FEATURE

Revisions to quarterly GDP growth and its components

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SUMMARY

This article presents the results of the latest revisions analysis of gross domestic product (GDP), updating and developing the previous article, Meader (2007) published in November 2007. 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 Office for National Statistics website at: www.statistics.gov.uk/cci/article.asp?id=2154

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).

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.[1]

This analysis includes revisions made up to and including *Blue Book* 2008, although the time span used runs over ten years, from 1996 Q1 to 2005 Q4. 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 at current prices rather than CVM, due to the nature of the data collected and the difficulty of deflating the components.

Key findings

The key findings from the 2008 GDP revisions analysis are:

- The initial estimate of quarterly GDP growth is, on average, 0.17 percentage points below the latest estimate. This is statistically significant and is higher than the figure of 0.15, calculated following last year's *Blue Book* dataset. This reflects lower revisions in the last year, due to the reasons given in **Box 1**
- The largest mean revision takes place at *Blue Book* 2 (BB2). Estimates made at month 1 (M1) and BB2 are statistically significant, indicating systematic underestimation at these stages
- The reliability assessment indicates that BB2 provides a more reliable indicator of the latest estimates than initial estimates made in M1. There has been an overall improvement in the second time period (2001 to 2005) for GDP, with improved reliability at all stages except M1 to M3
- Of the production components, the largest mean revisions are in agriculture, at 0.53 percentage points. The first estimate of agriculture is also the least reliable, while total services is 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 communications has the largest mean revision, at 0.60 percentage points, and has the least reliable first estimate. Government and other services has the most reliable first estimate
- Of the expenditure components, gross fixed capital formation (GFCF)

Box 1

Revisions and phase 1 of the modernisation of the UK National Accounts

Humphries (2008) explains the current position concerning the modernisation of the UK National Accounts. *Blue Book* 2008 represents the first phase of this modernisation and reintroduces benchmarking to annual survey data and methodological improvements which were suspended for the *Blue Book* 2007. In addition, annual data for 2004 to 2006 were balanced using the supply and use framework (see the section 'Approaches to measuring GDP').

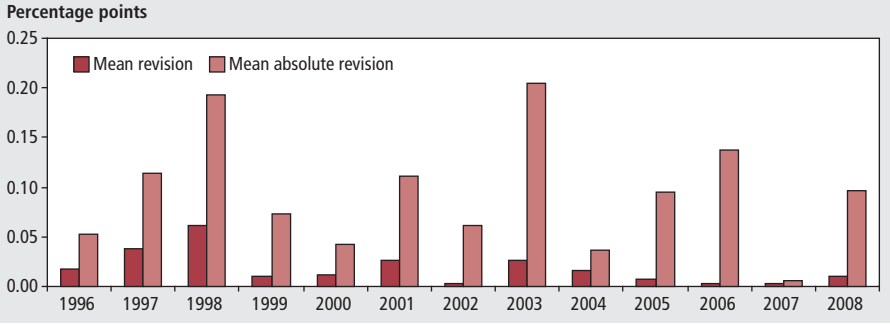
Revisions made in *Blue Book* 2008 were more substantial than those made in the *Blue Book* 2007, owing to the reintroduction of balancing, benchmarking and methodological improvements. Revisions extended back to 1961, due to the introduction of a new methodology for estimating FISIM (financial intermediation services indirectly measured). An analysis of the impact of the new treatment of FISIM on GDP growth can be seen in Meader and Tily (2008).

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 1992 Q1 up to each year's *Blue Book* date (published in either June or September).

It highlights the minimal revisions made in *Blue Book* 2007 and the increase in revisions in *Blue Book* 2008, when the absolute average revision since 1992 was 0.10 percentage points 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 (ESA 95) was implemented. The average revision since 1992 has been 0.01.

Revisions analysis is 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. To this end, a new coherence statement, which provides an assessment of the coherence of the three measures of GDP, has been incorporated into the Quarterly National Accounts First Release.

