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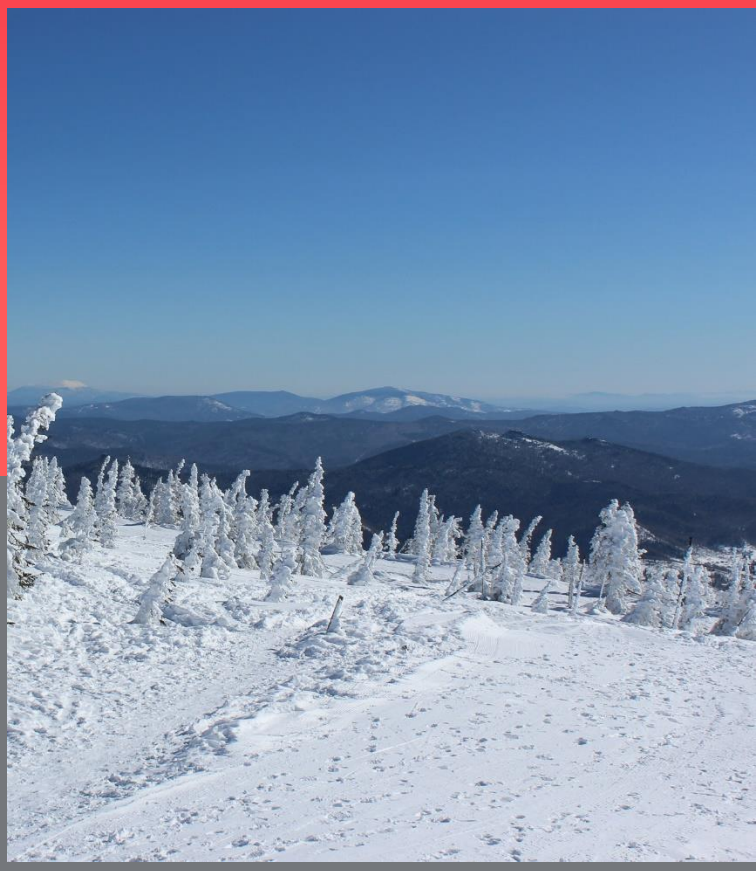

Reconstructing the publication history of Russia's GDP and its components

WORKING PAPER SERIES

№ 124 / January 2024

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Authors are grateful to Vlada Alekseenko, Nikita Gorevoy, Maxim Ivanov, Maria Lymar, Tatiana Sytina, Dmitriy Venevtsev and Mikhail Zhemkov for their help in data collection.

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Abstract

This paper presents a set of vintage data on Russian GDP and its components by the expenditure and production approaches. The dataset consists of revisions of nominal and real quarterly data for the period from December 2005 to the present. In addition to such data, the paper describes some properties of real and nominal GDP indicator revisions and its expenditure components, as well as the methodology for collecting historical indicators using the Wayback Machine, which enables data collection even in the absence of a saved history of their releases.

JEL classification: C82, E01, E2.

Key words: GDP, data vintages, data revisions, Russia.

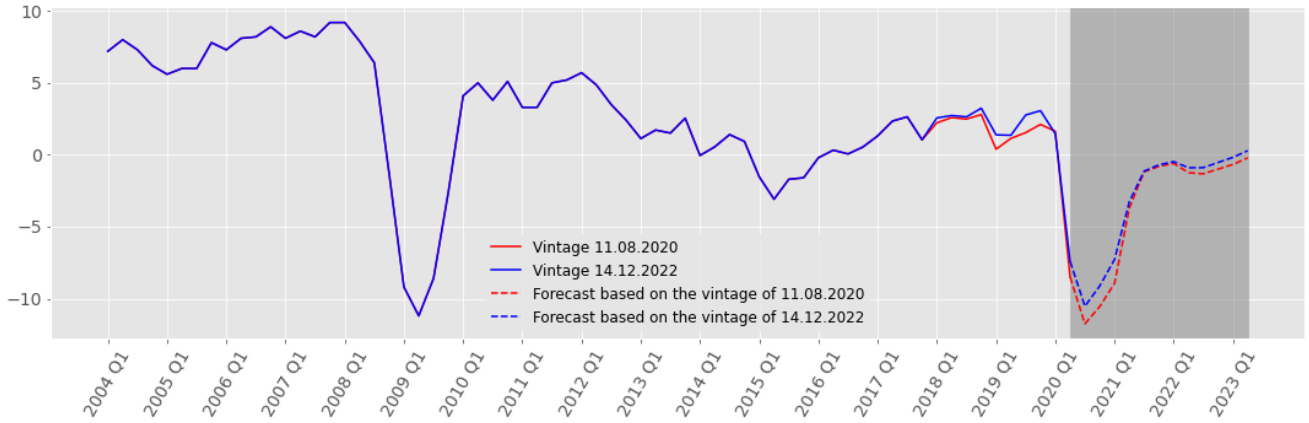
Contents

1. Introduction

Vintage (retrospective) data are one of key components in the quality evaluation of macroeconomic forecasting models and, as a consequence, of decisions made on their basis. These data are a snapshot of the information available at a certain point in time and reflect how the economic situation was viewed at a certain date in the past[1]. It is vintage rather than revised/updated data[2] that have provided a basis for projections and economic policy decisions.

To illustrate the importance of vintage data and their impact on the forecast path, Figure 1 shows a 12-quarter GDP forecast for the 2020 Q2 release based on a simple seasonal autoregression model (SARIMA)[3] using vintage (Gornostaev et al. (2021)) and revised data. The forecast was built in levels and recalculated into annual growth rates for better readability. The paths in the projection period diverge by as much as 1pp, as Figure 1 shows.

Figure 1. SARIMA-based GDP forecast (YoY), %



Absent a vintage dataset for key macroeconomic indicators, researchers and analysts are left with no better option than to use revised data to evaluate the formal quality metrics of the models they use; however, as the example above suggests, this approach may well produce incorrect estimates when revision-driven differences in forecasts are meaningful. In many cases, metrics evaluated on the basis of revised data are better than on vintage data (see, for example, Mamedli and Shibitov (2021)), which results in overestimated expectations regarding the accuracy of the model. To gain more insight into the quality of data and models used in the decision-making process as well

[1] In this paper, vintage refers to the set of information available at a particular date, not to the set of revisions of the value of the same indicator.
[2] It is standard for statistical agencies to revise previously released economic indicators. This is explained by the need to maintain a balance between the speed and accuracy of provided statistical indicators (for more details, see Tebrake (2019)). Most regular (scheduled) revisions are explained by releases of additional information, which can be used to calculate a statistical indicator but was unavailable at the time this indicator was previously released. Among other causes are one-time revisions in conjunction with a changing method of calculating statistical indicators.
[3] We implemented a standard SARIMA model using the *statsmodels* package (Seabold and Perktold (2010)).

as to stimulate further research in this area, central banks and statistical agencies across the world have turned to the practice of building databases of vintage indicators (see Appendix 2).

This research completes the cycle of vintage collection for the main Russian macroeconomic indicators that was initiated in Gornostaev et al. (2021) and Gornostaev et al. (2022) and complements the previously collected data (real GDP and Rosstat's indicators of the 'Short-term Economic Indicators of the Russian Federation') with quarterly data on nominal and real GDP and its components by the expenditure and production approaches. Our key contribution is the formation and publication[4] of retrospective data on GDP and its components. Furthermore, we describe the methodology for collecting data from open sources that allowed us to complete about 80% of vintages and which will hopefully be of value for researchers exploring similar issues in their countries.

The remainder of the paper is structured as follows. Section 2 describes the methodology for collecting vintage data. In Section 3, we analyse the properties of the indicators we have collected. Section 4 discusses the place of our paper in the research literature. Section 5 concludes.

2. Methodology for reconstructing publications

Our methodology for reconstructing publications involves three main steps that this section describes. At the first stage, the Wayback Machine helps collect files[5] with the required indicators from historical copies of the Rosstat website. Rosstat website copies, despite the Wayback Machine's high frequency of saving, often turn out to be incomplete and lack the necessary files. Therefore, the second step involved a procedure for additional completion based on information about the time of revisions and the additional information extracted from news about a publication or other public sources. At the third stage, some of the data that could not be reconstructed in previous steps were collected from various non-public sources, for example by asking colleagues who periodically handle the required data.

