

## FEATURE

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# GDP(O) revisions analysis system: overview and indicative results

## SUMMARY

Revisions are an inevitable consequence of the need for timely estimates of economic growth and are a well-understood part of the statistical process used to compile these estimates. The Office for National Statistics (ONS) has recently done much work to improve understanding of the causes of revisions to the early estimates of gross domestic product (GDP) as measured by the output, or production, approach (GDP(O)). Linked to this work has been the development of a system for recording and quantifying GDP(O) revisions. This is a significant step forward and puts ONS at the forefront of this area of work. This article outlines the new system, presents some initial results and gives details of planned future developments.

The Office for National Statistics (ONS) has developed a new system for recording and coding GDP(O) revisions. This is an important step forward and complements the information ONS already produces about revisions to the GDP estimates. It enables much quicker, more flexible and reliable analysis of the causes of revision. This article gives an overview of the new system and explains the benefits it will bring. Indicative results of analysis based on data published in June 2007 are then presented in several different formats. Lastly, future developments and next steps are outlined.

## Background

GDP(O) is the main indicator of short-term economic growth. The ONS preliminary estimate of quarterly GDP growth is based entirely on the GDP(O) measure. Published just 25 days after the end of the reference quarter, it is the fastest estimate of its type in the world. Updated estimates are published in the UK output, income and expenditure First Release (after 55 days) and the Quarterly National Accounts First Release (after around 85 days). Even after comprehensive annual data are available (usually around 18 months after the end of the reporting period), it is GDP(O) that largely determines the quarterly profile of changes in GDP within years.

## Benefits of the new system

Although revisions to UK quarterly GDP estimates compare well with other advanced

economies (see Fonzo 2005), supporting information about revisions is important to users. ONS recognises this and provides much background information about GDP revisions. This includes:

- briefing in the relevant First Releases
- publication of 'revisions triangles' on the National Statistics website.<sup>1</sup> These track revisions to GDP and its components over time
- annual analyses of the revisions performance of quarterly GDP and its components, including GDP(O) (see Obuwa and Robinson 2006 for the most recent). These analyses include explanations of significant revisions

By providing more detailed explanations for revisions to the GDP(O) data, the new GDP(O) revisions analysis system will complement these existing sources of information about revisions.

## Looking ahead

In the future, when a longer span of estimates is recorded on the new system, it will also help in assessing whether any causes of revisions are predictable. This is of particular interest to users: for example, the Bank of England has recently assessed the tendency towards upward revisions to the early estimates of quarterly GDP growth. It has recently published a set of quarterly GDP estimates that reflect expected future revisions to the ONS data (see Bank of England 2007). The new GDP(O) revisions analysis system will help to inform the

Bank of England's work. It should also help to minimise future revisions, for example, by helping to target improvements to the source data.

## Revisions system overview

This section gives an overview of the approach used to monitor revisions in the new system.

GDP(O) compilation is a complex process that draws on over 1,000 indicator series. This has made previous work to assess the causes of historic revisions difficult. The new revisions analysis system makes this much easier and more precise. Detailed information on revisions is recorded as each new GDP(O) estimate is produced.

The system is Excel spreadsheet-based and is designed to quantify the different causes of revisions in terms of their impact on total GDP(O). This gives great flexibility in analysing revisions. Some points to note are:

- revisions to all non-production industries (services, construction and agriculture) are stored for each 2-digit category (division) of the 2003 Standard Industrial Classification (SIC). This splits these industries into 31 components
- revisions to production industries are stored at the higher, section level. The relevant SIC sections are: mining and quarrying, manufacturing and energy supply
- revisions are then coded from a key of 14 possible causes. The key has been drawn up with reference to current work by the Organisation for Economic Co-operation and Development to develop a standard classification system for revisions to economic statistics
- some causes of revisions (including changes to adjustments and methodological reviews) are calculated automatically within the system. Other causes are identified and quantified through investigations by the GDP(O) team
- for reasons of practicality, a 'threshold' value determines the minimum revision to be investigated by the team. The threshold is set in terms of the weighted impact of revisions on total GDP(O). Typically, the threshold allows around 80 per cent by weight of revisions to be assigned to specific causes
- those revisions which are calculated automatically (such as changes to adjustments and methodological

reviews) are assigned to their relevant cause, whatever their size, and are not constrained by the threshold

### 'Other, not specified' contributions

The system greatly improves the precision of GDP(O) revisions analysis. However, the practical need for a threshold for manual investigation means there will be a 'not specified' contribution to revisions. To set the figures in context, some of the standard charts and tables show the 'not specified' residual as a separate category. For the data set used in this article, 15 per cent of absolute revisions to quarterly growth are not attributed to a specific cause.