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



Source: Office for National Statistics

has the largest mean revision, at 1.08 percentage points. Mean revisions to exports and imports are large, relative to other components, at 0.85 and 0.68 percentage points, respectively. Household final consumption expenditure (HHFCE) has a more reliable first estimate than any other expenditure component

- 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 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 goes through 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 articles by Mahajan (2004) and Skipper (2005) in *Economic Trends*.

- 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 (as opposed to forecast 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 80 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 90 per cent of actual output data and 80 per cent of actual expenditure and income data. 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
- Latest estimate – the Input-Output Supply and Use balancing process is rerun in subsequent *Blue Books* using further benchmark data and incorporating significant methodological improvements

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 1996 Q1 to 2005 Q4.[2,3] Taking the analysis only as far as 2005 Q4 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 Office for National Statistics (ONS) First Releases conform to a standard time period. Revisions 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 below.

- Using time series graphs to chart the path and behaviour of revisions in different quarters, covering the period 1996 Q1 to 2005 Q4
- Analysing summary statistics such as 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 1992 Q1, and shows the spread of revisions made at *Blue Books* going back to 1995. The thick black line represents the latest Blue Book GDP quarterly growth rates.

Figure 3 shows GDP growth as the preliminary and the latest estimate (the *Blue Book* 2008 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 +0.8 percentage points.

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. Positive and negative revisions at M1 to M3 and BB1 to BB2 are fairly evenly distributed, 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.

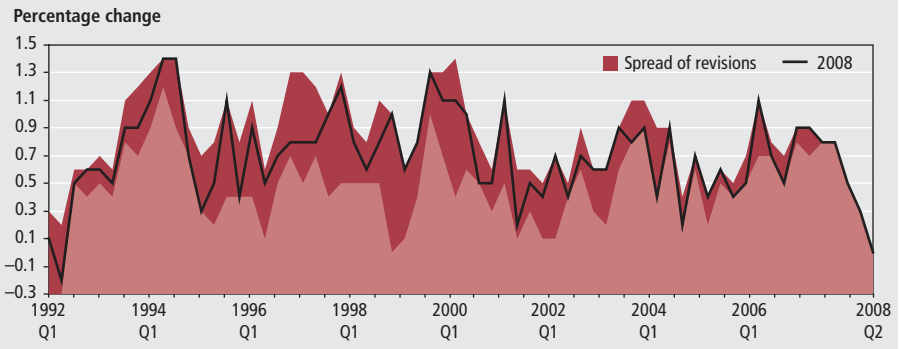
The revisions made at each stage of the process can, to some extent, be reconciled with the reasons for revisions given in Skipper (2007). In summary, the main causes of revisions are:

- 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 made at each stage of the production process. It shows that the most substantial revisions take place in the period from BB2 to latest. These revisions are statistically significant, indicating systematic underestimation at BB2, and are primarily caused by methodological changes and/or changes to national accounting standards (rather than data changes).

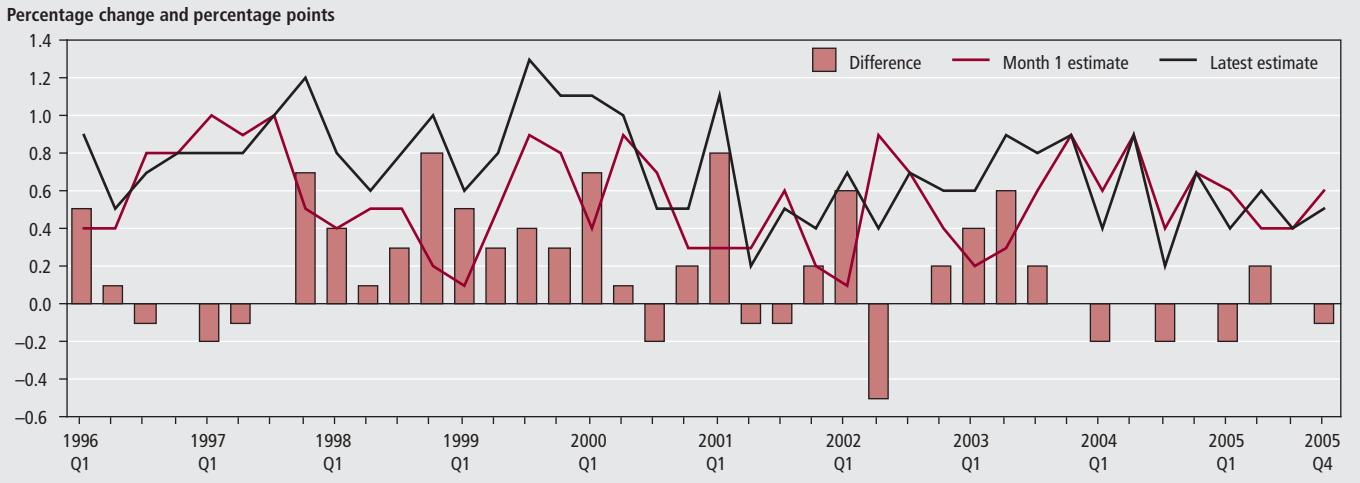
A relatively large mean absolute revision but a small mean revision for the period BB1 and BB2 indicates that positive and negative revisions are more equally balanced than other periods such as M3 to BB1. The period between M1 and M3

