

Revisions to GDP and components in Blue Books 2014 and 2015

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1. Summary

The main findings of this article are:

- revisions to GDP between the preliminary estimate and the first Quarterly National Accounts continue to be both small in size and unbiased
- annual Supply and Use balancing and revisions due to methodological improvements provide a larger source of revision
- the implementation of the European System of Accounts 2010 regulation added 2.3% to the level of UK current price GDP in the year 2010, which was exactly in line with the European Union average of 2.3%
- revisions performance during the 2008/09 economic downturn and subsequent recovery has been broadly comparable with the more stable 1990s period
- a recent Organisation for Economic Co-operation and Development (OECD) report on revisions concludes; “France, Italy, Norway and the United Kingdom record the lowest mean revisions for both quarter on quarter and year on year growth rates”
- the UK has seen more upward revisions beyond the typical 5-year revisions analysis period than other countries and this is in part due to the move in 2011 from using the Retail Price Indices to using the Consumer Price Indices as the main source for deflation for the expenditure approach to GDP – it also may be due to the composition of the UK economy towards more innovative activities which methodological improvements take time to catch up with

2. Introduction

Revisions to GDP are inevitable at some point in the lifetime of economic statistics. It is the role of the Office for National Statistics (ONS) to produce the best possible estimate of GDP using all of the available information at that time. Therefore the only way to avoid subsequent revisions to GDP as more information becomes available would be to either delay publication until all the relevant information has been received, which could be up to 3 years after the reference period, or to publish a first estimate and then ignore any subsequent new data and any methodological improvements. So revisions should be treated as generally a good thing, as long as the reasons for them are documented by ONS and communicated to users.

The balance between necessary revisions and revisions for minor issues is achieved through a [published revisions policy](#) which has now been updated to reflect a [National Statistics Quality Review: Review of National Accounts and Balance of Payments](#) recommendation (page 11) by grouping annual benchmark revisions into a single GDP publication, and limiting revisions in other quarters.

Articles such as this one also inform users of the reasons for GDP revisions and our revisions performance. The [last such article](#) was in January 2014 and this article provides an update on both the introduction of the European System of Accounts 2010 (ESA 2010) in September 2014 and the completion of the remaining ESA 1995 (ESA 95) Gross National Income (GNI) reservations, some in September 2014 (as part of Blue Book 2014) and the remainder in September 2015 as part of Blue Book 2015. This article will describe the revisions seen to GDP in a chronological order, starting with the Blue Book 2014 improvements and then layering on top the Blue Book 2015 changes. There is also a section on how the United Kingdom (UK) GDP revisions for ESA 2010 compared with those of other European countries and some of the possible reasons for these differences. All data in this article are consistent with the 23 December 2015 Quarterly National Accounts release.

3. Content

This article will:

- explain the impact of ESA 2010 revisions
- detail the scale of revisions to GDP seen in other countries when implementing ESA 2010
- describe Blue Book 2014 GDP levels revisions in both chained volume measure (CVM) and current price (CP) terms
- look in detail at Blue Book 2014 growth rate revisions
- describe the Blue Book 2015 GDP levels revisions in CVM and CP terms
- look at the Blue Book 2015 growth rate revisions
- focus on the quarterly GDP growth rates at Blue Book 2015
- answer the question “Is GDP biased?” using an update of the metrics used to test revisions performance, including some international comparisons
- draw conclusions
- describe the next steps

4. Where to find more general information on GDP

This version of the article assumes that you are familiar with the approach used to compile the various vintages of GDP, and that you followed the various impact articles during 2014 and 2015 and are aware of the main reasons for revision across these periods. Hence there is no detail of these changes provided here, but the [longer version of this article](#) gives much more information on the changes, or you can follow the reference links provided at the end of this article to find all the details.

5. GDP revisions

The [published GDP revisions policy](#) sets out the framework for revisions and this policy, combined with the timing of GDP releases, is designed to strike an appropriate balance between timeliness and accuracy. The recent [Independent review of UK economic statistics](#) made reference to this tension and suggested areas where alternative data sources in the future might increase the accuracy while not reducing the timeliness (see paras 2.12 to 2.17). We will be considering this issue but to this point we believe that we have struck a reasonable balance given current data sources and methodologies.