2.1. Wayback Machine-based data collection

The Wayback Machine enables access to historical website copies that were collected as part of the project at a certain time in the past. In order to view a copy of a particular page, it is required to enter its address in a special field, after which a set of dates with available copies is displayed (see Figure 2). Going to a page with a certain date, the user can see its copy. For example, a copy of the

[4] Beginning in 2024, these data and data from Gornostaev at al. (2021) and Gornostaev et al. (2022) will be updated on a semi-annually basis, accessible via this webpage.
[5] Roughly up to the end of 2009, the data were published in htm- format rather than as a file.

Rosstat website homepage as of 10 March 2012 is shown in Figure 3. At the same time, when viewing the page and especially when clicking on internal links, the user should remember to check on the date in the upper right corner of the page: clicking on links may cause the Wayback Machine to redirect the user to a page copy with another date.[6]

We manually collected all available data on quarterly nominal and real GDP and its production and expenditure components using links to official GDP data sections[7].

2.2.Additional data completion

As mentioned above, the data files provided by the Wayback Machine are not nearly for all dates. This is explained by, among other causes, a changing website structure and less frequently created copies for deeper pages in the website. The intervals for absent page copies may be up to several quarters, and some pages may come without any historical copies at all. This explains the need to search for additional methods to reconstruct historical data. In our case, additional manual completion proved a fairly useful technique. It can be divided into two types: completion on the left and completion on the right.

We opt for completion on the right if a later vintage is known, as shown in Figure 4, and if we know for certain there were no revisions between the unknown and later vintages. In this case, as Figure 4 shows, the data are simply copied from subsequent vintages. The information confirming a revision was obtained from analysis of one of the following sources: the vintage database of the Short-term Economic Indicators of the Russian Federation (see Gornostaev et al. (2022)), 'Social and Economic Situation in Russia' reports,[8] historical copies of news pages of the Rosstat website and real GDP vintage data (see Gornostaev et al. (2021)).

Completion on the left-hand side also uses the confirmation of unrevised data. However, an earlier instead of a later vintage is used in completion on the left (see Figure 5). The key difference from completion on the right-hand side is the absence of the last indicator value in an earlier vintage (the red cell in Figure 5). These data had to be reconstructed with the use of alternative sources such as news, 'Social and Economic Situation in Russia' reports or files with YoY quarterly data.[9]

[6] In some cases, the user can be redirected to a page of a different address, although they will in most cases obtain the required page.
[7] For example, National Accounts /Gross Domestic Product (in the Russian version) was this section for 2012.
[8] Historical reports are available on the Rosstat's website.
[9] If the same vintage was based on several data sources at any of the stages, such data sources were used for additional verification and search for errors.

Figure 2. Wayback Machine-based access to gks.ru copies

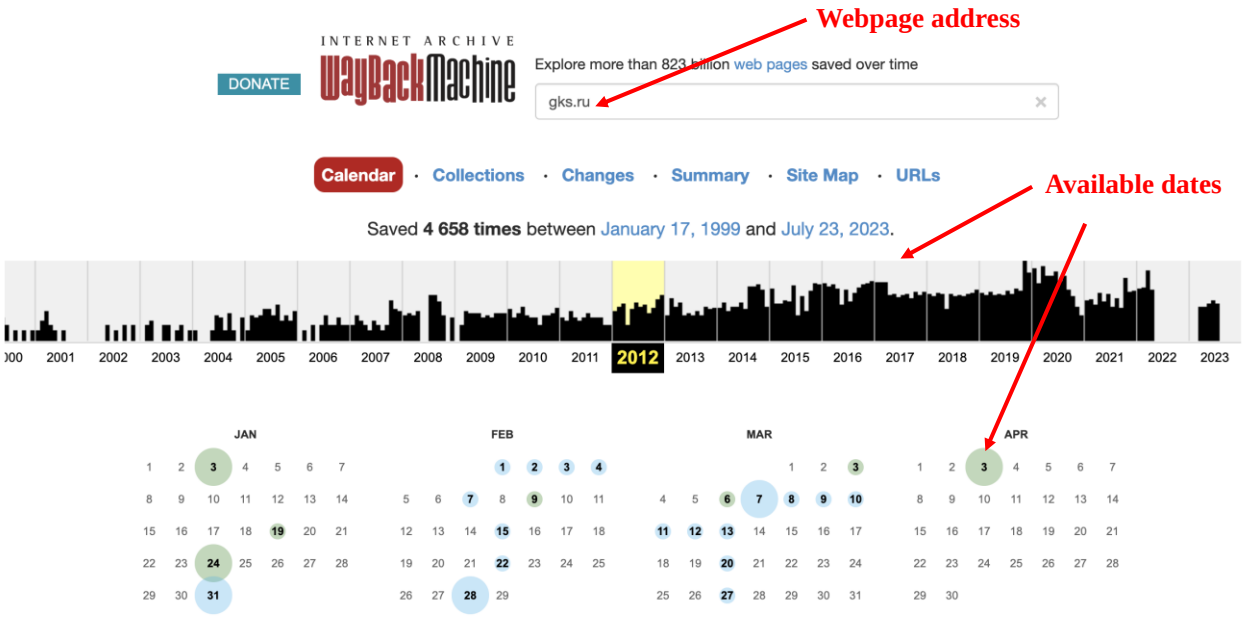
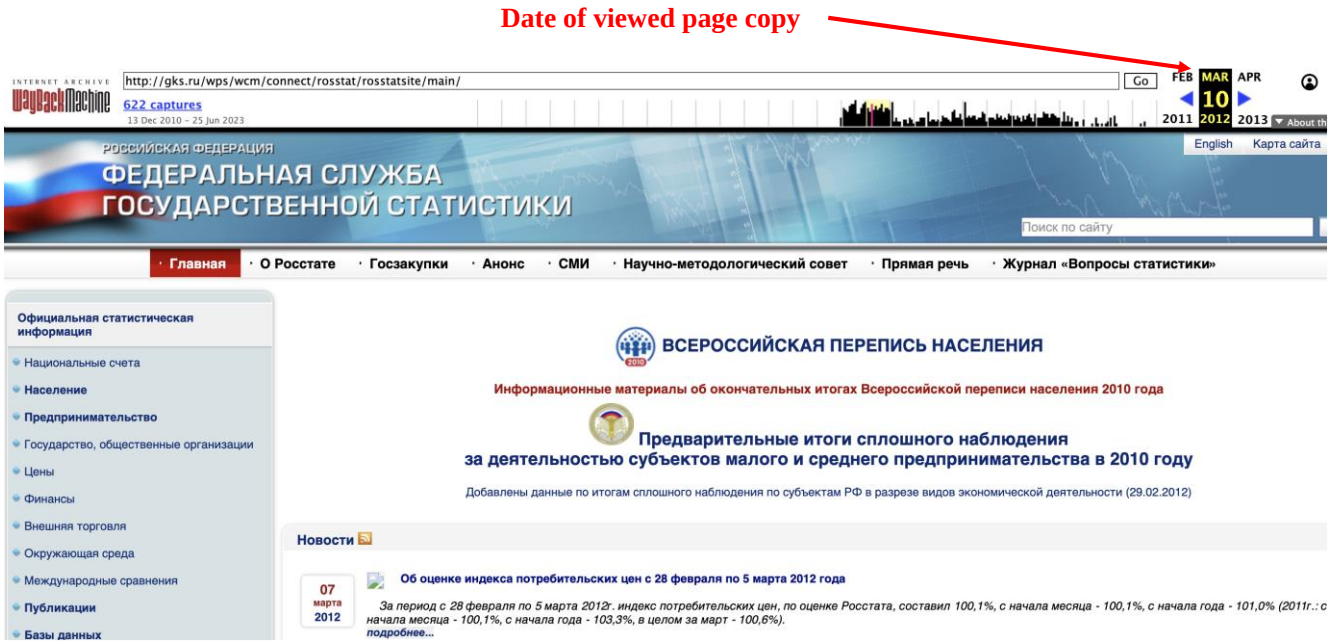


Figure 3. Rosstat website homepage copy as of 10 March 2012



2.3. Data collection from alternative sources

We relied on the methods presented in Paragraphs 2.1 and 2.2 to successfully recover 80–95% of vintages for each of nominal and real[10] GDP indicators and GDP expenditure and production components. We searched the remainder of data by asking colleagues and the expert community.

[10] All the indicators of real GDP and its components were collected in terms of growth rates.