Future plans include expanding the range of contributions to revisions that are calculated automatically. This will help to reduce the size of the 'not specified' category and improve accuracy.

### Reasons categories: summary

There are currently 14 different codes for causes of revisions (see Appendix). The main categories covered include:

- **forecasts replaced by new survey data** – forecasts are used to produce estimates of the recent past in the absence of survey data. When forecasts are replaced by survey data from the supplier, this can lead to revisions. See Skipper (2005) for details of the forecasting methods used in GDP(O)
- **later data received from suppliers** – refers to revisions caused by updates to source data (for example, due to later survey returns or benchmarking to annual surveys)
- **seasonal adjustment**
  - **updates due to later data** – for the results presented in this article, this refers to revisions to the seasonally adjusted growth rate in a quarter where the non-seasonally adjusted growth rate is unrevised. Revisions of this type can occur when a new quarter is added to the series. They may also occur where there are revisions to the non-seasonally adjusted data for other quarters in the series
  - **annual review** – revisions may also occur after the annual review of the seasonal adjustment parameters for seasonally adjusted time series. These revisions were calculated automatically, by isolating the changes in quarterly growth rates due to updating the parameters

The definition and method for assessing the impact of revisions due to seasonal adjustment is currently under review. See **Box 1** for further details about seasonal adjustment and its impact on revisions.

- **improvements to sources and methods** (including service sector industry reviews) – revisions caused by changes to sources and methods are normally introduced at the time of the annual National Accounts *Blue Book* publication. Changes implemented in the 2007 Q1 Quarterly National Accounts data set published in June 2007 included three service sector industry reviews<sup>2</sup>
- **changes to quarterly data quality and coherence adjustments**
  - data quality adjustments are usually made because of uncertainties about the quality of forecasts or early survey estimates. They are reviewed when the quality of the survey estimates improves and this may lead to revisions
  - quarterly coherence adjustments are applied if ONS decides to bring the quarterly path of the GDP(O) data closer into line with the other measures of GDP. See Marks (2006) for further details about GDP(O) adjustments

## Results

This section presents indicative analysis based on data published in the 2007 Q1 Quarterly National Accounts First Release in June 2007.<sup>3</sup>

GDP(O) data in this release included revisions back to 2005 Q1. The mean quarterly revision to headline GDP(O) was 0.00 percentage points. The absolute average revision to quarterly growth (ignoring direction) was 0.02 percentage points. These averages are based on rounded estimates. GDP(O) percentage growth rates are published to one decimal place as it is not possible to measure beyond that degree of accuracy.

### Revisions by cause: overview

**Figure 1** shows the main contributions to revisions, identified by the system. In summary, these were:

- later survey data and forecast replacement by new data. These were the biggest identified causes of revisions, accounting for 33 per cent, by size of impact, of all contributions to quarterly GDP(O) revisions

**Box 1**

**Definition of seasonal adjustment impacts**

Seasonal adjustment involves estimating and removing systematic calendar related variations in a time series. When new information becomes available, it is possible to obtain a more up-to-date estimate of these variations. This can cause revisions to the seasonally adjusted estimates.

Revisions to the seasonally adjusted estimates are attributable to three possible causes:

- a new data point has been added to the not seasonally adjusted series
- the not seasonally adjusted series has been revised at one or more historic points, and
- the parameters (that is, specific estimation method) used in the seasonal adjustment of the relevant time series have been re-estimated

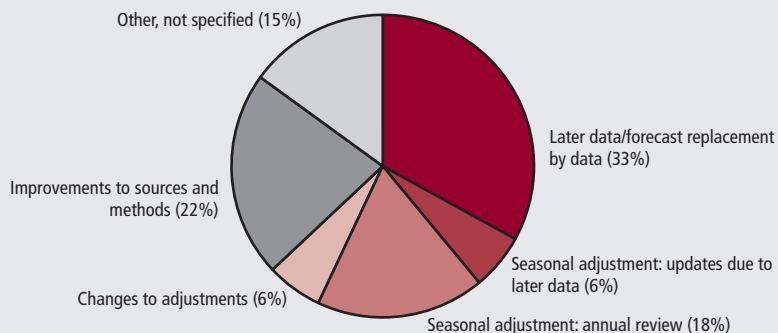
For the purposes of seasonal adjustment, a time series can be broken down into a number of different components, for example, a trend component, a seasonal component and an irregular component. A revision to the seasonally adjusted

estimate will be associated with revisions to at least one of these components. For example, a new data point or a revision to an historic point in the original series is new information that allows a more up-to-date estimate of systematic calendar variations throughout the time series.