Figure 2
Historical path of GDP published in successive (1996 to 2008) *Blue Books*



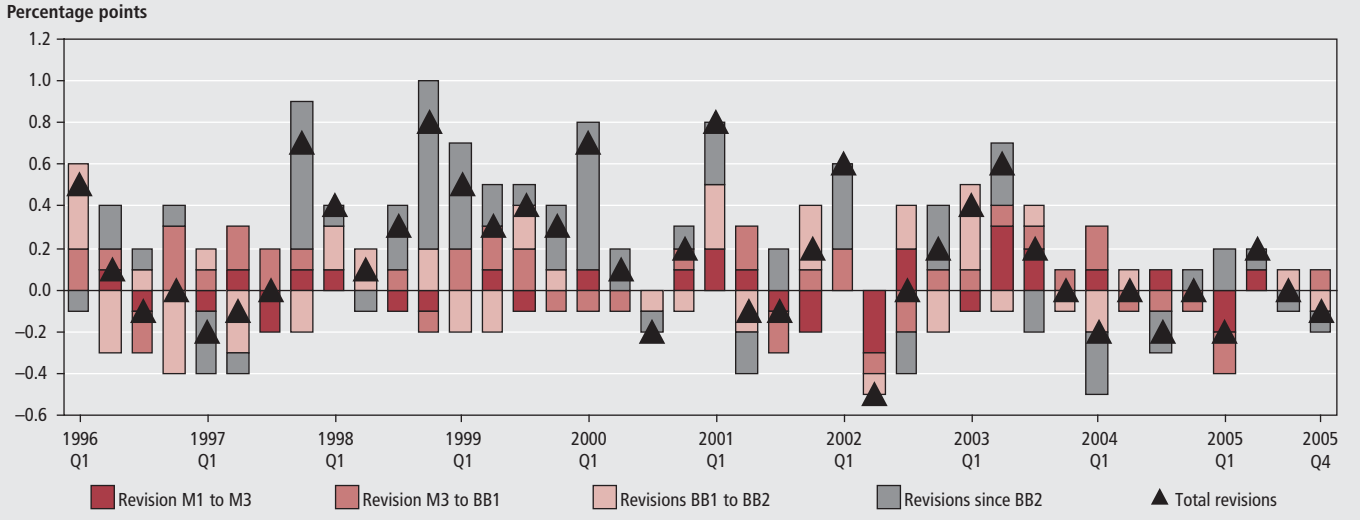
Source: Office for National Statistics

Figure 3
Total revisions to quarterly GDP growth



Source: Office for National Statistics

Figure 4
Revisions by stage to quarterly GDP growth



Source: Office for National Statistics

Table 1
Summary statistics for revisions to quarterly GDP growth, 1996 Q1 to 2005 Q4

Revisions period	Mean revision	Mean absolute revision	Variance	Root mean squared error	Significant?
M1 to M3	0.01	0.09	0.02	0.12	No
M3 to BB1	0.04	0.12	0.02	0.14	No
BB1 to BB2	0.01	0.15	0.04	0.19	No
BB2 to latest	0.11	0.21	0.07	0.28	Yes
Total revisions	0.17	0.27	0.10	0.36	Yes

Source: Office for National Statistics

contains the least 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 0.36.

