

FEATURE

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Revisions to quarterly GDP growth and its components

SUMMARY

This article presents the results of the latest revisions analysis of gross domestic product (GDP), updating and developing the previous article, Robinson and Obuwa (2006) published in December 2006. Revisions to the estimates of quarterly GDP are analysed at different stages of the production process, and the reliability of initial estimates over two different time periods is assessed. An analysis of revisions to quarterly growth rates for the main components of the expenditure, production and income measures of GDP is also presented. More detailed analysis of the components can be found in the appendices to this article on the National Statistics website at www.statistics.gov.uk/cci/article.asp?id=1888

The quality of gross domestic product (GDP) estimates can be assessed using a variety of measures. Of these, revisions analysis examines the reliability of an early estimate in predicting the value of a later estimate. Revisions analysis does not measure accuracy, which relates to how close the estimate is to the underlying 'true' value. It is possible that a reliable estimate (in that it is revised only very slightly over time) could be very inaccurate (in its closeness to the underlying 'true' value), and vice versa.

Reliability (measured through revisions analysis) is only one aspect of quality and should be considered as part of a wider range of indicators of quality that address issues such as timeliness and coherence. Quality reports provide information on different elements of quality (including reliability) and include both static and dynamic quality information specific to a release. More information on quality reports is available at www.statistics.gov.uk/about_ns/economicstatistics_qualityreports.asp

Revisions to GDP are of wide interest to data users, who are concerned that current estimates will be revised and therefore change the economic inferences that can be drawn. The Bank of England recently analysed GDP revisions within the August 2007 Inflation Report.

The analysis in this article includes revisions made up to and including the 2007 *Blue Book*, although the time span used runs over ten years, from 1995Q1 to 2004Q4. This year's *Blue Book* contained fewer revisions than in previous years. The reasons for this and the implications are described in **Box 1**.

For most of the analyses, seasonally adjusted data and chained volume measures (CVM) (or constant prices) are used. For the income components of GDP, the analysis uses seasonally adjusted data but at current prices, not chained volume measures, due to the nature of how the data are collected and the difficulty of deflating the components.

Key conclusions

The key findings from the 2007 GDP revisions analysis are:

- the initial estimate of quarterly GDP growth is, on average, 0.15 percentage points below the latest estimate. This is statistically significant, but is reduced from the figure of 0.18, calculated following last year's *Blue Book* data set. This reflects lower revisions in the last year, due to the reasons given in **Box 1**
- within the compilation process for GDP, the largest mean revision is seen to happen post *Blue Book 2* (BB2). The month 1 (M1) estimate of quarterly GDP is the best indicator of the month 3 (M3) estimate. The results also indicate that the M3 estimate is a good indicator of the *Blue Book 1* (BB1) estimate, with the least reliable stage being BB2 to latest
- the reliability assessment indicates an overall improvement in the second time period for GDP, with improved reliability at all stages except M1 to M3
- for output components, the largest mean revisions are in agriculture, at 0.40 percentage points. The first

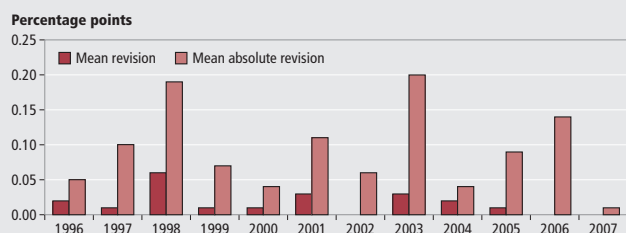
Box 1

Modernising the National Accounts and revisions

In the year since the last revisions article was written in Robinson and Obuwa (2006), the Office for National Statistics (ONS) has been heavily engaged in modernising its statistical systems. Full details are presented in Beadle (2007), but there are a number of implications for revisions work. In particular, revisions made in this year's *Blue Book* were smaller than usual, due to its reduced scope.

Figure 1 illustrates mean revisions to quarterly GDP growth, comparing the data published in each year's *Blue Book* with the data published in the previous quarter's Quarterly National Accounts First Release. For each year, revisions are averaged over the period from 1992Q1 up to each year's *Blue Book* date (published in either June or September).

Figure 1
Revisions made exclusively at *Blue Book* to GDP growth



It highlights the minimal revisions made in the 2007 *Blue Book*, when the mean absolute revision since 1992 was 0.01 per quarter. This compares with as much as 0.20 in September 2003, when annual chain linking was introduced, and 0.19 in September 1998, when the new European System of National Accounts (ESA95) was implemented. Average revisions in the 2007 *Blue Book* were zero, which has only happened twice since 1996.