The parameters used in the GDP(O) seasonal adjustment process are reassessed every year. This may result in updates to the parameters for individual series. Changes might include an improvement to the models used for the forecasting part of the seasonal adjustment process or changing the filters used to estimate the trend and seasonal components.

ONS's Time Series Analysis Branch is carrying out research into revisions to growth rates and aims to decompose these revisions into the separate time series components in order to provide a clearer picture of what is driving revisions in the seasonal adjustment process. This will provide a clear distinction between the types of revision associated with seasonal adjustment. The research will help to ensure the seasonal adjustment deals appropriately with revisions.

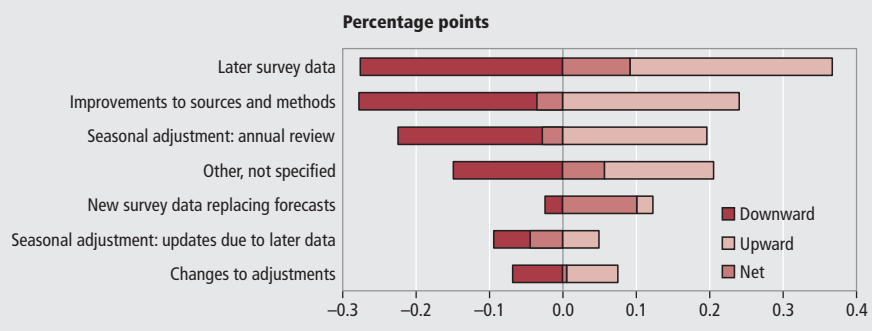
**Figure 1**  
**Contributions to revisions to quarterly GDP(O) growth, 2005Q1 to 2007Q1<sup>1</sup>**



**Note:**

<sup>1</sup> Data as published in June 2007.

**Figure 2**  
**Contributions to revisions to quarterly GDP(O) growth: by cause, 2005Q1 to 2007Q1<sup>1</sup>**



**Note:**

<sup>1</sup> Data as published in June 2007.

- updates to seasonal adjustment accounted for a further 24 per cent of contributions to revisions to quarterly growth rates. This underlines the value of ONS's current work to investigate the impact of revisions due to seasonal adjustment
- one-off improvements to sources and methods (including service sector industry reviews) accounted for 22 per cent of contributions to revisions

**Revisions by cause: detail**

Figure 2 shows the causes of revisions to quarterly growth rates in more detail. These causes are ranked according to contributions to revisions to quarterly growth of headline GDP(O) (shown as percentage points). Contributions from upward and downward revisions are shown by separate bars, with the 'net' segment showing the difference between them.

Percentage points contributions as shown in Figure 2 were produced by:

- assigning causes to revisions (as proportions of revisions to quarterly growth rates). For automatically calculated causes, this is done by the system
- converting actual revisions to components to percentage points contributions to headline GDP(O) quarterly growth revisions
- applying the 'causes' proportions from the first bullet point to the percentage points contributions from the second. This assigns a value to the causes of

revisions in terms of percentage points contributions to headline GDP(O) revisions

- summing the percentage points contributions from each cause. In addition to totals for absolute contributions, subtotals are produced for contributions to upward and downward revisions. These totals cover all identified causes of revisions to components, irrespective of the direction of the revision to headline GDP(O) in a particular quarter

Detailed points to note from Figure 2 are:

- later data and new survey data replacing forecasts were the largest identified cause of revisions to quarterly growth rates over this period. Together they accounted for 33 per cent of absolute contributions to revisions to quarterly GDP(O) growth, with 27 percentage points coming from later data. These revisions due to new and later source data were spread across a number of industries. The most significant are shown below (with percentages of total absolute contributions to revisions to quarterly GDP(O) growth in brackets):
  - health and social work (5.3)
  - education (4.2)
  - letting of dwellings (4.1). This category includes imputed rental income from owner-occupied dwellings