Compared with the last time this analysis was carried out (following *Blue Book* 2007) revisions have increased slightly in periods following BB1.

Revisions reflect reliability of the estimates and are used by some analysts to assess data uncertainty. By dividing the time period used for analysis into two halves, an assessment can be made as to whether the reliability has improved or worsened by comparing the summary statistics for one period against the other. Periods chosen are the same length and contain complete years to avoid having an unequal number of *Blue Book* quarters.

Table 2 displays marked differences between the two periods, 1996 Q1 to 2000 Q4 and 2001 Q1 to 2005 Q4. Only revisions between M1 and M3 are higher in the second period, shown by the mean absolute revision and the RMSE. Table 2 shows that revisions occurring later in the process perform comparatively better in the second period. BB1 to BB2 is the only period to show a switch in sign of the mean revision between the two periods.

The revisions performance of the UK compares favourably with other countries, shown by a paper released in 2007 by the Organisation for Economic Co-operation and Development. The UK is one of a number of countries with significant upward revisions.

Table 2
Summary statistics for the reliability of GDP estimates

	Mean revision		Mean absolute revision		Root mean squared error	
Revisions period	1996Q1 to 2000Q4	2001Q1 to 2005Q4	1996Q1 to 2000Q4	2001Q1 to 2005Q4	1996Q1 to 2000Q4	2001Q1 to 2005Q4
M1 to M3	0.00	0.02	0.07	0.11	0.09	0.15
M3 to BB1	0.07	0.02	0.13	0.12	0.15	0.14
BB1 to BB2	–0.02	0.03	0.17	0.13	0.21	0.17
BB2 to latest	0.19	0.03	0.26	0.16	0.35	0.21
Total revisions	0.24	0.09	0.30	0.11	0.39	0.33

Source: Office for National Statistics

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 output.

The production approach in volume terms actually measures GVA rather than 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 1996 Q1 to 2005 Q4 for the M3 estimates, with M2 estimates available from 1998 Q4. For total services, M1 estimates are also available from 1998 Q4.

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 0.53 percentage points, and the much larger mean absolute revision indicates that there have been both large positive and negative revisions over the time period. Of the main production 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 higher due to the lower variance of revisions. The mean revision of the service industries is now statistically significant in contrast to last year's analysis, although the year-on-year changes to the mean revision and variance were small.

For the production and construction industries, mean absolute revisions and RMSE values are slightly lower than when this analysis was last published in November 2007, indicating that recent revisions have declined for these industries.

Figure 5 shows the mean absolute revision alongside the weighted mean absolute revision (using the percentage of total GVA represented by 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 (output) components is available in Appendix A to this article on the ONS website.

A summary of the results is presented here. They focus on the results of the data reliability assessment and how this has changed between the two analysis periods.

Agriculture

The total mean revision is larger in the second period, although the mean absolute revision is smaller. The RMSE shows that data reliability between the first and latest estimates over the two periods has improved.

Total production

While the mean revision increased in the second period, the mean absolute revision decreased. The RMSE shows data reliability between the first and latest estimates improved between periods, BB2 being a much more reliable estimate of the latest figure in the second period than in the first period.