In particular, the following revisions did not take place:

- previously planned methodological improvements – with the exception of own account software, these have been postponed until 2008. This includes major changes to GDP, caused by implementing financial intermediation services indirectly measured (FISIM), as well as a number of other smaller revisions. In previous *Blue Books*, methodological improvements have been a major cause of revisions. Changes to own account software had a big effect on GDP levels but a minimal impact on growth rates and were the only cause of revisions to data before 2005
- annual supply and use balancing – the process of reconciling annual estimates of production, expenditure and income in current prices through the Input-Output Supply and Use framework was not done this year. For the revisions period used, this only affects 2004, which would normally have been through a second annual supply and use balancing process
- benchmarking to annual surveys – while some benchmarking was carried out, some of the new data from annual surveys (in particular the annual business inquiry) and administrative data sources were not incorporated. Of the benchmarked data that were incorporated, this was not done using Input-Output Supply and Use
- re-referencing the base year and annual chain linking – the base year was not advanced to 2004. Although this only affects the level of each CVM series, it has an impact on growth rates in recent years

It is expected that revisions following modernisation will be higher than usual as postponed methodology and annual benchmarking are taken on, although some of these may be offsetting.

Revisions are just one aspect of quality. While measuring quality through revisions can be problematic in the short term, National Accounts are monitoring quality closely during this transitional period.

estimate of agriculture is also the least reliable, with total services the most reliable

- total services has the lowest mean absolute revision but the largest impact on gross value added (GVA), due to its proportion. Within total services, transport, storage and communication has the largest mean revision at 0.43 percentage points. Government and other services has the most reliable first estimate, while transport, storage and communication has the least reliable
- within expenditure, gross fixed capital formation (GFCF) has the largest mean revision, at 1.16 percentage points. Mean revisions to exports and imports are relatively large, at 0.77 and 0.61 percentage points, respectively. Of all the expenditure components,

the household final consumption expenditure (HHFCE) first estimate is the most reliable

- of the income components, financial corporations has the largest mean revision, at 4.71 percentage points. Compensation of employees has the most reliable first estimate

Approaches to measuring GDP

GDP can be measured using three theoretical approaches:

- production (or output)
- expenditure, and
- income

The production (or output) approach measures the sum of the value added created through the production of goods

and services within the economy; the expenditure approach measures the total expenditure on all finished goods and services produced within the economy; and the income approach measures the total income generated by the production of goods and services in the economy.

The components of each approach to measuring GDP are estimated through sample surveys and administrative sources. In the short run, forecasts and models can be used to estimate growth for the later months of the quarter, for which data have not yet been collected. These forecasts are replaced with the actual data when they become available. A single estimate is then derived through a balancing process and published as the official estimate of GDP. For more details on the balancing process see Box 2 in Robinson (2005).

GDP framework

The production of quarterly GDP in the UK follows a number of stages. The main stages of the production process are outlined below. Analysis of the availability of actual data at each stage has been covered in previous *Economic Trends* articles by Mahajan (2004) and Skipper (2005).

- **M1** – the first estimate of GDP quarterly growth is published around 25 days after the end of the quarter in the GDP Preliminary Estimate First Release. This preliminary estimate is based on about 40 per cent ‘actual’ data and is driven by the production approach to GDP
- **M2** – the second estimate is published around 55 days after the end of the quarter in the UK Output, Income and Expenditure First Release. This is based on about 60 per cent of actual output data, as well as early estimates of the expenditure and income estimates (about 60 per cent actual data)
- **M3** – the third estimate is published around 85 days after the end of the quarter in the Quarterly National Accounts First Release. This is based on about 80 per cent of actual data encompassing fuller survey data for components of production, expenditure and income. This release includes updated data for the estimate in the current quarter as well as updated estimates for earlier quarters
- **first estimate of annual GDP (BB1)** – annual GDP estimates are published in the *Blue Book*, usually in June. The quarterly data are updated again during the production of the first estimate of annual GDP, as data from new and more comprehensive annual data sources become available
- **second estimate of annual GDP (BB2)** – the second time an annual estimate is published in the *Blue Book*, Input-Output Supply and Use Tables are produced and used to reconcile the three measures of GDP for the first time. This was not carried out for the 2007 *Blue Book*, as detailed in Box 1
- **latest estimate** – the Input-Output Supply and Use balancing process is re-run in subsequent *Blue Books* using further benchmark data and any methodological improvements that are being implemented

In this article, revisions to quarterly GDP growth rates are analysed over the periods between:

- M1 and M3

- M3 and BB1 (the first time an annual estimate is published)
- BB1 and BB2 (the second time an annual estimate is published and the first time Input-Output Supply and Use is carried out), and
- BB2 and the latest estimate (post BB2)

For the analysis of quarterly GDP growth rates, the time series used runs from 1995Q1 to 2004Q4.¹ Taking the analysis only as far as 2004Q4 ensures that all the estimates have had at least three years to mature and have all been through two *Blue Books*.