- updates to the seasonal adjustment of the quarterly path accounted for 24 per cent of absolute contributions to revisions to quarterly GDP(O) growth rates. Of this, 18 percentage points were attributable to the annual review of the seasonal adjustment parameters used for individual series (see Box 1 for further details). Industries most affected by seasonal adjustment changes include (percentages of total absolute contributions to revisions to quarterly GDP(O) growth in brackets):
  - post and telecommunication (2.7)
  - recreational, cultural and sporting activities (2.7)
  - manufacturing (2.6)
  - motor trades (2.4)

The annual review also included a one-off improvement in the method of seasonal adjustment, with the introduction of monthly rather than quarterly series being used for a

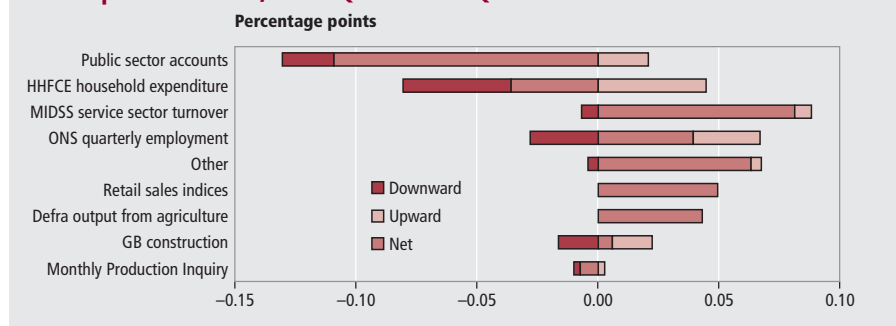
number of service sector components. This provides greater consistency between GDP(O) and the monthly Index of Services and improves the estimate of the quarterly growth

- improvements to sources and methods, including implementation of three service sector industry reviews accounted for 22 per cent of absolute contributions to revisions to quarterly growth rates. The main industries affected were (percentages of total absolute contributions to revisions to quarterly GDP(O) growth in brackets):
  - real estate activities (8.9)
  - renting of machinery and equipment (5.2): due to service sector industry review
  - research and development (3.8): due to service sector industry review

The service sector methodological industry review programme has been a major cause of historic revisions. Almost all of the service sector has now been reviewed and so this cause should not lead to significant revisions in future. There are, however, planned future methodology changes which include the allocation of Financial Intermediation Services Indirectly Measured (FISIM) in the 2008 *Blue Book* data set and the re-engineering of the UK National Accounts. Both are likely to lead to some revision to GDP(O). The estimated impact of the allocation of FISIM is shown in Akritidis (2007)

- reassessment of adjustments as data became firmer accounted for 6 per cent of absolute contributions to revisions to quarterly GDP(O) growth. However,

**Figure 3**  
Contributions to revisions to quarterly GDP(O) growth rates: by type of output indicator, 2005Q1 to 2007Q1<sup>1</sup>



**Note:**  
1 Data as published in June 2007.

**Table 1**  
Details of data sources shown in Figure 3

Data source	Percentage coverage of GDP(O) (2003)	Details
Public sector accounts	10	ONS quarterly estimates of government activity
HHFCE (household final consumption expenditure)	3	ONS quarterly estimates of household expenditure, used to estimate output from services including letting of dwellings and betting and gaming
MIDSS (Monthly Inquiry into the Distribution and Service Sector)	37	ONS monthly turnover estimates, used for a range of service industries, including wholesale and accountancy
ONS quarterly employment	7	Employment estimates from ONS quarterly surveys, used as output indicators for services including public administration, market sector health and membership organisations
Retail sales indices	6	ONS monthly indices of retail output
Defra (Department for Environment, Food and Rural Affairs)	1	Quarterly estimates of output from agriculture, supplied by the Department for Environment, Food and Rural Affairs (Defra)
GB construction	6	Quarterly estimates of construction activity for Great Britain. Supplied by the Department for Business, Enterprise and Regulatory Reform
Monthly Production Inquiry	14	ONS monthly turnover estimates for production industries
Other	16	Includes: VAT-based turnover estimates, used for services industries, and data from the Bank of England on values of loans and deposits, used in estimating output from financial intermediation

the total size of adjustments to GDP(O) was reduced and on balance changes to adjustments reduced revisions. The new system makes it easier to assess the impact of adjustments on revisions; this is already proving useful in informing the allocation of adjustments