2.4. Final dataset

As a result of the steps discussed in this section, we obtained vintages for all the quarterly production components of nominal and real GDP for the period from December 2005.[11] We succeeded in collecting almost all the data on GDP expenditure components for the same period, apart from nominal imports and exports in the October and December vintages of 2018[12] (see Figure 6). For these dates, we succeeded in completing data on the left, but the alternative sources lacked data on nominal exports and imports. It should also be noted that for real indicators only data in the most recent base-year prices available at that time were reconstructed. The only exception was real GDP expenditure components for 2017. We take data in terms of 2011 base-year prices, although data in 2016 base-year prices were also published on certain dates. This is due to the short history of GDP expenditure data in these releases and the fact that our colleagues in 2017 used data in terms of 2011 base-year prices.

Research and analysis often need longer series than those available in latest base-year prices. Therefore, following Gornostaev at al. (2021) we make an extension to the past (a separate sheet in the attached file) for real GDP expenditure series. This was done on the basis of published files with YoY quarterly data (the volume index). In addition, we used the Rosstat publication calendar and news we had collected to approximately reconstruct the data release dates for each vintage (to an accuracy of several days).

Figure 4. Vintage completion on the right (example)

Release date	30.12.2005	03.04.2006	30.06.2006	02.10.2006	29.12.2006	04.04.2007	29.06.2007	28.09.2007	29.12.2007	14.04.2008	01.07.2008	02.10.2008
base year	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
2003 Q2	101,2	102,1	102,1	102,1	102,1	102,1		102,1	102,1	102,1	102,1	102,1
2003 Q3	104,3	104,3	104,3	104,3	104,3	104,3		104,3	104,3	104,3	104,3	104,3
2003 Q4	106,2	106,3	106,3	106,3	106,3	106,3		106,3	106,3	106,3	106,3	106,3
2004 Q1	95,3	95,4	95,4	95,4	95,4	95,5		95,5	95,5	95,5	95,5	95,5
2004 Q2	102,2	102,9	102,9	102,9	102,9	102,9		102,9	102,9	102,9	102,9	102,9
2004 Q3	105,7	104,7	104,6	104,6	104,6	105,2		105,2	105,2	105,2	105,2	105,2
2004 Q4	105,9	106,3	106,3	106,3	106,3	105,5		105,5	105,5	105,5	105,5	105,5
2005 Q1	93,5	93,2	93,2	93,2	93,2	93,4		93,4	93,4	93,3	93,3	93,3
2005 Q2	104,9	105,6	105,7	105,7	105,7	106,4		106,4	106,4	105,2	105,2	105,2
2005 Q3	105,9	104,3	104,2	104,2	104,2	105,6		105,6	105,6	105,6	105,6	105,6
2005 Q4		106,1	106,1	106,1	106,1	105,7		105,7	105,7	106,0	106,0	106,0
2006 Q1			92,9	92,9	92,9	92,7		92,7	92,7	91,8	91,8	91,8
2006 Q2				106,7	106,7	104,9		104,9	104,9	105,6	105,6	105,6
2006 Q3					104,2	106,0		106,0	106,0	106,2	106,2	106,2
2006 Q4						106,3		106,3	106,3	106,6	106,6	106,6
2007 Q1								92,8	92,8	92,3	92,3	92,3
2007 Q2								105,1	105,1	105,8	105,8	105,8
2007 Q3									106,3	106,2	106,2	106,2
2007 Q4										107,0	107,0	107,0
2008 Q1											92,0	92,0
2008 Q2												104,6

[11] Although we also collected information for almost all annual releases in late January-early February, from which estimates of quarterly indicators can be calculated indirectly, here and below we describe only results for quarterly releases, as the issues of converting annual estimates into quarterly ones (especially for nominal indicators) are non-trivial and outside the scope of this paper. The data found for annual estimates are presented in additional files.

[12] We would be grateful if our readers would send us these data.

Figure 5. Vintage completion on the left (example)

Release date	30.12.2005	03.04.2006	30.06.2006	02.10.2006	29.12.2006	04.04.2007	29.06.2007	28.09.2007	29.12.2007	14.04.2008	01.07.2008	02.10.2008
base year	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
2003 Q2	101,2	102,1	102,1	102,1	102,1	102,1	102,1	102,1		102,1	102,1	102,1
2003 Q3	104,3	104,3	104,3	104,3	104,3	104,3	104,3	104,3		104,3	104,3	104,3
2003 Q4	106,2	106,3	106,3	106,3	106,3	106,3	106,3	106,3		106,3	106,3	106,3
2004 Q1	95,3	95,4	95,4	95,4	95,4	95,5	95,5	95,5		95,5	95,5	95,5
2004 Q2	102,2	102,9	102,9	102,9	102,9	102,9	102,9	102,9		102,9	102,9	102,9
2004 Q3	105,7	104,7	104,6	104,6	104,6	105,2	105,2	105,2		105,2	105,2	105,2
2004 Q4	105,9	106,3	106,3	106,3	106,3	105,5	105,5	105,5		105,5	105,5	105,5
2005 Q1	93,5	93,2	93,2	93,2	93,2	93,4	93,4	93,4		93,3	93,3	93,3
2005 Q2	104,9	105,6	105,7	105,7	105,7	106,4	106,4	106,4		105,2	105,2	105,2
2005 Q3	105,9	104,3	104,2	104,2	104,2	105,6	105,6	105,6		105,6	105,6	105,6
2005 Q4		106,1	106,1	106,1	106,1	105,7	105,7	105,7		106,0	106,0	106,0
2006 Q1			92,9	92,9	92,9	92,7	92,7	92,7		91,8	91,8	91,8
2006 Q2				106,7	106,7	104,9	104,9	104,9		105,6	105,6	105,6
2006 Q3					104,2	106,0	106,0	106,0		106,2	106,2	106,2
2006 Q4						106,3	106,3	106,3		106,6	106,6	106,6
2007 Q1							92,8	92,8		92,3	92,3	92,3
2007 Q2								105,1		105,8	105,8	105,8
2007 Q3										106,2	106,2	106,2
2007 Q4										107,0	107,0	107,0
2008 Q1											92,0	92,0
2008 Q2												104,6

Search for value from alternative source

Figure 6. Nominal export data that could not be reconstructed

Release date	30.06.2017	02.10.2017	29.12.2017	02.04.2018	02.07.2018	02.10.2018	29.12.2018	01.04.2019	01.07.2019	02.10.2019	31.12.2019	01.04.2020
…	…	…	…	…	…	…	…	…	…	…	…	…
2017 Q1	5575,8	5575,8	5575,8	5583,5	5583,5	5583,5	5583,5	5578,1	5578,1	5578,1	5578,1	5578,1
2017 Q2		5621,5	5621,5	5636,2	5636,2	5636,2	5636,2	5636,4	5636,4	5636,4	5636,4	5629,8
2017 Q3			5886,3	5897,5	5897,5	5897,5	5897,5	5890,1	5890,1	5890,1	5890,1	5882,9
2017 Q4				6848,9	6848,9	6848,9	6848,9	6889,7	6889,7	6889,7	6889,7	6871,9
2018 Q1					6599,2	6599,2	6599,2	6578,3	6578,3	6578,3	6578,3	6566,9
2018 Q2						?	?	7749,3	7749,3	7749,3	7749,3	7748,2
2018 Q3							?	8376,5	8376,5	8376,5	8376,5	8372,5
2018 Q4								9228,5	9228,5	9228,5	9228,5	9242,0
2019 Q1									7706,6	7706,6	7706,6	7697,2
2019 Q2										7620,7	7620,7	7565,8
2019 Q3											7758,4	7772,4
2019 Q4												8122,0

3. Analysis of properties of indicators collected

To illustrate the properties of our collection of indicators and the characteristics of their revisions, this section analyses expenditure components of quarterly nominal and real GDP. We skip the results related to GDP by the production approach since they are less illustrative due to the switch from OKVED to OKVED2, which made many time series incomparable.

3.1. Analysis of revisions

For real GDP expenditure components for up to and including 2010, the base year was 2003, those from 2011 to 2015 – 2008, from 2016 to 2017 – 2011,[13] and starting from 2018 to 2022 – 2016.

For clarity in what follows, let us be more specific:

- an *observation* is understood to be a GDP or its component value (or their growth rates in the case of real indicators) for a certain period, presented in a Rosstat release;
- a *publication/release* of quarter i is understood to be the information on a quarterly GDP time series (its components or real growth rates) published either at the end of quarter i or at the beginning of quarter $i + 1$;
- a *revision* is a fact of correcting the observable value in the publication against the value of the previous publication;
- the *frequency* of revisions reflects the proportion of observations affected by a revision, and helps establish the time, after the reporting quarter, in which the data may be updated;
- the *magnitude* of revisions is the percentage of deviation of the observation value from the first published value.