Data in this article are comparable with the data used in the revisions analysis in GDP First Releases but the analysis is carried out over different time periods and so the summary statistics will not be the same. For consistency, revisions analyses in all ONS First Releases conform to a standard time period. In this article there is more flexibility in choosing the scope of the analysis. In addition, revisions here are analysed in relation to the stages of the compilation process, as outlined above. Analysis is based on a variety of statistical tools, and methods are outlined as follows:

- using time series graphs to chart the path and behaviour of revisions in different quarters covering the period 1995Q1 to 2004Q4
- analysing summary statistics like mean revision, mean absolute revision and root mean squared error (RMSE) to measure the size, scope and impact of revisions to GDP and its components.

For more details on RMSE see Box 1 in Robinson and Obuwa (2006). In brief, it indicates how well the initial estimate predicts the end value. A low RMSE suggests that the initial value was a good estimator, where a value of zero suggests a perfect estimator

- splitting the analysis period in half and using the RMSE to assess whether the reliability of initial estimates has improved or worsened. It is worth noting that the second time period will have been through fewer post-BB2 revisions compared with the first period
- using weighted mean absolute revisions to assess the impact revisions to GDP components have on headline GDP. Weighted mean absolute revision is the product of mean absolute revision and proportion of GVA/GDP of each component.
- applying a statistical test to the mean revisions to test if they are statistically significantly different from zero. For details on testing for significance in revisions see Box 1 in Robinson (2005). The outcome of the test gives an indication of whether the revisions pattern may have occurred by chance rather than due to a systematic over- or underestimation of earlier estimates.

Analysis of revisions to quarterly GDP growth

Figure 2 plots the path of GDP from 1992Q1 at each of the *Blue Books* going back to 1995. The thick red line represents the latest GDP quarterly growth rates. It

Figure 2

Historical path of GDP published in successive *Blue Books* 1995 to 2007

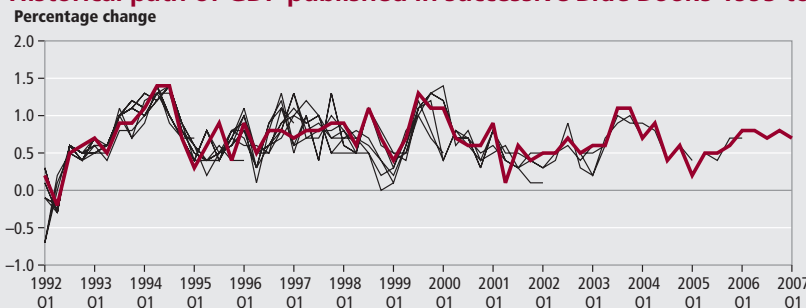


Figure 3

Total revisions to quarterly GDP growth, 1995Q1 to 2004Q4

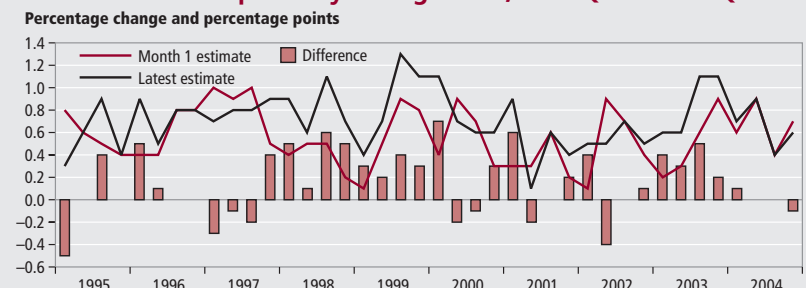
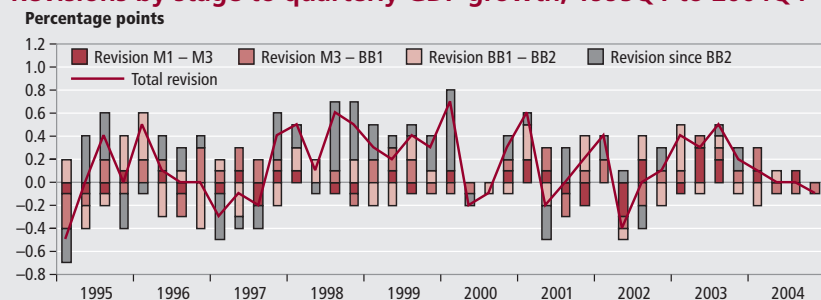


Figure 4

Revisions by stage to quarterly GDP growth, 1995Q1 to 2004Q4



demonstrates that although mean revisions have a tendency to be positive, downward revisions are also common.

Figure 3 shows GDP growth as the preliminary and the latest estimate (the *Blue Book* 2007 value) for any given quarter, with the total revision as the difference. Over the life cycle of a quarterly growth rate up to the latest estimate, it is evident the initial estimate tends to be revised upwards. Over the time period studied, the revisions to individual quarters range from -0.5 to $+0.7$ percentage points.