Construction

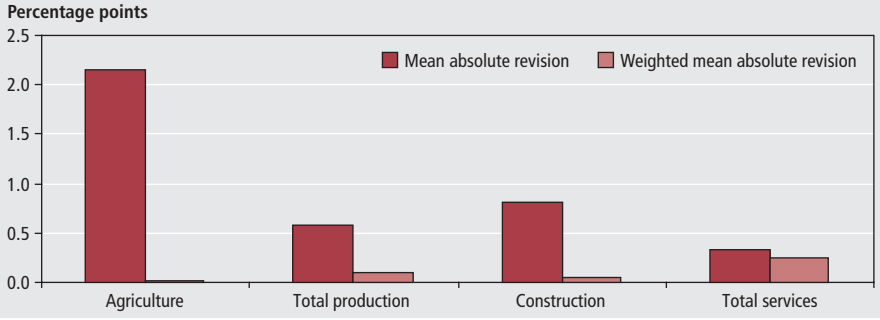
The total mean revision value switched from being positive in the first period to negative in the second period, and the mean absolute revision grew between the two periods. The reliability of the first estimate

Table 3
Summary statistics: by main production components, 1996 Q1 to 2005 Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision	Variance	Root mean squared error	Statistically significant?	Weighted mean absolute revision
Agriculture	*0.010*	0.53	2.16	9.59	3.14	No	0.02
Total production	*0.180*	0.20	0.57	0.46	0.71	No	0.10
Construction	*0.059*	0.01	0.82	1.08	1.04	No	0.05
Total services	*0.752*	0.19	0.34	0.15	0.43	Yes	0.25

Source: Office for National Statistics

Figure 5
Mean absolute revision and weighted mean absolute revision: by main production component, 1996 Q1 to 2005 Q4



Source: Office for National Statistics

as an indicator of the latest estimate decreased slightly, although the BB2 estimate has improved.

Total services

The total mean revision is lower in the second period, with the mean absolute revision similarly decreasing. The reliability of the first and BB2 estimates as indicators of the latest estimate has improved considerably.

Total services sub-components

Since total services make up a large proportion of total GVA (75.2 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 communications
- business services and finance, and
- government and other services

The analysis for the services breakdown covers the period 1996 Q1 to 2005 Q4 for the M3 estimates, with M2 estimates available from 1998 Q4. For distribution, hotels and catering, M1 estimates are also available from 1998 Q4.

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 0.60 percentage points. The lowest mean revision is to government and other services, although the mean absolute revision of 0.38 indicates that there have been positive and negative revisions in different quarters.

The RMSE indicates that the first estimate for government and other services is the best estimator of the latest estimate in comparison with other components, with transport, storage and communications the least reliable.

The mean revision between the first and latest estimates is statistically significant for transport, storage and communication and business, services and finance.

Compared with last year's analysis, the reliability of estimates as shown by the mean absolute revision and the RMSE value has declined for all service components.

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 ONS website.

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 improved in the second period compared with the first, with a significant improvement in the reliability of the BB2 estimate.

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 the reliability of 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 slightly worse in the second period although the BB2 estimate has improved.

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

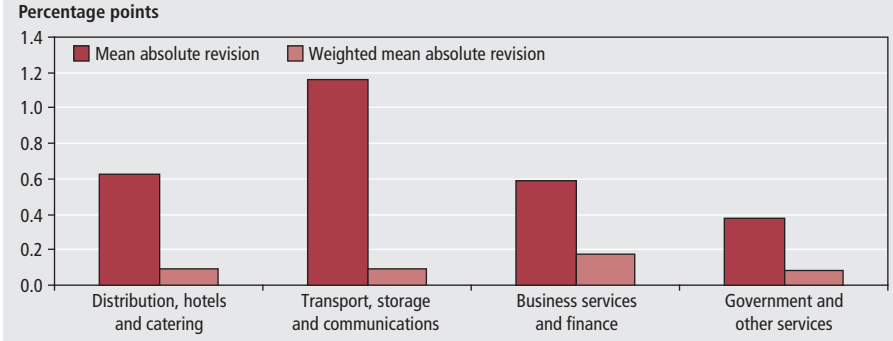
The analysis of most expenditure components covers the period 1996 Q1 to 2005 Q4. Expenditure components are first published at M2 and so, for this analysis, the first revisions period investigated will be M2 to M3 rather than M1 to M3. Analysis for the NPISH component will cover the period 1998 Q3 to 2005 Q4. This is because NPISH was first published as a separate series in 1998 Q3. M2 revisions for imports