Figures 7–12 present descriptive statistics of the quarterly GDP database. Figures 7–9 are based on data on nominal GDP and its components, and Figures 10–12, on real GDP growth and GDP component data. The frequency of revisions, the revision magnitude and the number of revisions by release are reported sequentially.

The frequency of revision of nominal GDP and its components is presented in Figure 7. Between 25% and 30% of observations are reviewed in a quarter following the first release. For most indicators, the frequency of revisions holds for 11 quarters. After three years (12 quarters), the frequency of revisions declines sharply to less than 8% of total observations. For exports and imports, revisions stop after five and seven years respectively; for other indicators, revisions stop after nine years after the first release.

The magnitude of revisions can be estimated as Figure 8 shows. The average revision magnitude of such indicators as GDP, final consumption of households and general government, and gross fixed capital accumulation increases from several tenths to about 5% (relative to the value in the first release) over five years following the first release. Exports and imports are revised to a lesser extent (the absolute value is 0.5% or less) and on average downwards (the magnitude goes below zero as the horizon increases). Among more intensely revised indicators are changes in inventories (over 75% in absolute value after one year) and final consumption of non-profit organizations serving

[13] In our sample. See notes regarding vintages for 2017 from Section 2.4.

households (about 10% in absolute value), as a result of specific procedures for collecting data on these indicators.[14]

Figure 9 shows the number of revisions in a publication in a given calendar period. The horizontal axis indicates a release for which the number of one quarter later revisions is calculated.[15]

As is clear from Figure 9, most revisions occur at the end of the first quarter of the year (that is for a fourth-quarter release) and usually data from the last eleven calendar observations (two years and three quarters) are revised. That revisions most often fall on the end of the first quarter is a result of more detailed annual data becoming available to build annual national accounts.

First, second and third quarter publications are almost never revised (the exceptions are 2009 Q3, 2010 Q2, 2011 Q1 (exports and net exports), and 2017 Q2). In several cases, more than eleven observations were revised (for GDP, these are as follows: 2010 Q2 (29 revisions), 2015 Q4 and 2018 Q4 (19 revision each), and 2019 Q4 (35 revisions)). Behind the reasons for such revisions are the development of the information base alongside improvements in the methodology.

With regard to real GDP and its components growth rates, 25–30% of observations are revised 1–11 quarters after the release; 5–10% of observations are revised after 12 quarters (3 years), and almost no revisions take place after 7 years (see Figure 10).

The revision magnitudes of real growth indicators are shown in Figure 11. Our task is to account for the magnitude of changes unrelated to a change in base years, so the principles of building in Figure 11 and Figure 8 are different (the latter did not have base years and the magnitude was calculated relative to values in the first publication). First, we calculate a percentage-point deviation from the data in the publication that first covers the same base year. Then, the last magnitude (also in percentage points) is calculated for the previous base year. We conclude by summing up the two calculated deviations (see Figure 14, Appendix 1). The results are shown as solid lines in Figure 11. In constructing the dashed lines in Figure 11, we have removed the magnitudes calculated at the time of transition to the new base year.

The magnitude of the absolute values of revisions (the blue lines in Figure 11) fluctuates around 1% for the growth rate of spending on final consumption of households and general government, exports and imports, and GDP. A larger magnitude (in absolute values) is seen for the growth rate of final consumption of non-profit organizations serving households (around 1.5%),

[14] A notable observation here is that changes in inventories and spending on final consumption of such organisations account for a minor GDP share; therefore, the magnitude of revisions of these indicators does not have strong effects on the magnitude of GDP revisions.

[15] For example, among observations published at the turn of 2005 Q4 and 2006 Q1, 11 observations were revised at the end of 2006 Q1 (see Figure 13, Appendix 1 for clarity).

gross fixed capital formation (around 3%) and gross capital formation (up to 6%). The average values of the magnitude (the red lines in Figure 11) of many indicators fluctuate around zero, implying that the growth rates of indicators in real terms are revised both upwards and downwards. The analysis of alternative magnitude values (the dashed lines in Figure 11) leads to similar conclusions.

As in Figure 9, Figure 12 shows that most revisions are made in fourth-quarter publications. Typically, there are 11 revisions, but there are more, in some cases, as follows: 2009 Q3 (25 revisions), 2010 Q2 (28 revisions), 2017 Q2 (24 revisions), and 2019 Q4 (22 revisions). More revisions are caused by changes in the methodology including corrections of base year values.

In Figure 12, we assume that Q4 publications have zero revisions in 2010, 2015 and 2017 since those were the last releases relying on a certain base year,[16] and the base year changed thereafter. There is no way of knowing with certainty how much of the value change is due to the base change and what is the contribution of the indicator correction, so we zeroed the number of revisions in Figure 12.

4. Related work

This paper is related to several lines of research that can be divided into three groups. One is focused on the sources of vintage data in different countries, the second on vintage data for Russia, and the third on the methods of vintage data collection. Each of these directions is discussed in more detail below.

4.1. Sources of revisions for Russian indicators

There are several sources of data on Russian indicator revisions. Outside Russia, data were collected for ALFRED, a US database of more than 2,000 indicator revisions found with the keyword search (the keyword was 'Russia'). These data capture the dynamics of various variables including real GDP and some of its expenditure components. However, unlike the data collected for this paper, ALFRED's data on real GDP and its components are fragmentary. Moreover, the database mainly stores seasonally adjusted rather than original observations, which may be a limiting factor in many studies.

To the best of our knowledge, the first work of Russian researchers to present vintage data was written by Astafieva and Turuntseva (2021), who explored the properties of volume index and nominal GDP revisions. Although the publication of data was not the authors' key goal, Astafieva

[16] In our sample. See notes regarding vintages for 2017 from Section 2.4.

and Turuntseva (2021) indeed presented annual nominal GDP data and mentioned the possibility of providing quarterly data on nominal GDP and the volume index on a year-on-year basis.

The Bank of Russia working paper Gornostaev et al. (2022) and analytical note Gornostaev at al. (2021) presented vintages from the 'Short-term Economic Indicators of the Russian Federation' (more than 400 indicators from January 2001) and on quarterly growth of real GDP (from December 2005). The data were published as appendices to the corresponding materials on the Bank of Russia website.

4.2. Sources of indicator revisions in other countries

The practice of collecting vintage data was pioneered in the US. The most complete and regularly updated databases are the Real Time Data Set for Macroeconomists (RTDSM) and ALFRED; the databases contain US and non-US data. The Organisation for Economic Cooperation and Development has created the Original Release Data and Revisions Database (ORDRD), covering OECD and some non-OECD countries. Other international revision databases include the Euro Area Real-Time Database (RTDB, which covers euro area countries, Japan and the US) and the International Real-Time Dataset (for Germany, Canada, the United States, Switzerland and Japan). At the country level, vintage data is collected in the UK, Germany, Canada, New Zealand and Australia. The databases are further described in Appendix 2.

Of former Soviet Union (FSU) countries, just few collect vintage data. Beyond the Bank of Russia whose practice is described above, vintage data have been collected by the Central Bank of Lithuania since 2018 for a selected set of indicators. In some research projects (Benkovskis (2008), Lewis (2013)) revisions of indicators for Latvia, Lithuania and Estonia were presented, but the data were never updated after the papers were published.

4.3. Approaches to collecting revision data

Revision databases are built up on the basis of periodical statistical bulletins, reviews and other information reports in multiple formats. Previously, these formats were hard copy documents (standard practice at the cusp between the 20th and 21st centuries), microfiches, CD disks, and PDF/Excel files. Typically, revision databases were manually compiled. One of the first databases was created in Diebold and Rudebusch (1991) on the basis of the monthly Business Condition Digest by the US Bureau of Economic Analysis. The database enabled the authors to use Composite Leading Index revisions for output projections.

Vintage data were initially collected independently by authors for their research, and data series not always updated (for example, Diebold and Rudebusch (1991) in the United States, Gerberding et al. (2005) in Germany, Stone and Wardrop (2002) in Australia). Subsequently, such databases expanded as other authors added current data. In the years that followed, researchers have systematically updated and made them available in public sources (see Appendix 2 for further details).