A recent paper released by the Organisation for Economic Co-operation and Development shows that the UK is one of a number of countries with significant upward revisions. However, the UK's revisions performance compares favourably with other countries in terms of the mean absolute revision.

Figure 4 shows the revisions for a given quarter broken down into the different stages of the production process. It shows that revisions can occur in either direction for each stage of the process. Revisions at M1 to M3 and BB1 to BB2 are fairly evenly distributed between positive and negative revisions, while revisions at M3 to BB1 and BB2 to latest are more likely to be positive. It also shows that offsetting revisions can be made for any given quarter at different stages of the process.

The revisions made at each stage of the process can, to some extent, be reconciled with the reasons for revisions given in Skipper (2007). In summary, the main causes of revisions are:

- later data or data replacing forecasts
- seasonal adjustment (either updates due to later data or annual changes to methodology)
- changes to adjustments (for instance, to help with balancing), or
- improvements to sources and methods

Table 1 gives more information about revisions by stage of the production process. It shows that the period from BB2 to latest is

the greatest contribution to total revisions.

For this period, revisions are positively biased, averaging 0.10 and the mean revision is significant. These revisions are primarily caused by methodological changes and/or changes to national accounting standards (rather than data changes).

The period from M3 to BB1 is also contributing positive revisions of 0.04 on average, mainly due to the incorporation of some annual data sources.

While these two stages have the largest mean revision, the mean absolute revision indicates that large revisions occur between BB1 and BB2, although positive and negative revisions are more equally balanced. The period between M1 and M3 contains the smallest revisions in terms of both the mean revision and the mean absolute revision.

It can be seen from the table that although the M1 estimate is a good indicator of the M3 estimate, with an RMSE value of 0.12, it is not such a good indicator for the latest estimate, as the total revisions RMSE value is 0.33.

Compared with the last time this analysis

was carried out (following the 2006 *Blue Book*), revisions in all periods have decreased, with revisions between M3 and BB1 no longer significant.

Revisions reflect reliability of the estimates and are used by some analysts to assess data uncertainty. By splitting the time period used for analysis in half, an assessment can be made about whether the reliability has improved or worsened, by comparing the summary statistics for one period against the other. The first period is 1995Q1 to 1999Q4 and the second period 2000Q1 to 2004Q4.

Table 2 displays marked differences between the two periods. Only revisions between M1 and M3 are greater in the second period, shown by a higher mean absolute revision and RMSE. Table 2 also shows that revisions occurring later in the process perform comparatively better in the second period. M1 to M3 is the only period to show a switch in sign of the mean revision between the two periods.

Production (output) components

The production (or output) approach to GDP measures the sum of GVA, created through the production of goods and services within the economy. In theory, this is the total output less the intermediate consumption of goods and services used up in the production process. However, for short-term volume measurement, and in practice, this is done by using proxies for GVA. Examples of such proxies are deflated turnover and volume measures of production.

The production approach in volume terms actually measures GVA rather than

Table 1

Summary statistics for revisions to quarterly GDP growth, 1995Q1 to 2004Q4

Revisions period	Mean revision	Mean absolute revision	Variance	RMSE	Significant?
M1 to M3	0.01	0.09	0.02	0.12	No
M3 to BB1	0.04	0.13	0.02	0.15	No
BB1 to BB2	0.01	0.16	0.04	0.20	No
BB2 to latest	0.10	0.20	0.06	0.26	Yes
Total revisions	0.15	0.26	0.08	0.33	Yes

Table 2

Summary statistics for the reliability of GDP estimates, 1995–99 and 2000–04

Revisions period	Mean revision		Mean absolute revision		RMSE	
	1st period	2nd period	1st period	2nd period	1st period	2nd period
M1 to M3	-0.02	0.04	0.08	0.11	0.10	0.15
M3 to BB1	0.06	0.02	0.15	0.12	0.17	0.13
BB1 to BB2	0.00	0.02	0.20	0.13	0.23	0.17
BB2 to latest	0.12	0.08	0.27	0.14	0.31	0.22
Total revisions	0.16	0.14	0.27	0.11	0.34	0.32

Note:

1st period represents 1995Q1 to 1999Q4 and 2nd period 2000Q1 to 2004Q4.

GDP. GDP is GVA plus taxes on products less subsidies on products. Since it is not possible to split these taxes on products less subsidies on products by industry, the production approach measures GVA (not GDP) at industry level.

The main industry breakdowns used for the production approach in volume terms are:

- agriculture, forestry and fishing
- total production
- construction, and
- total services

The analysis for the main industry breakdowns covers the period 1996Q1 to 2004Q4 for the M3 estimates, with M2 estimates available from 1998Q4. For total services, M1 estimates are also available from 1998Q4.

Table 3 shows the summary statistics for revisions (first available period to latest) to growth rates for the main industry breakdown.