Table 4
Summary statistics: by main services sub-components, 1996 Q1 to 2005 Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision	Variance	Root mean squared error	Statistically significant?	Weighted mean absolute revision
Distribution, hotels and catering	*0.148*	0.04	0.63	0.67	0.82	No	0.09
Transport, storage and communications	*0.076*	0.60	1.16	1.95	1.52	Yes	0.09
Business services and finance	*0.299*	0.33	0.59	0.48	0.76	Yes	0.18
Government and other services	*0.229*	–0.03	0.38	0.27	0.52	No	0.09

Source: Office for National Statistics

Figure 6
Mean absolute revision and weighted mean absolute revision: by main services sub-component, 1996 Q1 to 2005 Q4



Source: Office for National Statistics

and exports are only available from 1998 Q3 and 1998 Q4, 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 such rates 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 1.08 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.

For the period covered, the mean revision to HHFCE is almost zero, at 0.04. However, the mean absolute revision of 0.39 percentage points shows there were positive and negative revisions, which cancelled each other out over the time period analysed. The comparatively low RMSE of 0.51 percentage points indicates that of all the expenditure components, the HHFCE estimate has the most reliable first estimate.

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

Table 5 also shows that the mean revisions to GFCF, imports and exports are statistically significant, indicating systematic underestimation, despite relatively large variances. Mean revisions to HHFCE, NPISH and GGFCE are not statistically significant.

Compared with last year's analysis, all expenditure components show an improvement to the mean absolute revision and RMSE.

Figure 7 illustrates the impact of revisions to individual components on GDP. This shows that, despite the varying size of the mean absolute revisions, the weighted mean absolute revisions for GFCF, exports and imports are similar in size.

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 ONS website.

As with headline GDP, the analysis is based on dividing the time period into two halves and assessing whether the reliability has improved or worsened. The first period is from 1996 Q1 to 2000 Q4 and the second from 2001 Q1 to 2005 Q4 (for NPISH, the first period is from 1999 Q1 to 2002 Q2 and the second from 2002 Q3 to 2005 Q4). A summary of the results is presented here.

Household final consumption expenditure

The results show that 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 following BB2 estimates.

Non-profit institutions serving households

The mean absolute revision and the RMSE are both higher in the second period, with the average revision being downward.

General government final consumption expenditure

The total mean revision is little changed from the first period to the second period. The mean absolute revision and RMSE between periods are both improved in the second period.

Gross fixed capital formation

While the total mean revision is smaller in the second period compared with the first, the mean absolute revision increased. The RMSE shows 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 the latest estimate worsened in the second period.

Imports

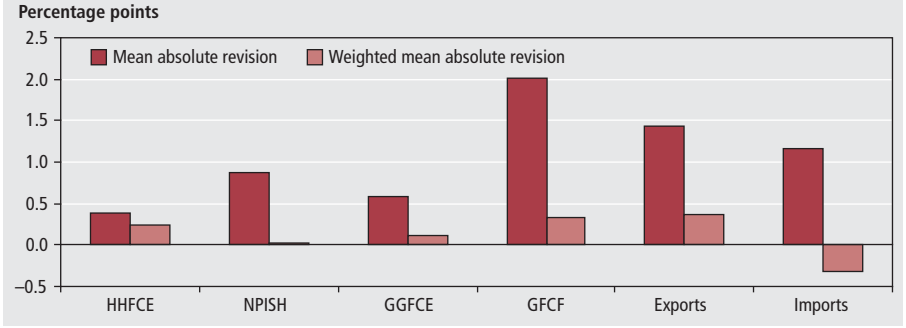
The total mean revision (M3 to latest) is larger in the second period compared with the first and the mean absolute revision also

Table 5
Summary statistics for revisions: by main GDP expenditure component, 1996 Q1 to 2005 Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision	Variance	Root mean squared error	Statistically significant?	Weighted mean absolute revision
HHFCE	*62.7*	0.04	0.39	0.26	0.51	No	0.24
NPISH	*2.4*	–0.18	0.88	1.48	1.23	No	0.02
GGFCE	*20.4*	–0.06	0.58	0.63	0.79	No	0.12
GFCF	*16.4*	1.08	2.01	5.62	2.61	Yes	0.33
Exports	*25.5*	0.85	1.44	3.25	1.99	Yes	0.37
Imports	*–27.8*	0.68	1.16	1.47	1.39	Yes	–0.32
Inventories	*0.3*	n/a	n/a	n/a	n/a	n/a	n/a