In particular, Croushore and Stark (2001) created the Real-Time Data Set for Macroeconomists, a large database of US revisions. The researchers worked with public periodical statistical books, reviews and other data sources. Historical data were collected from hard copies. In their paper, the authors acknowledge the contributions of student interns. Under the authors' supervision, they manually collected data from these sources into a single electronic database. The authors posted their revision database on the website of the Federal Reserve Bank of Philadelphia. The Real-Time Data Set for Macroeconomists was one of the first databases to become available in the public domain. The database quickly drew attention, and its data soon became the basis for research (for example, Orphanides and Norden (2002), Giordani and Söderlind (2003)). Today, the Federal Reserve Bank of Philadelphia's vintage database has grown and contains a number of additional indicators including data from the Greenbook of the Federal Reserve.

The revision database for euro area countries was created on the basis of the ECB Economic Bulletin (formerly ECB Monthly Bulletin) (see Giannone et al. (2012)). FSU countries have similar experience. Benkovskis (2008) used vintage data on Latvia's GDP, sourcing them from the publication 'Macroeconomic Indicators of Latvia'. Lewis (2013) manually collected data from annual 'Transition Reports' by the European Bank for Reconstruction and Development for Central and Eastern Europe (the sample included Latvia, Lithuania and Estonia as FSU countries). Analysing fiscal policy data, Cimadomo (2016) notes that existing databases (RTDSM, ALFRED, ECB-EABCN, and ORDRD) are often insufficient and many researchers (especially in the early days of using vintage data) collected data manually from official publications such as the OECD Economic Outlook, Excessive Deficit Procedure Notifications, and Stability and Convergence Programmes.

5. Conclusion

This paper presents the vintage datasets on nominal and real GDP and its components and describes the data collection methodology. Hopefully, the indicators we have collected, combined with the indicators published in Gornostaev at al. (2021) and Gornostaev et al. (2022), will help researchers and analysts understand how the economic situation was assessed at certain periods in

the past and will become a starting point for more correct experiments with models in pseudo-real time.

Figure 7. Frequency of revisions depending on number of years after first publication