The largest mean revision is to agriculture at 0.40 percentage points, and the much larger mean absolute revision indicates that there have been both large positive and negative revisions over the time period. Out of the main output components, the RMSE indicates that the first estimate is the best indicator of the latest estimate for total services, with agriculture having the least reliable estimate. Although the mean revision to total production and total services is similar in size, the reliability of the services estimate is due the lower variance of revisions. None of the mean revisions are statistically significant.

All mean absolute revisions and RMSE

Table 3

Summary statistics for the main output components, 1996Q1 to 2004Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision		RMSE	Statistically Significant?	Weighted mean absolute revision
			revision	Variance			
Agriculture	1.0	0.40	1.98	9.86	3.17	No	0.02
Total production	18.5	0.20	0.62	0.48	0.72	No	0.11
Construction	6.1	0.04	0.93	1.29	1.14	No	0.06
Total services	74.4	0.16	0.29	0.11	0.37	No	0.22

values are slightly lower than when this analysis was last published in December 2006. This indicates that recent revisions have been smaller.

Figure 5 shows the mean absolute revision alongside the weighted mean absolute revision (using the percentage of GVA for each main component). Revisions to total services have the biggest impact on revisions to total GVA, despite having the smallest mean absolute revision.

Summary of revisions to production components

Analysis of revisions to quarterly growth rates for the main production components is available in Appendix A to this article on the National Statistics website at www.statistics.gov.uk/cci/article.asp?id=1888

A summary of the results is presented here. They focus on the results of the data reliability assessment which uses the same theory as for the GDP analysis – by splitting the sample of quarters in half, an assessment can be made about whether data reliability is improving or worsening over time. Periods chosen are the same length and contain complete years to avoid having an unequal number of *Blue Book* quarters, where revisions tend to be higher.

Agriculture

The total mean revision is smaller in the second period, although the mean absolute revision is larger. The RMSE shows that data reliability between the first and latest estimates over the two periods deteriorated considerably. This reflects decreased reliability at initial stages of the process, particularly M3 to BB1.

Total production

While the mean revision increased in the second period, the mean absolute revision decreased. The RMSE shows that data reliability between the first and latest estimates improved between periods, largely due to increased reliability of the BB2 estimate as an indicator of the latest estimate.

Construction

The negative total mean revision value grew in the second period, although the mean absolute revision is similar between the two quarters. The reliability of the first estimate as an indicator of the latest estimate decreased slightly, driven by the worsening reliability of the BB1 estimate as an indicator of the BB2 estimate.

Total services

The total mean revision is smaller in the second period, with the mean absolute revision similarly decreasing. The reliability of the first estimate as an indicator of latest estimate improved considerably, driven by enhanced reliability for the BB2 estimate in reflecting the latest value.

Total services sub-components

Since total services make up a large proportion of total GVA (74.4 per cent in 2003), an analysis has been carried out on the key sub-components of services.

The breakdown for total services is:

- distribution, hotels and catering
- transport, storage and communication
- business services and finance, and
- government and other services

The analysis for the services breakdown covers the period 1996Q1 to 2004Q4 for the M3 estimates, with M2 estimates available from 1998Q4. For distribution, hotels and catering, M1 estimates are also available from 1998Q4.

Table 4 shows the summary statistics for revisions to growth rates for the main services breakdown.

The largest mean revision is to transport, storage and communication, at 0.43 percentage points, and a relatively large mean absolute revision. The mean revision for government and other services is zero, but the mean absolute revision of 0.32 indicates that there have been positive and negative revisions in different quarters.

Of the key services sub-components, the RMSE indicates that the first estimate is the best indicator of the latest estimate for government and other services, with

Figure 5

Mean absolute revision and weighted mean absolute revision for the main output components, 1996Q1 to 2004Q4

Percentage points

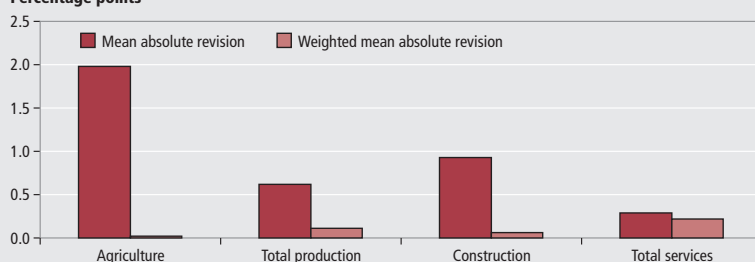


Table 4
Summary statistics for the main services sub-components, 1996Q1 to 2004Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision	Variance	RMSE	Statistically Significant?	Weighted mean absolute revision
Distribution, hotels and catering	15.3	0.28	0.59	0.45	0.73	Yes	0.09
Transport, storage and communications	7.8	0.43	0.83	0.99	1.08	Yes	0.06
Business services and finance	27.7	0.24	0.54	0.40	0.68	No	0.15
Government and other services	23.5	0.00	0.32	0.18	0.43	No	0.08