Source: Office for National Statistics

Figure 7
Mean absolute revision and weighted mean absolute revision: by main GDP expenditure component, 1996 Q1 to 2005 Q4



Source: Office for National Statistics

increased. The reliability of the M3 estimate as an indicator of the 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 on inventories.

Analysis of income components covers period 1998 Q2 to 2005 Q4, using seasonally adjusted current price data as opposed to chained volume data used for the production and expenditure components. M2 data for CoE is available from 1999 Q1; M2 data for other income and taxes and products less subsidies is available from 1998 Q3.

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

Both financial corporations and public non-financial corporations show large mean absolute revisions despite relatively low mean revisions, indicating that there have been both large positive and negative revisions over the period.

Of the income components, CoE provides the most reliable initial estimate, shown by the relatively low RMSE calculation. This contrasts with financial corporations which has the highest RMSE of the income components.

The revisions to CoE are statistically significant in contrast to the other components, which taken together with the positive mean revision indicates systematic underestimation.

In Table 6, the weighted mean absolute revision shows revisions to financial corporations have the biggest impact on GDP, a reflection of the large mean absolute revision of this component. Also evident from Table 6 is the relatively small impact that revisions to CoE and taxes less subsidies on products have on headline GDP, despite together accounting for 66.4 per cent of the income measure. This is mainly due to the low mean absolute revisions of both components.

Figure 8 illustrates the comparison between mean absolute revision and weighted mean absolute revision for all the income components.

Summary of revisions to income components

Analysis of revisions to quarterly growth in the income components of GDP is contained in Appendix C to this article on the ONS website.

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 1999 Q1 to 2002 Q2 and the second period is from 2002 Q3 to 2005 Q4.

Compensation of employees

The results show that total mean revision and mean absolute revision decreased in the second period. This is reflected in the RMSE which shows the reliability of the M3 estimate as an indicator for the latest estimate improved in the second period.

Public non-financial corporations

The total mean revision switched from a negative in the first period to a positive in the second period. The mean absolute revision worsened in the second period, and the RMSE shows that the reliability of the M3 estimate as an indicator for the latest estimate worsened in the second period.

Private non-financial corporations

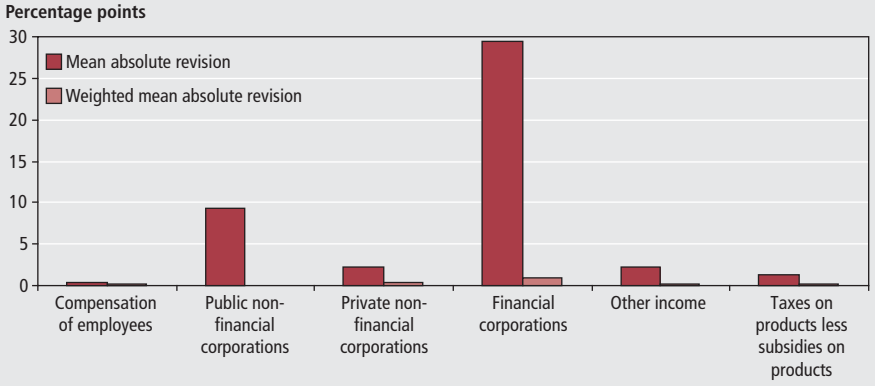
The total mean revision has switched from a positive in the first period to a negative in the second period, with the mean absolute revision increasing marginally. The reliability of the M3 estimate as an indicator for the latest value worsened in the second period.