(nominal GDP and its components), %

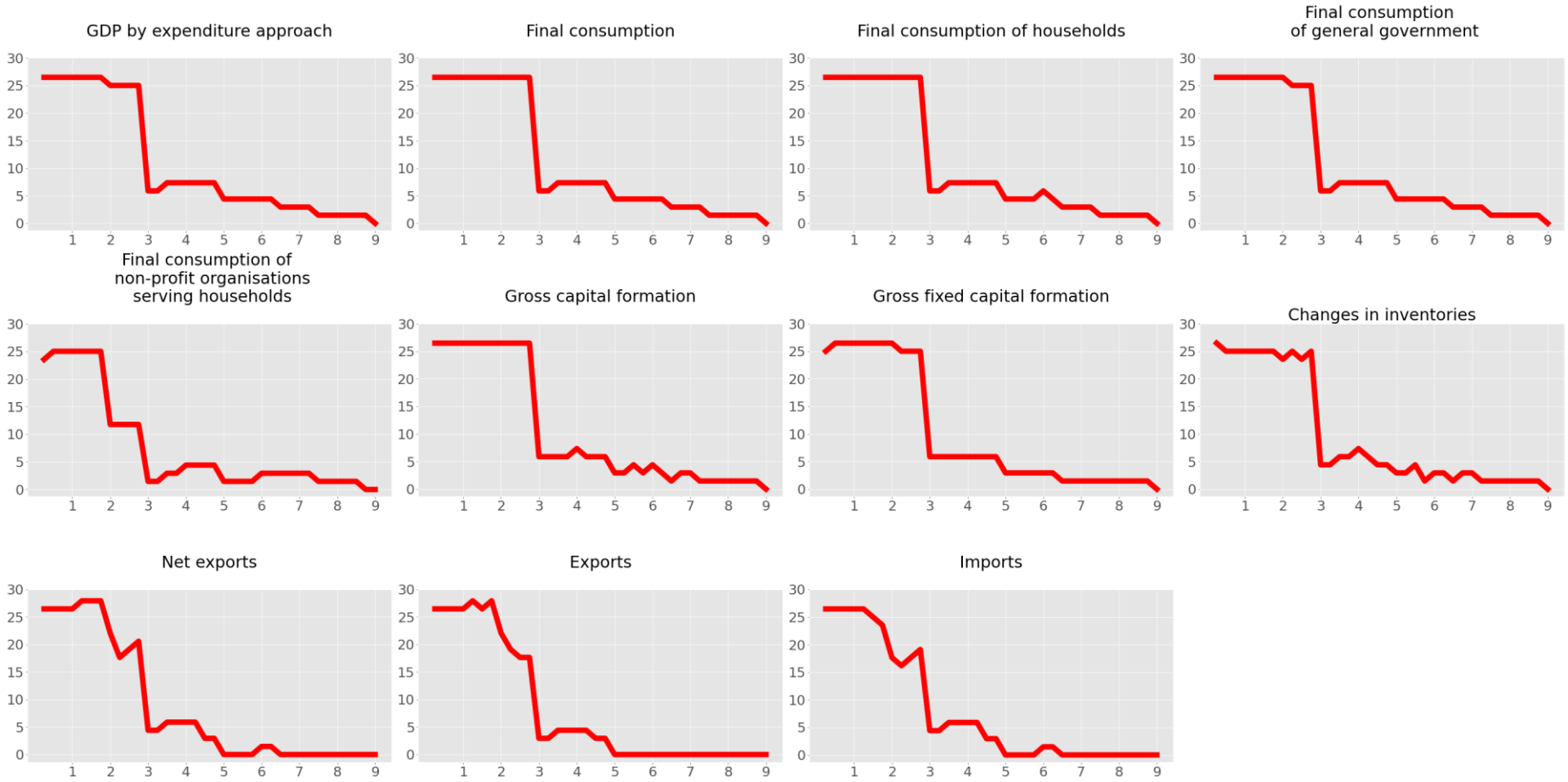


Figure 8. Magnitude of revisions (nominal GDP and its components), pp

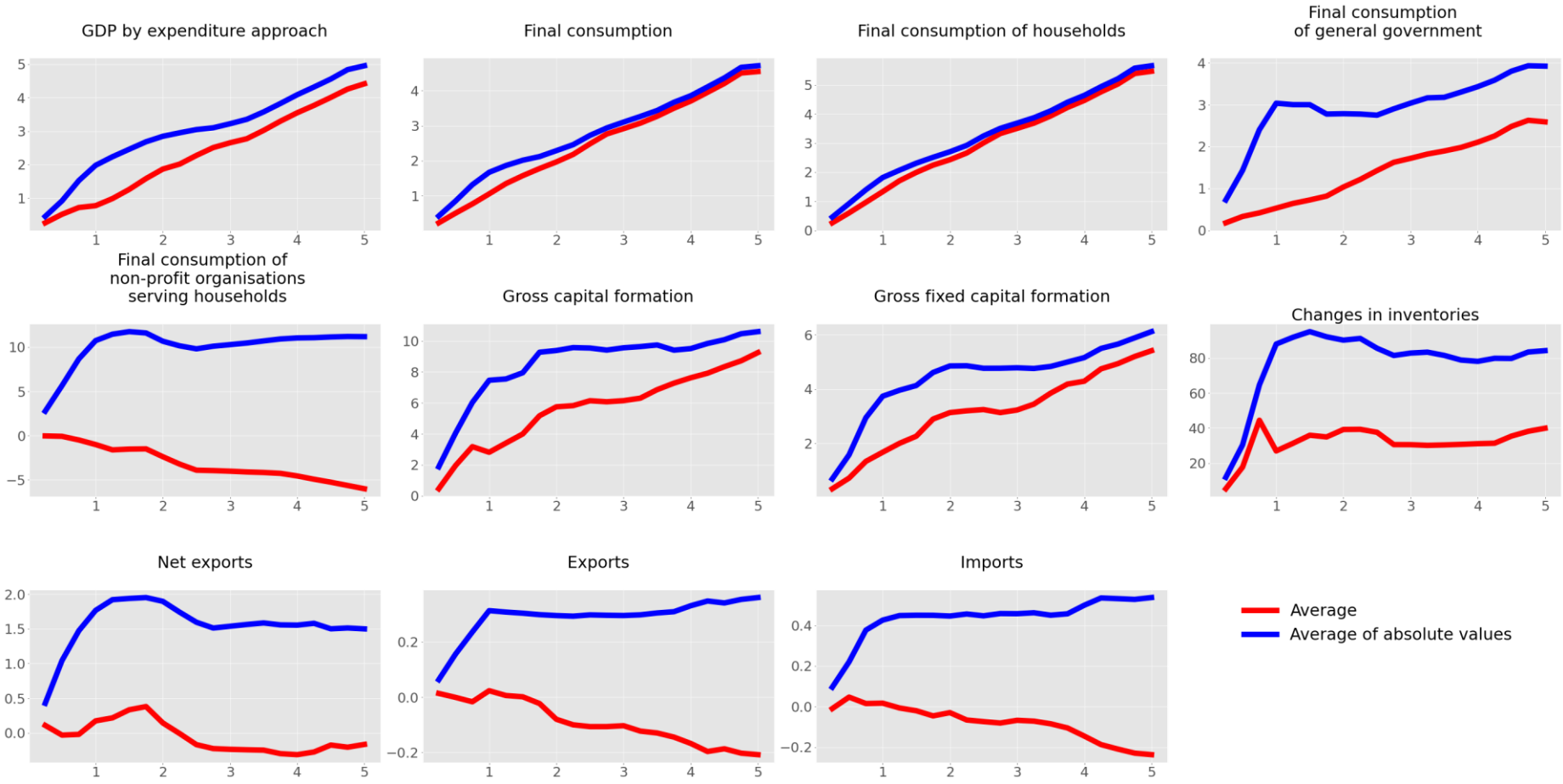


Figure 9. Number of revisions at time of last release (nominal GDP and its components)