Figure 6

Mean absolute revision and weighted mean absolute revision for the main services sub-components, 1996Q1 to 2004Q4

Percentage points

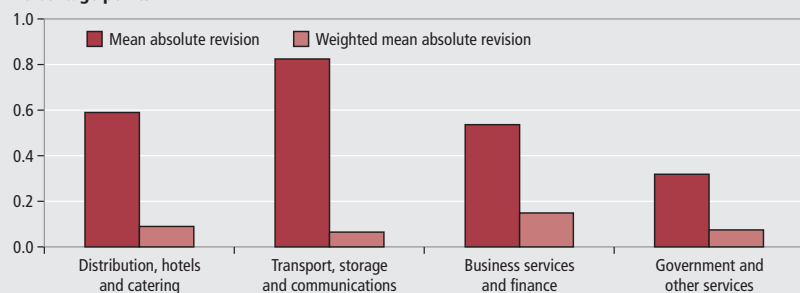


Table 5
Summary statistics for revisions to the main expenditure components of GDP, 1996Q1 to 2004Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision	Variance	RMSE	Statistically Significant?	Weighted mean absolute revision
HHFCE	62.8	0.01	0.41	0.29	0.53	No	0.26
NPISH	2.4	-0.41	0.95	1.27	1.20	No	0.02
GGFCE	21.0	-0.06	0.62	0.71	0.84	No	0.13
GFCF	16.1	1.16	2.19	6.10	2.73	Yes	0.35
Exports	25.7	0.77	1.46	3.55	2.03	Yes	0.38
Imports	-28.4	0.61	1.16	1.60	1.41	Yes	-0.33
Inventories	0.4	n/a	n/a	n/a	n/a	n/a	n/a

transport, storage and communication the least reliable.

The mean revision between the first and latest estimates is statistically significant for distribution, hotels and catering and transport, storage and communication.

Compared with last year's analysis, only government and other services displays an increase in the mean absolute revision and the RMSE value.

Figure 6 shows the mean absolute revision alongside the weighted mean absolute revision (using the percentage of GVA for each main component). Revisions to business services and finance are the biggest cause of revisions to total services.

Summary of revisions to services sub-components

Analysis of revisions to quarterly growth rates for the key services components is available in Appendix A to this article on the National Statistics website at www.statistics.gov.uk/ccl/article.asp?id=1888

A summary of the results is presented

here, focusing on the results of the data reliability assessment.

Distribution, hotels and catering

Data reliability overall has worsened in the second period compared with the first, driven by poorer reliability at the start of the process, between M3 and BB1.

Transport, storage and communications

Data reliability has improved overall and at each stage of the process when comparing the two periods. There were particularly large improvements in reliability for the BB2 estimate as an indicator of the latest estimate.

Business services and finance

Data reliability has improved overall as a result of improved reliability at each stage of the process, most noticeably for BB2 compared with the latest estimate.

Government and other services

Data reliability is better overall in the second period with a lower RMSE, driven

by the reliability for BB2 in indicating the latest estimate.

Expenditure components

The expenditure measure of GDP calculates the total expenditure on final demand for UK-produced goods and services (also described as total domestic expenditure, adjusted for trade). The main components are:

- HHFCE – household final consumption expenditure
- NPISH – final consumption expenditure by non-profit institutions serving households
- GGFCE – general government final consumption expenditure
- GFCF – gross fixed capital formation
- changes in inventories
- exports of goods and services
- less imports of goods and services

The analysis of most expenditure components covers the period 1996Q1 to 2004Q4. Expenditure components are first published at M2 and so, for this analysis, the first revisions period investigated will be M2 to M3 rather than M1 to M3. Analysis for the NPISH component will cover the period 1998Q3 to 2004Q4. This is because NPISH was first published as a separate series in 1998Q3. M2 revisions for imports and exports are only available from 1998Q3 and 1998Q4, respectively.

Table 5 shows summary statistics for the revisions (first available estimate to latest) to growth rates of expenditure measure components of GDP. Revisions to growth rates of changes in inventories are not included. Analysis of growth rates to changes in inventories would not be meaningful because the underlying estimate is a flow and is published as levels rather than growth.

The largest mean revision is to GFCF, at 1.16 percentage points, with a much larger mean absolute revision. The comparatively large RMSE indicates that the first estimate at M2 is not a good indicator of the latest estimate.

Mean revisions to exports and imports are relatively large, with a high RMSE indicating that the first estimate for both components is not a good indicator of their respective latest estimates.