Table 6
Summary statistics for revisions: by main GDP income component, 1998 Q2 to 2005 Q4

Component	Percentage of GVA (based on 2003 values)	Mean revision	Mean absolute revision	Variance	Root mean squared error	Statistically significant?	Weighted mean absolute revision
Compensation of employees	*54.1*	0.20	0.41	0.26	0.55	Yes	0.22
Public non-financial corporations	*0.6*	–0.70	9.23	171.99	13.13	No	0.06
Private non-financial corporations	*17.6*	0.06	2.19	7.55	2.75	No	0.39
Financial corporations	*2.9*	0.36	29.35	1729.23	41.59	No	0.86
Other income	*12.3*	–1.12	2.23	8.65	3.15	No	0.27
Taxes on products less subsidies on products	*12.4*	–0.09	1.23	2.28	1.51	No	0.15

Source: Office for National Statistics

Figure 8
Mean absolute revision and weighted mean absolute revision: by main GDP income component, 1998 Q2 to 2005 Q4



Source: Office for National Statistics

Private financial corporations

The total mean revision has switched drastically from a negative in the first period to a positive in the second period, with the mean absolute revision decreasing significantly. The reliability of the M3 estimate as an indicator for the latest estimate vastly improved in the second period.

Other income

The total mean revision fell to zero in the second period and the mean absolute revision decreased greatly. The RMSE shows the reliability of the M3 estimate as an indicator for latest estimate improved markedly in the second period.

Taxes on products less subsidies on products

The total mean revision became a larger negative figure in period two, while the mean absolute revision decreased. The reliability of the M3 estimate as an indicator for the latest value improved in the second period.

The household saving ratio

The household saving 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 0.96.

Notes

1 More information on quality reports is available at: www.statistics.gov.uk/about_ns/economicstatistics_qualityreports.asp

2 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.

3 Data for 2005 have only been through one BB2 period (that is, they have only been through the annual balancing process once) in contrast to data for all prior years.

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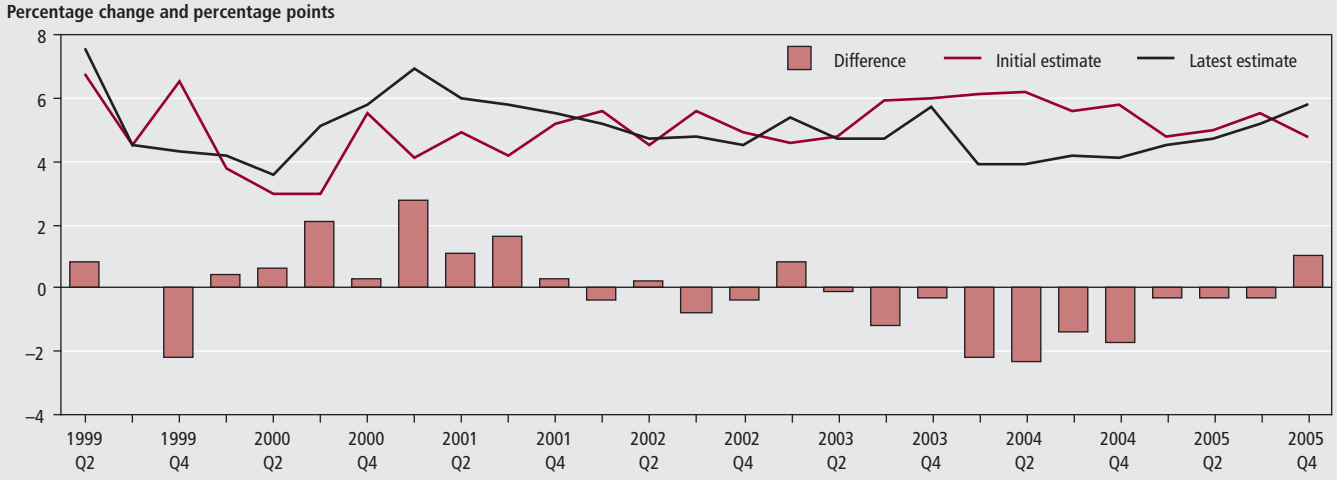
Figure 9

Total revisions to the household savings ratio, 1998 Q2 to 2005 Q4



Source: Office for National Statistics