Factored into the revisions policy are user needs for short-term indicators, reliable estimates generated through benchmarking to more robust annual sources and the need for a consistent and coherent picture of the economy. GDP revisions can be categorised according to reason, although it is subsequently very difficult to quantify specifically the amount of revision due to any one reason in any given period as several reasons will almost certainly apply to each vintage of GDP:

- revisions to a source
- replacing nowcasts with data
- revised seasonal adjustment factors
- updating the output weights
- new methods (continuous improvement)
- new international standards

Note: This categorisation excludes any corrections arising from errors in statistical processing. These are monitored separately as part of the ONS correction process.

The specific reasons for revisions in each Blue Book can be found in annex F of this article.

6. ESA 2010 reasons for revision

ESA 2010 was the largest change to National Accounts methodology in over 15 years, and was consistent with wider SNA 2008 changes which have been made worldwide. While some of the improvements impacted on headline GDP and gross national income (GNI), others were GDP neutral and only impacted on lower level detail or between GDP components. ESA 2010 had 5 main changes which impacted on the level of current price GDP: Research and Development, Weapons, Decommissioning Costs, Pensions and Small Tools. Fuller information can be found in the article [Impact of ESA 2010 changes on current price GDP estimates](#).

The impact of these individual methodology improvements was explained to users in a series of articles during 2014 and the summary impacts were provided to Eurostat by all member states, based on the 2010 impact as shown for the UK in Table 1.

Table 1: Impact of ESA 2010 implementation on current price GDP in 2010 (UK)

GDP at current market prices £ million	2010	
As published on 27 June 2014	1,485,615	
ESA 2010 revisions:		Revision as a percentage of GDP
Research and Development	23,255	1.6%
Weapons	3,551	0.2%
Decommissioning costs	98	0.0%
Pensions	6,341	0.4%
Small Tools	262	0.0%
Total ESA 2010 Revision	33,507	2.3%

Source: Office for National Statistics

For the UK the implementation of ESA 2010 added 2.3% to the level of current price GDP in the year 2010 and of that 1.6% was from the R & D change.

7. Experiences of other countries when implementing ESA 2010

In October 2014, Eurostat published a news release [ESA 2010 shifts level of EU and euro area GDP upward, growth rates almost unaffected](#) detailing the scale of revisions seen by all member states when implementing ESA 2010 and comparing these with the revisions seen worldwide during the implementation of SNA 2008.

In summary, the UK observed an impact of a 2.3% level shift in GDP in 2010, of which 1.6% was due to R & D and this was very much in line with the impacts observed in other countries. Table 2 reproduces the impact table from the Eurostat news release. The total GDP impact relates not just to ESA 2010 impacts (which can be seen in the 3rd and 4th columns), but also to the ESA 95 GNI reservations, any other non-ESA 2010 methodological improvements and the inclusion of new data which are all included under the column labelled "Statistical Improvements" and form part of the total GDP revision column.

Table 2: Impact of methodological changes and statistical improvements on the level of GDP in 2010 (% of GDP) for European countries and the United States of America

	GDP	Methodological changes (ESA 2010)		Statistical improvements
	Total	Total	of which R&D	Total
EA18	3.5	2.2	1.9	1.3
EU28	3.7	2.3	1.9	1.4
Belgium	2.8	2.5	2.4	0.3
Bulgaria	2.0	0.4	0.3	1.6
Czech Republic	4.3	3.1	1.2	1.2
Denmark¹	2.5	2.7	2.6	-0.2
Germany	3.3	2.7	2.3	0.6
Estonia	1.2	1.4	0.9	-0.2
Ireland	4.2	3.6	3.5	0.6
Greece	1.8	1.3	0.6	0.6
Spain	3.3	1.6	1.2	1.7
France	3.2	2.4	2.2	0.8
Croatia	1.3	0.5	0.4	0.8
Italy	3.4	1.5	1.3	1.9
Cyprus	9.5	1.1	0.2	8.4
Latvia	-0.1	1.1	0.5	-1.2
Lithuania	1.1	0.8	0.4	0.2
Luxembourg	0.2	1.6	0.5	-1.4
Hungary	1.6	1.6	1.2	0.0
Malta	2.2	0.5	0.5	1.7
Netherlands	7.6	1.7	1.8	5.9
Austria	3.2	3.7	2.3	-0.6
Poland	1.5	1.2	0.5	0.2
Portugal	4.1	2.1	1.3	2.0
Romania	1.9	0.6	0.5	1.3
Slovenia	2.1	2.0	1.9	0.1
Slovakia	1.9	1.8	0.6	0.1
Finland	4.7	4.2	4.0	0.5
Sweden	5.5	4.4	4.0	1.1
United Kingdom	4.9	2.3	1.6	2.6
United States¹	3.6	:	2.5	:

Source: Eurostat

: Data not available

¹Denmark: 2008 data, United States: 2012 data

8. Current price GDP level revisions at Blue Book 2014

This section focuses on revisions to the level of the current price estimate of GDP which is measured with price change included, whereas the chained volume measure of GDP (CVM) has had the effects of inflation removed. Figure 1 shows the quarterly levels of current price GDP at each Blue Book from 2003 to 2014 for a period from 1991 to 2012. Before Blue Book 2014 data were added to the graph, the lines were all almost on top of each other, showing the historically small scale of current prices revisions. However Blue Book 2014 saw the completion of a number of ESA 95 reservations and the implementation of ESA 2010, both of which have added to the level of current price GDP by including new concepts within the boundary of economic activity (as shown in table 1 earlier).

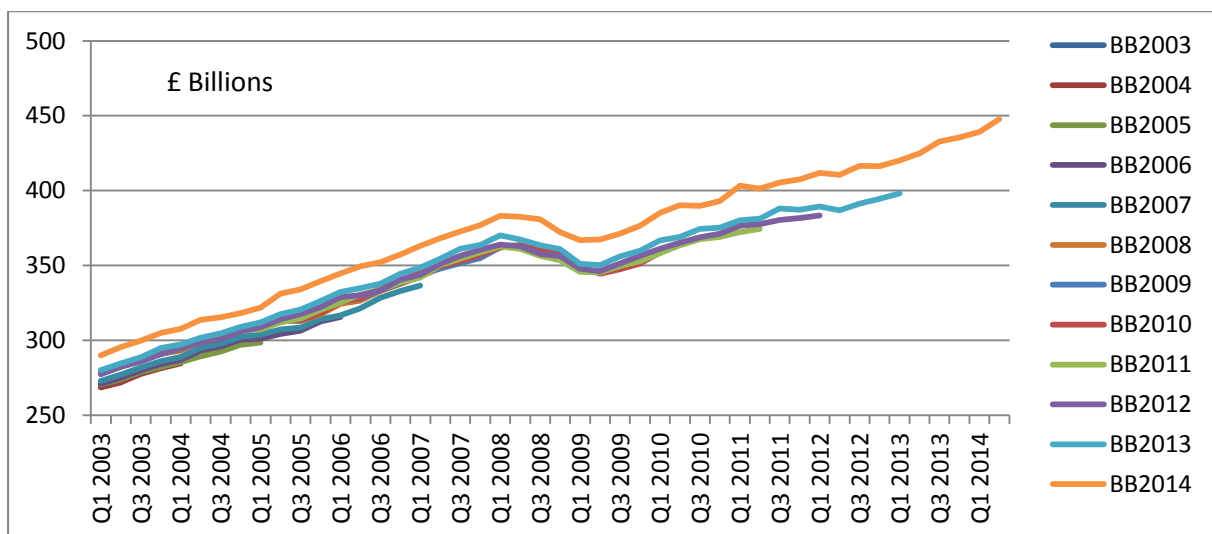
Figure 1: Current price quarterly GDP, Quarter 1 (Jan to Mar) 1991 to Quarter 2 (Apr to June) 2014 (Blue Book 2003 to 2014) (UK)



Source: Office for National Statistics

If we focus on the latest few years (in Figure 2) then the revisions in the current price levels can be seen more clearly.