For the period covered, the mean revision to HHFCE is almost zero, at 0.01. The mean absolute revision of 0.41 percentage points shows that there were small positive and negative revisions, which cancelled each other out over the time period analysed. The comparatively low RMSE of 0.53 percentage points indicates that of all the expenditure components, the first HHFCE estimate is the

best indicator of the latest estimate.

Mean revisions to exports and imports are statistically significant largely due to trade associated with VAT Missing Trader Intra-Community (MTIC) fraud. The estimates of the impact of MTIC fraud on the trade statistics are volatile and difficult to predict. For more detailed analysis of this impact, see Ruffles et al (2003).

Table 5 also shows that mean revisions to GFCF are statistically significant. The statistical significance of GFCF and exports revisions comes despite comparatively large variances, indicating there are normally large revisions to these components. Mean revisions to HHFCE, NPISH and GGFCE are not statistically significant.

Compared with last year's analysis, GGFCE and total exports show a worsening of the mean absolute revision and RMSE; other components show an improvement.

The weighted mean absolute revision shows that revisions to HHFCE have a bigger impact on GDP compared with that made by revisions to GGFCE. The weighted mean absolute revision for NPISH of 0.02 shows the minimal impact revisions to this component has on overall GDP. This is highlighted in **Figure 7**, which shows mean absolute revisions alongside their weighted counterparts.

Although the mean absolute revision for GFCF is highest at 2.19, because of its smaller proportion of GDP, the overall impact is similar in size to that made by revisions to exports and imports, which both have lower mean absolute revisions. This is illustrated in **Figure 7**.

Summary of revisions to expenditure components

Analysis of revisions to quarterly growth in the expenditure components of GDP is contained in Appendix B to this article on the National Statistics website at <<add weblink>>. As with headline GDP, analysis is based on splitting the time period in half and assessing whether the reliability has improved or worsened. The first period is from 1997Q1 to 2000Q4 and the second

period from 2001Q1 to 2004Q4 (for NPISH, the first period is from 1999Q1 to 2001Q4 and the second period from 2002Q1 to 2004Q4). A summary of the results is presented here.

HHFCE

The results show the total mean revision changed to a negative in the second period, with the mean absolute revision falling between the periods. The RMSE compared across the two time periods for total revisions shows that the reliability of the M2 estimate as an indicator for the latest estimate improved in the second period. This is due to smaller mean absolute revisions over the period from the second *Blue Book* published figure to the latest estimate for the second period.

NPISH

The total mean revision has a larger negative value in the second period, although the mean absolute revision is smaller. The RMSE shows that the reliability of the M2 estimate as an indicator for the latest estimate improved in the second period.

GGFCE

The total mean revision is little changed from the first period to the second period. There is also little difference in the mean absolute revision and RMSE between periods, although both are marginally improved in the second period.

GFCF

The total mean revision is larger in the second period compared with the first, with the mean absolute revision increasing likewise. The RMSE shows that the reliability of the M2 estimate as an indicator of the latest estimate worsened in the second period.

Inventories

In the second period, the total mean revision is larger, with the mean absolute revision showing a significant increase. The reliability of the M2 estimate as an indicator of the latest estimate worsened markedly in the second period.

Exports

The total mean revision (M3 to latest) is larger in the second period compared with the first, but the mean absolute revision decreased. The reliability of the M3 estimate as an indicator of latest estimate improved in the second period.

Imports

The total mean revision (M3 to latest) is larger in the second period compared with the first and the mean absolute revision also increased. The reliability of the M3 estimate as an indicator of latest estimate worsened in the second period.

Income components

The income approach to GDP measures the total income generated by the production of goods and services within the economy. It is broken down into categories according to who has earned the income. The main components are:

- compensation of employees (CoE) – primarily made up of wages and salaries
- public corporations – gross operating surplus of public non-financial corporations
- private non-financial corporations (PNFCs) – gross operating surplus of private non-financial corporations
- financial corporations – gross operating surplus of financial corporations
- other income – includes mixed income which covers the income of the self-employed
- taxes on products less subsidies on products

The gross operating surplus is made up of gross trading profits, rental and holding gains/losses of inventories.

Analysis of income components covers the period from 1998Q2 to 2004Q4, using seasonally adjusted current price data as opposed to chained volume data used for the output and expenditure components. M2 data for CoE is available from 1999Q1. M2 data for other income and taxes and products less subsidies is available from 1998Q3.

Table 6 shows summary statistics for the revisions to growth rates of components of the income measure of GDP.

The largest mean revision is to financial corporations, at 4.71 percentage points. A markedly larger mean absolute revision indicates that there have been both large positive and negative revisions over the period. The mean revision to public corporations is relatively large without regard to sign, and this too has a comparatively larger mean absolute revision.