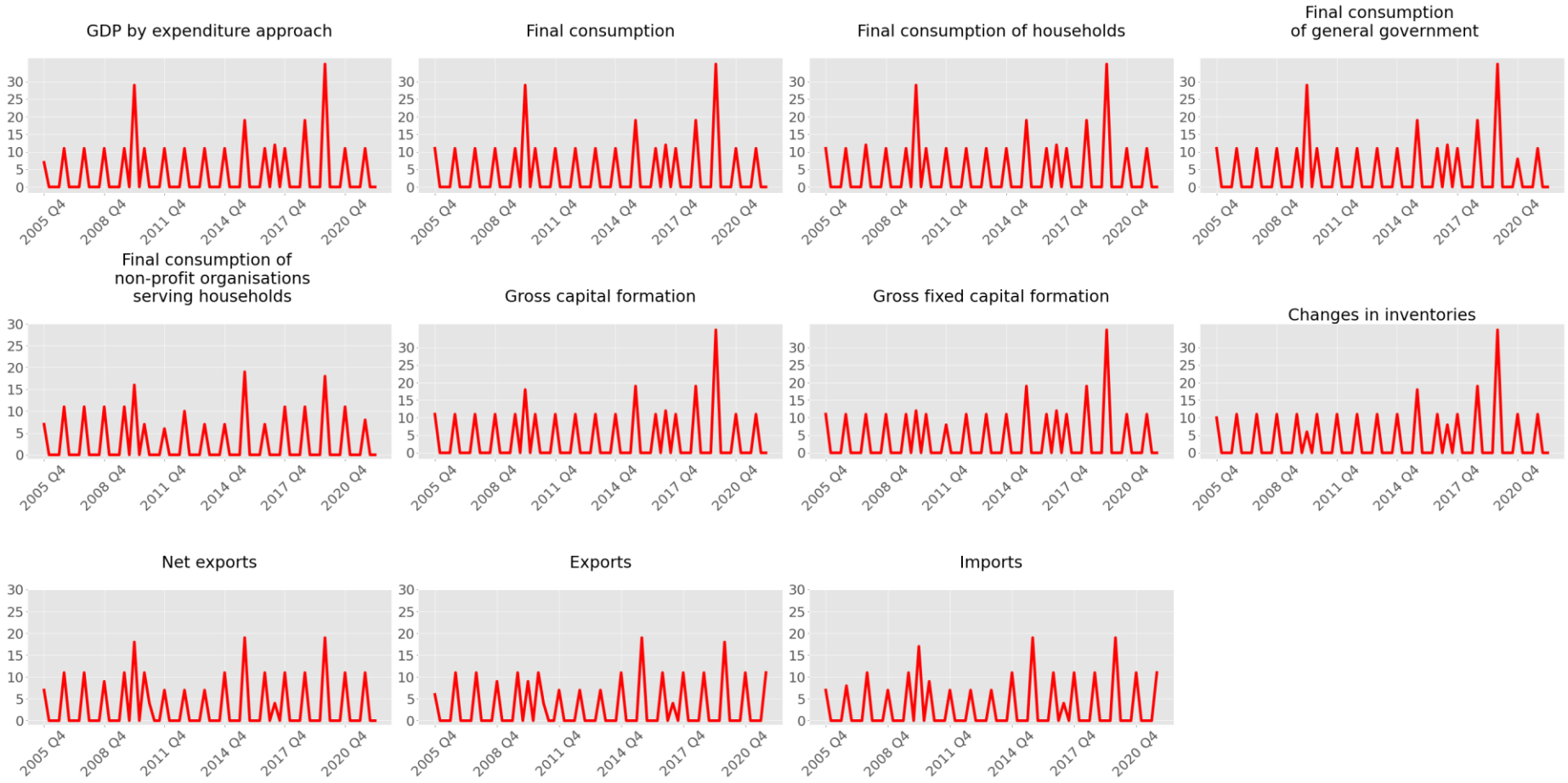


Figure 10. Frequency of revisions (real GDP and its components growth rates), %

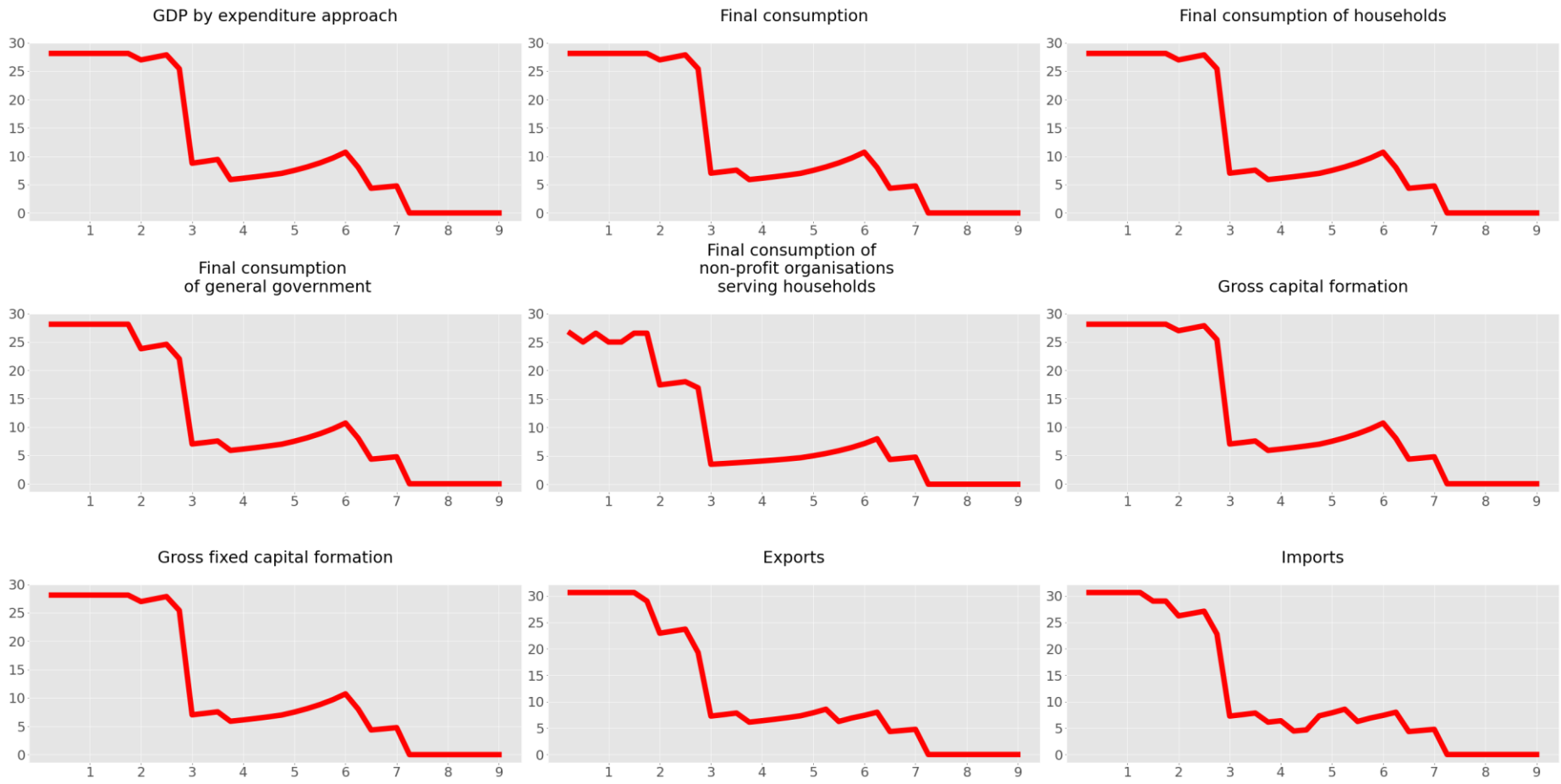


Figure 11. Magnitude of revisions (real GDP and its components growth rates), pp

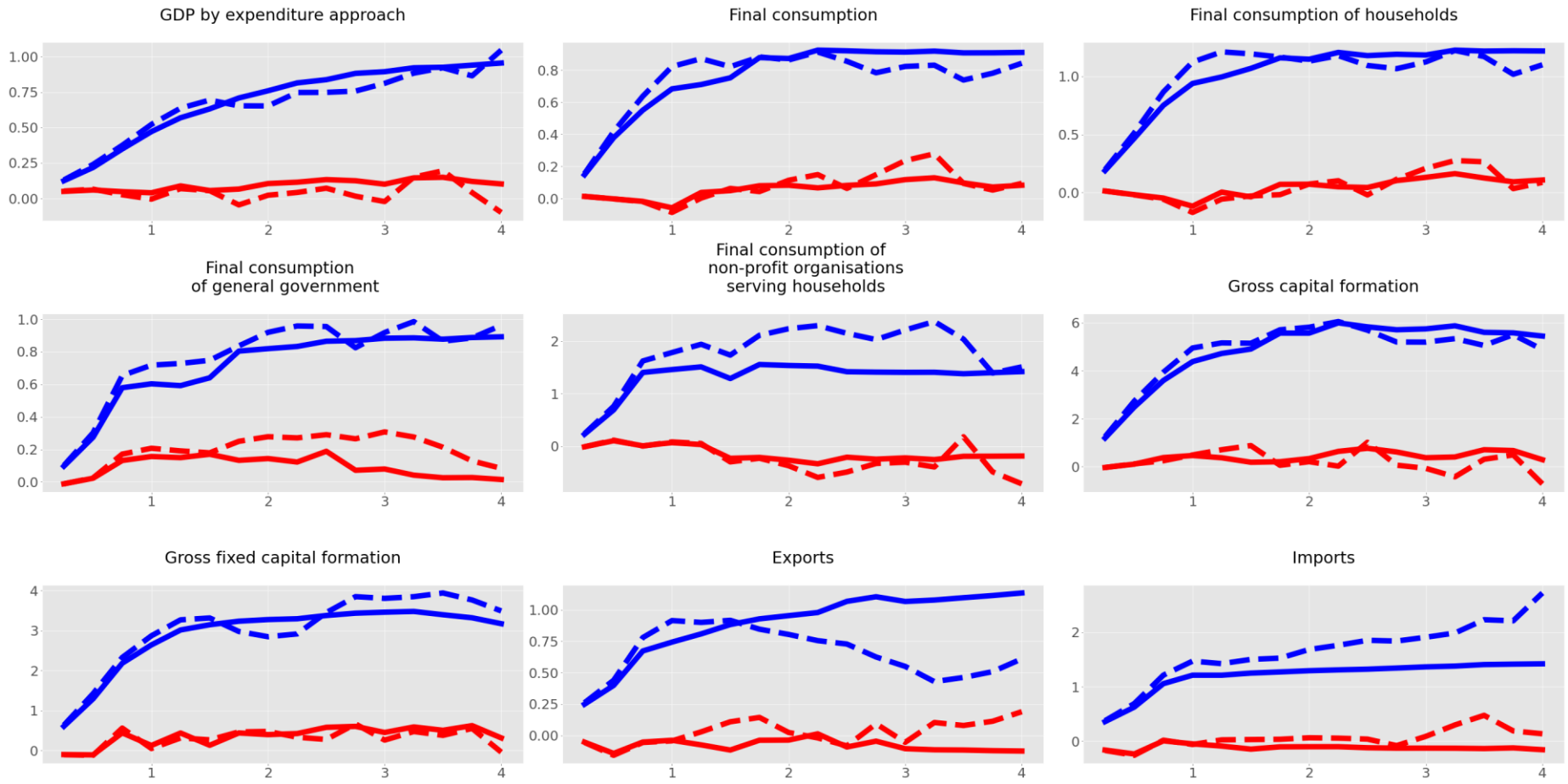
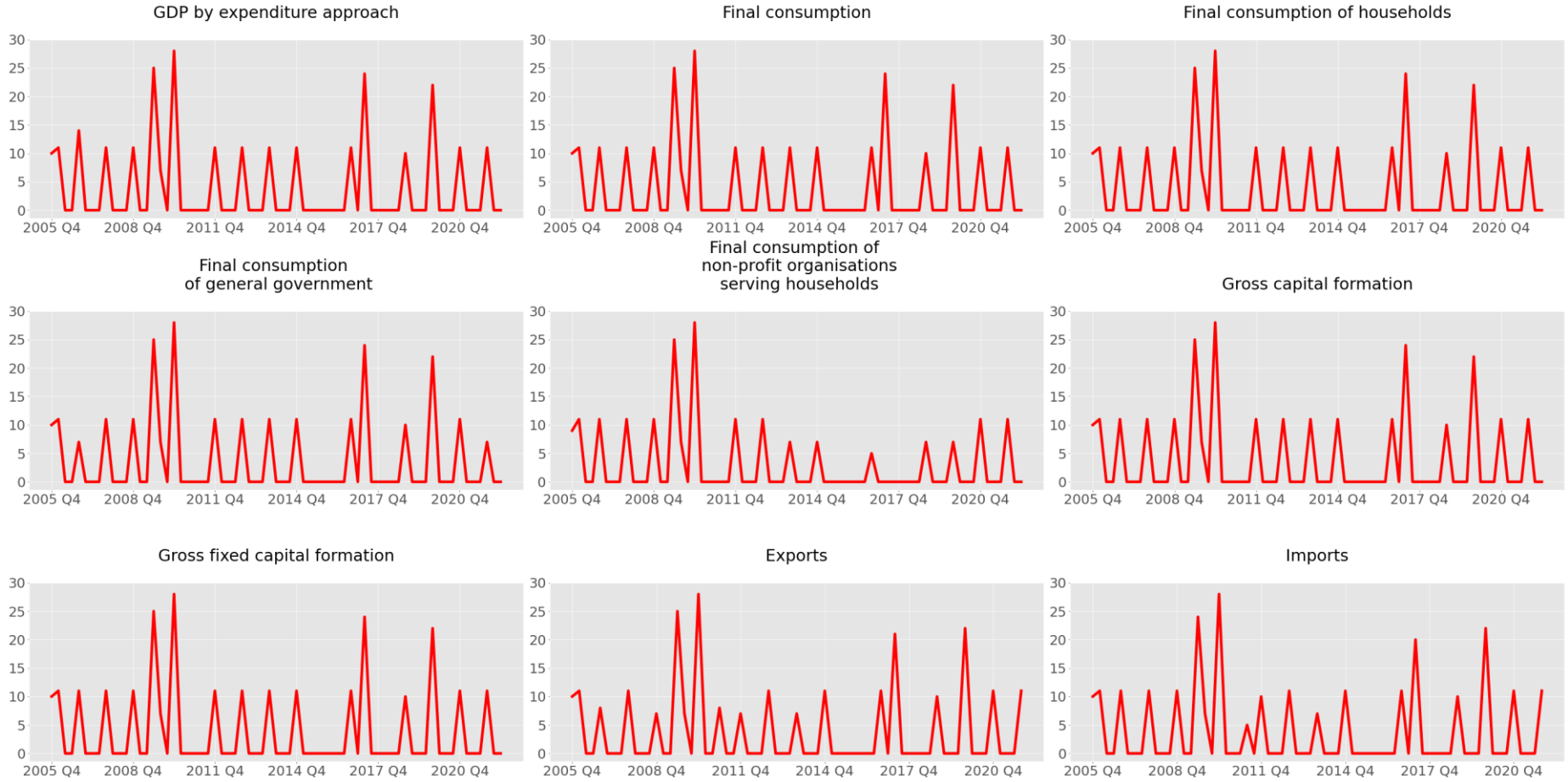