- contributions to revisions amounting to 15 per cent were not attributed to specific causes because they fell below the threshold for manual investigation by the GDP(O) team

**Revisions by type of source data**

Figure 3 follows the same format as Figure 2 to show revisions by type of output indicator source data. The data sources are shown in Table 1. Output indicators (such as turnover and household expenditure) accounted for over 85 per cent of revisions from new/late source data. The remainder

was due to price indicators (deflators).<sup>4</sup>

The main points to note from Figure 3 are:

- a small number of input sources, such as the public sector accounts, household final consumption expenditure and Defra data had a disproportionate impact on total revisions. This is useful information in targeting future quality improvements
- new annual data/benchmarking to annual data explains the predominance of upward revisions to the Defra data and retail sales indices

**Revisions to components**

The next two charts focus on absolute revisions to SIC components.

Figure 4 shows the absolute contributions to revisions to quarterly GDP(O) growth from SIC components. The

chart covers 85 per cent of total absolute contributions to revisions to GDP(O) quarterly growth.

Figure 5 shows the causes of revisions to the five most significant industries from Figure 4.

The main points to note from Figures 4 and 5 are:

- actual revisions to real estate activities and renting of machinery and equipment were relatively large and arose mainly from improvements to sources and methods. There was a change to the source data for real estate; renting of machinery and equipment was subject to a service sector industry review. This illustrates the large impact that one-off changes to sources and methods can have at the industry level.

**Future developments to the system**

ONS plans to expand the automatic calculation of causes of revisions. Some progress towards this should be possible in the short term. However, looking further ahead, the new computer system being developed as part of ONS's National Accounts Re-engineering Project should allow a much greater degree of automation. This promises to make revisions analysis faster and more accurate.

**Next steps**

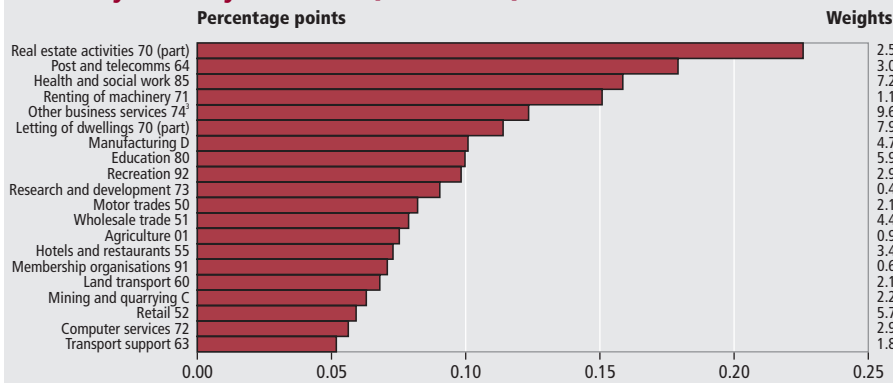
These include:

- expanding the range of causes for revisions that are calculated automatically
- refining the definition of revisions due to seasonal adjustment changes
- using the information from the new system to identify ways of reducing the overall revision to GDP(O)
- using the new system to improve the regular briefing published alongside the release of GDP(O), including an annual summary of the main causes of revisions to GDP(O) in the National Accounts *Blue Book* data set

**Notes**

- 1 GDP revisions triangles are available on the National Statistics website at [www.statistics.gov.uk/statbase/product.asp?vlnk=13560](http://www.statistics.gov.uk/statbase/product.asp?vlnk=13560)
- 2 Details of the service sector industry reviews introduced in the 2007 Q1 Quarterly National Accounts First Release are available on the National

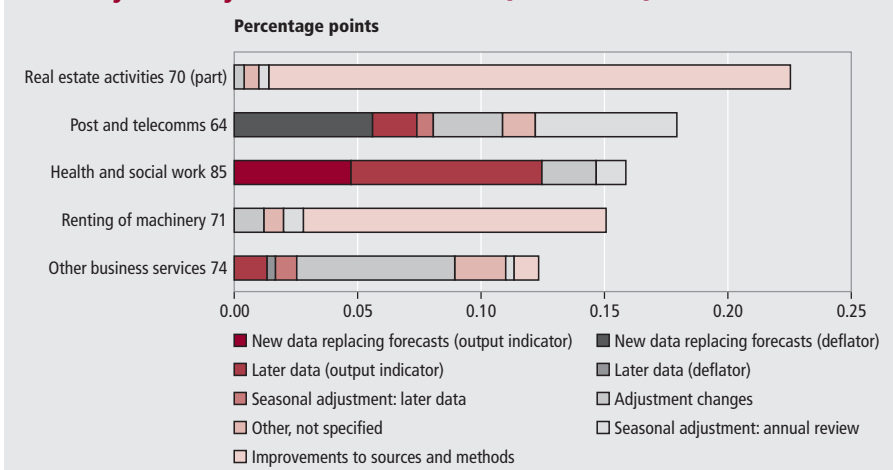
**Figure 4**  
**Absolute contributions to revisions to quarterly GDP(O) growth rates: by industry/SIC, 2005Q1 to 2007Q1<sup>1,2</sup>**