Figure 7

Mean absolute revision and weighted mean absolute revision for the main expenditure components of GDP, 1996Q1 to 2004Q4

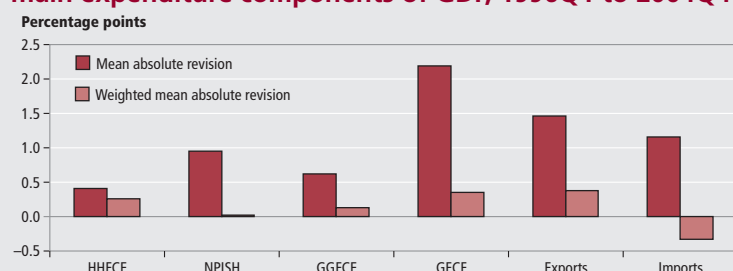


Table 6

Summary statistics for revisions to the main income components of GDP, 1998Q2 to 2003Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision	Variance	RMSE	Statistically Significant?	Weighted mean absolute revision
CoE	55.6	0.20	0.43	0.28	0.57	No	0.24
Public non-financial corporations	7.0	-2.03	8.32	149.93	12.41	No	0.05
Private non-financial corporations	18.2	0.25	2.10	6.09	2.48	No	0.38
Financial corporations	3.6	4.71	28.27	1,970.41	44.64	No	1.02
Other income	9.2	-1.56	4.87	31.85	5.86	No	0.45
Taxes on products less subsidies on products	12.7	-0.05	1.19	2.20	1.49	No	0.15

Figure 8

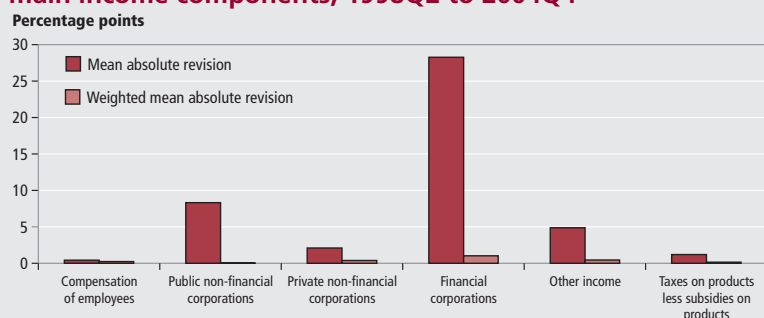
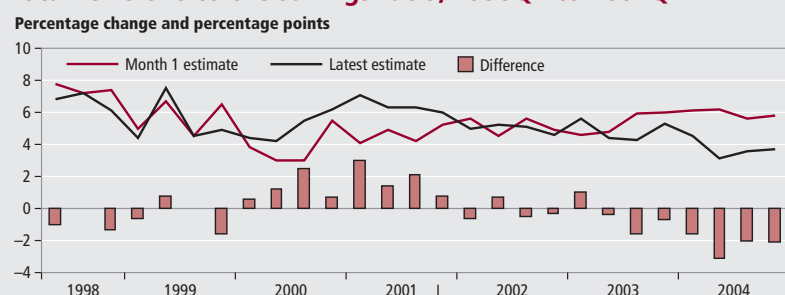
Mean absolute revision and weighted mean absolute revision for the main income components, 1998Q2 to 2004Q4

Figure 9

Total revisions to the savings ratio, 1998Q2 to 2004Q4

The first estimate is the best indicator of its latest estimate for CoE, shown by having the lowest RMSE value at 0.57. The first estimate for financial corporations is the least reliable indicator of its latest estimate.

Despite CoE being significant when last year's analysis was carried out, none of the components are significant. This is due to a decrease in the CoE mean revision. Of the six components, only CoE and private non-financial corporations have not improved since last year, based on the mean absolute revision and the RMSE.

In Table 6, the weighted mean absolute revision shows that revisions to financial corporations have the biggest impact on GDP, a reflection of the large mean absolute revision of this component. The table also shows that revisions to PNFCs and other income also have a notable impact on headline GDP. Figure 8 illustrates the comparison between mean absolute revision and weighted mean absolute

revision for all income components.

Also evident from Table 6 is the minimal impact revisions to CoE and taxes on products less subsidies have on headline GDP, despite together accounting for 68.3 per cent of the income measure. This is mainly due to the low mean absolute revisions of both components.

The savings ratio

The household savings ratio calculates household saving as a percentage of total gross household disposable income, adjusted for changes in net equity of households in pension funds. It is published quarterly within the *UK Economic Accounts*, which coincides with M3.

Revisions to the savings ratio are not significant. Figure 9 shows that, during 2000 and 2001, there were eight successive positive revisions. However, the mean revision is negative, largely due to seven successive quarters of negative revisions at the end of the series. The mean absolute revision is 1.19.

Notes

- Due to historical reasons and availability of data, the analyses of revisions to the quarterly growth rates for the components of each of the three measures could not be carried out in all cases for consistent time periods. Details of the time periods which were used for each of the three approaches are outlined just before the analysis.

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