Figure 12. Number of revisions as of last release (real GDP and its components growth rates)



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Appendix 1. Notes on calculated descriptive statistics

Figure 13. Quarterly data publication[17]

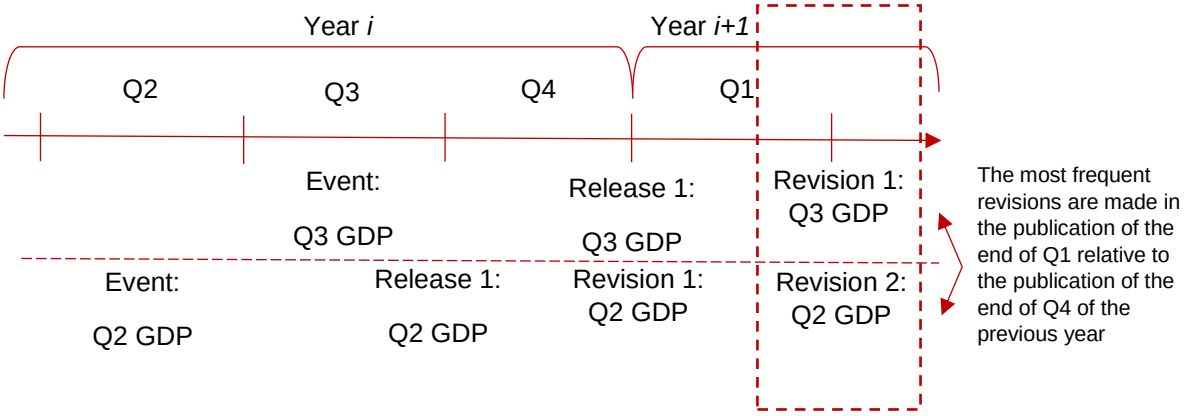
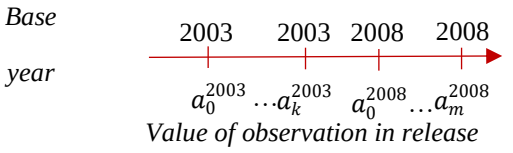


Figure 14. Revision magnitude calculation



$\frac{a_m^{2008}}{a_0^{2008}} - 1$ is the deviation from the first publication with the same base year

$\frac{a_k^{2003}}{a_0^{2003}} - 1$ is the accumulated deviation for observations with the previous base year

$\frac{a_k^{2003}}{a_0^{2003}} - 1 + \frac{a_m^{2008}}{a_0^{2008}} - 1$ is the value of magnitude for observation a_m^{2008}

[17] This figure assumes that both releases are revised, although a release is generally not always reviewed at once.

Appendix 2. Revision databases by country

Country	Database	Indicators/frequency	Data collection	References
USA	Real Time Data Set for Macroeconomists (RTDSM)[18]	Monthly and quarterly data (about 100 indicators)	Initially, data collection took eight years; the database was manually collected by researchers and student interns.	Croushore and Stark (2001)
USA	ALFRED[19]	Monthly, quarterly and annual (730 thousand series)	FRED and ALFRED are similar in architecture. Thanks to a similar design, data revision in the FRED database is automatically reported as a vintage in the ALFRED database.	Anderson (2006)
USA	FRED-MD[20], FRED-QD	Monthly (134 indicators) and quarterly (248 indicators)	The series of Stock and Watson (1996), Jurado et al. (2015) and Stock and Watson (2012) were merged. Data from the *Global Insights Basic Economics Database* was added. Automatic updates from FRED.	McCracken and Ng (2016, 2020)
USA	Bureau of Economic Analysis previously published estimates[21]	Quarterly and annual: GDP and its components, regional output, sectoral output, input-output tables, and balance of payments data	–	–

[18] https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/real-time-data-set-for-macroeconomists.
[19] http://alfred.stlouisfed.org.
[20] https://research.stlouisfed.org/econ/mccracken/fred-databases/.
[21] https://apps.bea.gov/histdata/.

OECD + Argentina, Brazil, India, Indonesia, China, Russia and South Africa[22]	Original Release Data and Revisions Database (ORDRD)[23]	Monthly and quarterly (24 indicators)	Data collected from archived CD-ROMs containing data from the *OECD Main Economic Indicators*. Revisions have been accumulated since 1999.	–
OECD (26 countries)	Real-Time Historical Dataset for the OECD[24]	13 indicators: real and nominal real and nominal GNP/GDP, price level (GNP/GDP deflator index), industrial production, manufacturing production, capacity utilization rate, unemployment rate, consumer price index, money supply, capital holdings, imports, exports and net capital movements	The data were collected from hard copies of the *OECD Main Economic Indicators*, so earlier data revisions than in the ORDRD were obtained.	Fernandez et al. (2011)
UK	Gross Domestic Product Real-Time Database[25]	Quarterly: real and nominal GDP (including its components), GDP deflator, sectoral output, nominal income by industry, net lending by industry, and labour market indicators	The data are sourced from the Blue Book, an annual publication of the UK Office for National Statistics. For the early 2000s, GDP and its component series were obtained from *Economic Trends and Financial Statistics* and their annexes.	Castle and Ellis (2002), Egginton et al (2002), Garratt and Vahey (2006)

[22] Not all indicators are available for all countries.
[23] https://stats.oecd.org/Index.aspx?DataSetCode=MEI_ARCHIVE.
[24] https://www.dallasfed.org/research/international/oecd.
[25] https://www.bankofengland.co.uk/statistics/gdp-real-time-database.

UK	Revisions triangles for monthly GDP[26]	Monthly: GDP growth rate, MoM.	–	–
Euro area, Japan and USA	Euro Area Real-Time Database (RTDB) context of Euro Area Business Cycle Network (EABCN)[27]	Monthly, quarterly and annual (about 230 series)	The vintage series were collected from the ECB Economic Bulletin (formerly the ECB Monthly Bulletin). Data are updated semi-annually (in early January and early July).	Giannone et al. (2012)
Germany	Macroeconomic real-time database[28]	Monthly, quarterly and annual (about 280 series)	The base was compiled on the basis of hard and soft copies and it is updated through an automated updating system..	Knetsch (2009)
Canada, Germany, Japan, Switzerland, and USA	International real-time dataset	Quarterly: real and nominal GDP, inflation, money supply, and unemployment rate	Data sources: floppy disks and CDs.	Faust et al. (2003)
Canada	Real-time Canadian Socio-Economic Information Management System	Monthly and quarterly (21 indicators)	The database is automatically updated.	–

[26] https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/revisionstrianglesformonthlygdp.
[27] https://sdw.ecb.europa.eu/browseExplanation.do?node=9689716.
[28] https://www.bundesbank.de/dynamic/action/en/statistics/time-series-databases/time-series-databases/745590/real-time-data?statisticType=BBK_RTD&treeId=113205500.

	(CANSIM) tables[29]			
Canada	The real-time database of Bank of Canada staff projections[30]	Quarterly (22 indicators)	The data were obtained from the archived publications of the Bank of Canada's *Staff Economic Projections*.	Champagne et al. (2018)
New Zealand	A Real-Time Database for GDP[31]	Monthly GDP and its components	–	Sleeman (2006)
Australia	Australian Real-Time Macroeconomic Database[32]	Monthly and quarterly: GDP and its components, prices, key monetary indicators, labour market indicators and 21 indicators of fiscal and tax statistics	Revisions were collected on the basis of series published by the Australian Bureau of Statistics (hard copies, microfiches, CD ROMs and, less common, electronic files (PDF, Excel and Lotus 123)). Monetary statistics were published by the Reserve Bank of Australia in its Monthly Bulletin available online.	Lee et al. (2012), Lee et al. (2019)

[29] https://www.statcan.gc.ca/en/dai/btd/rct.
[30] https://www.bankofcanada.ca/rates/staff-economic-projections/.
[31] https://www.rbnz.govt.nz/research-and-publications/research-programme/additional-research/a-real-time-database-for-gdp.
[32] https://fbe.unimelb.edu.au/economics/macrocentre/artmdatabase.