.4

* Money income is calculated based on the old methodology.

** Industrial production: revisions were not considered in the case of a switch to new methodologies or bases for calculation.

Sources: Rosstat, R&F Department calculations.

Appendix 2. Correlations of final revisions of macroeconomic indicators

Indicators	Industrial production	Industrial production*	Agriculture production	Livestock and poultry production	Milk production	Eggs production	Freight turnover of transport	Commercial freight turnover	Freight loading on railway transport	Investments in fixed capital	Construction	Residential buildings commissioned	Export of goods	Import of goods	Retail trade turnover	Food products, incl. beverages, and tobacco retail trade turnover	Non-food goods retail trade turnover	Catering turnover	Volume of market services	Unemployment rate	Nominal wages	Real wages	Real awarded pensions	Money income*	Real money income*	Real disposable money income*	
Industrial production	1.00	0.27	-0.06	0.05	0.08	-0.09	0.08	0.06	0.05	-0.04	0.08	0.04	-0.13	0.07	-0.13	-0.19	-0.01	0.07	-0.10	-0.07	-0.03	-0.04	0.03	0.11	0.09	0.02	
Industrial production**		1.00	0.05	-0.03	0.07	-0.03	-0.07	-0.04	0.03	0.08	0.20	0.03	-0.01	-0.08	-0.17	-0.03	-0.15	0.03	-0.03	0.06	-0.04	-0.04	-0.02	-0.13	-0.13	-0.11	
Agriculture production			1.00	0.05	-0.01	-0.03	-0.06	-0.03	-0.06	0.06	-0.41	-0.05	0.02	-0.08	0.03	0.11	-0.05	0.00	-0.14	-0.03	-0.06	-0.04	0.04	-0.04	-0.04	-0.04	
Livestock and poultry production				1.00	0.14	0.23	0.06	0.06	0.05	0.00	0.00	-0.07	0.10	0.08	0.05	-0.10	0.13	0.09	0.10	-0.05	-0.07	-0.07	0.04	0.06	0.08	0.09	
Milk production					1.00	0.11	0.00	0.01	0.02	-0.08	0.01	0.01	-0.13	0.02	-0.18	-0.18	-0.06	0.05	0.16	0.10	0.02	0.01	-0.06	0.11	0.09	0.13	
Eggs production						1.00	0.07	0.07	0.01	0.09	-0.05	-0.09	0.00	0.10	-0.04	-0.05	-0.02	0.00	0.03	0.00	0.02	0.03	0.07	0.08	0.09	0.13	
Freight turnover of transport							1.00	0.97	0.04	0.10	-0.05	-0.05	0.11	0.17	-0.01	0.07	-0.08	0.06	0.09	0.09	0.07	-0.14	-0.15	0.05	0.05	0.06	0.05
Commercial freight turnover								1.00	0.04	0.14	-0.05	-0.06	0.11	0.19	0.01	0.09	-0.06	0.06	0.07	0.08	-0.13	-0.14	0.04	0.05	0.06	0.06	
Freight loading on railway transport									1.00	-0.05	0.02	-0.02	-0.04	-0.12	0.03	0.11	-0.04	-0.16	-0.14	0.18	-0.12	-0.10	-0.03	-0.13	-0.12	-0.10	
Investments in fixed capital										1.00	0.00	-0.04	0.16	0.14	0.06	0.07	0.01	0.15	0.03	0.03	0.00	0.01	0.10	0.01	0.05	0.00	
Construction											1.00	0.03	-0.05	-0.10	-0.05	-0.12	0.03	0.16	-0.01	0.05	-0.01	-0.01	-0.01	0.10	0.07	0.09	
Residential buildings commissioned												1.00	0.03	-0.01	-0.08	-0.10	-0.03	-0.04	-0.06	0.03	0.15	0.16	0.02	0.04	0.03	0.05	
Export of goods													1.00	0.15	-0.01	0.14	-0.12	-0.04	-0.03	0.13	0.02	0.04	-0.07	-0.16	-0.16	-0.15	
Import of goods														1.00	0.33	0.00	0.33	-0.06	0.12	0.07	0.08	0.07	0.02	0.14	0.16	0.08	
Retail trade turnover															1.00	0.39	0.75	0.23	-0.02	-0.09	-0.05	-0.06	-0.06	0.06	0.10	0.11	
Food products, incl. beverages, and tobacco retail trade turnover																1.00	-0.31	0.01	-0.12	0.12	-0.11	-0.11	-0.05	-0.28	-0.26	-0.21	
Non-food goods retail trade turnover																	1.00	0.21	0.05	-0.17	0.03	0.02	-0.02	0.25	0.29	0.26	
Catering turnover																		1.00	0.06	-0.01	0.01	0.00	0.05	0.18	0.14	0.18	
Volume of market services																			1.00	-0.16	0.02	0.01	0.04	0.12	0.12	0.16	
Unemployment rate																				1.00	-0.08	-0.08	-0.07	0.06	0.04	0.08	
Nominal wages																				1.00	0.99	-0.07	-0.05	-0.05	-0.01		
Real wages																					1.00	-0.06	-0.05	-0.06	-0.01		
Real awarded pensions																						1.00	0.04	0.03	0.03		
Money income*																							1.00	0.98	0.87		
Real money income*																								1.00	0.88		
Real disposable money income*																									1.00		

* Money income is calculated based on the old methodology.

** Industrial production: revisions were not considered in the case of a switch to new methodologies or bases for calculation.

Sources: Rosstat, R&F Department calculations.