**Notes:**

- 1 Data as published in June 2007.
- 2 Weights are as percentages of GDP(O), 2003.
- 3 SIC 74 'Other business services' covers a number of services including architectural services, legal services and accountancy.

**Figure 5**  
**Absolute contributions to revisions to quarterly GDP(O) growth rates: by industry/SIC and cause, 2005Q1 to 2007Q1<sup>1</sup>**



**Note:**

- 1 Data as published in June 2007.



Statistics website at  
[www.statistics.gov.uk/iosmethodology/future\\_improvements.asp](http://www.statistics.gov.uk/iosmethodology/future_improvements.asp)

- 3 This release is available on the National Statistics website at  
[www.statistics.gov.uk/statbase/product.asp?vlnk=818](http://www.statistics.gov.uk/statbase/product.asp?vlnk=818)
- 4 An output indicator refers to a measure of the quantity of output. This includes the value of turnover or expenditure and volume measures such as passenger-kilometres travelled. Where turnover or expenditure is used, this needs to be deflated using a price estimator to convert it to a constant price basis (that is, remove the effects of inflation). These price estimators are known as deflators.

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Obuwa D and Robinson H (2006) 'Revisions to quarterly GDP growth and its production (output), expenditure and income components', *Economic Trends* 637, pp 28–39.

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**APPENDIX****Key (causes for revisions 1 to 14)**

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|--|---|--|
| <p>1 Forecast output indicator series replaced by new survey data</p> <p>2 Forecast deflator series replaced by new survey data<br/><i>Forecasting is used to produce estimates of the recent past in absence of survey data. This reason code is used when replacement of forecasts by data from the supplier leads to a revision.</i></p> <p>3 Later data for output indicator series received from supplier</p> <p>4 Later data for deflator series received from supplier<br/><i>Refers to revisions caused by updates to source data (for example, due to later survey returns or benchmarking to annual surveys).</i></p> <p>5 Seasonal adjustment (from later data)<br/><i>Refers to revisions to the seasonally adjusted growth rate in a quarter where the non-seasonally adjusted (or original estimate) growth rate is unrevised. These</i></p> | <p><i>revisions can occur when a new quarter is added to the series or where there are revisions to the non-seasonally adjusted data for other quarters.</i></p> <p>6 Changes to quarterly data quality adjustments (automatically assessed)<br/><i>Usually made because of uncertainties about the quality of forecasts or early survey estimates. They are reviewed when the quality of the survey estimates improves and this may lead to revisions.</i></p> <p>7 Changes to quarterly coherence adjustments (automatically assessed)<br/><i>Applied if ONS decides to bring the quarterly path of the GDP(O) data closer into line with the other measures of GDP.</i></p> <p>8 Changes to Monthly Inquiry into the Distribution of Service Sector (MIDSS) adjustments<br/><i>Adjustments applied to MIDSS turnover data when response rate is low, the quality of survey data is questioned or to compensate for the effects of sample</i></p> | <p><i>rotation.</i></p> <p>9 Changes to weights (automatically assessed)</p> <p>10 Seasonal adjustment review (automatically assessed)<br/><i>Revisions due to the annual review of the seasonal adjustment parameters. See Box 1 for further details.</i></p> <p>11 Changes to sources and methods, including service sector industry reviews (automatically assessed)</p> <p>12 Changes to annual coherence adjustments (automatically assessed)<br/><i>The adjustments used to bring quarterly GDP(O) into line with the balanced annual measure. There were no changes to these adjustments in the GDP(O) data used in this article.</i></p> <p>13 Errors – source error<br/><i>Errors caused by incorrect source data.</i></p> <p>14 Errors – processing error<br/><i>Include errors from implementing system or methodology changes.</i></p> |
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