Figure 2: Current price quarterly GDP, Quarter 1 (Jan to Mar) 2003 to Quarter 2 (Apr to Jun) 2014 (Blue Book 2003 to 2014) (UK)



Source: Office for National Statistics

The gap between Blue Book 2013 and Blue Book 2014 increases more in the latter years, showing both a larger impact of the methods improvements on the more recent periods and the inclusion of more complete data in the Supply and Use open period balances (2010 to 2012). The Blue Book 2014 revisions to current price levels were due to both ESA 95 GNI reservations and the implementation of ESA 2010. There is more information on the specific Blue Book 2014 revisions in annex F, and a breakdown of the impacts into the categories is shown in table 3, using the period 2010 to 2012 as an illustration.

Table 3: Causes of Blue Book 2014 current price revisions by category (2010 to 2012) in £ millions

GDP at current market prices	2010	2011	2012
As published on 27 June 2014	1,485,615	1,536,937	1,558,415
Revision due to:			
ESA 95 GNI reservations	40,756	50,385	46,523
ESA 2010 changes	33,507	37,404	38,574
Gross Fixed Capital Formation	-1,375	2,673	3,331
Inventories	2,171	-6,826	1
Other ESA95 methods changes	623	551	587
Data changes	-2,932	-3,447	2,245
Removal of the Statistical Discrepancy	0	0	5,708
Blue Book 2014	1,558,365	1,617,677	1,655,384
Total revision	72,750	80,740	96,969
Total revision (% of total GDP)	4.9%	5.3%	6.2%

Of which:	2010	2011	2012
ESA 2010	33,507	37,404	38,574
ESA 2010 (% of total GDP level)	2.3%	2.4%	2.5%
Non-ESA 2010	39,243	43,336	58,395
Non-ESA 2010 (%)	2.6%	2.8%	3.7%

Source: Office for National Statistics

So Table 3 shows that the impact of ESA 2010 changes for the period 2010 to 2012 caused just under half of the total level shift in current price GDP and the ESA 95 GNI reservations were a large proportion of the Non-ESA 2010 revision.

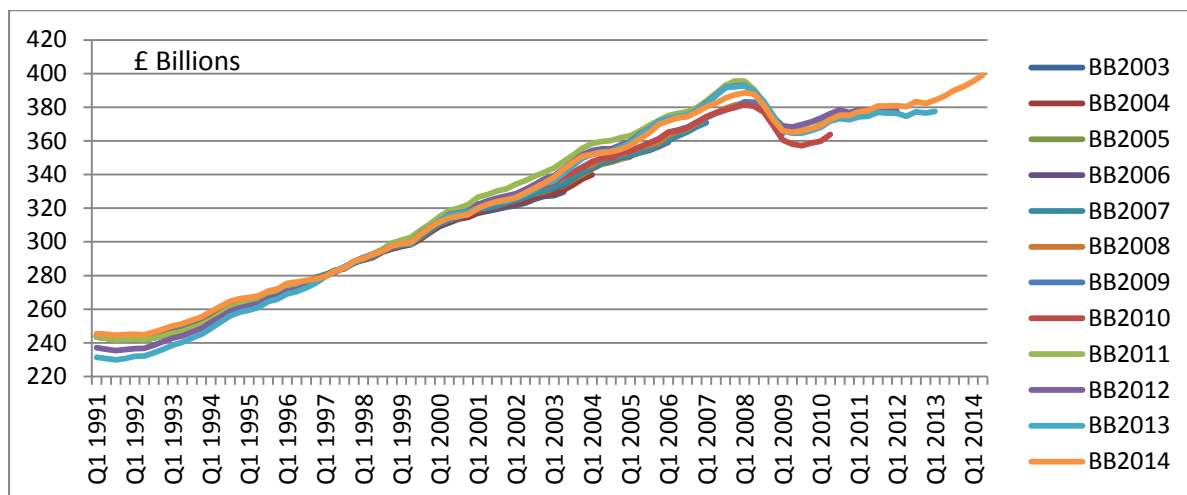
9. BB2014 GDP chain volume measure revisions

Annual chained volume measure (CVM) estimates of GDP use the current price annual estimates and are deflated using a range of expenditure deflators to produce constant price estimates which are then annually chain-linked. Therefore revisions to CVM GDP incorporate all the current price revisions to GDP as well as revisions to deflators and revisions to some of the output approach components which are compiled from volume data sources.

Figure 3 shows successive estimates of the level of chained volume measure GDP for years since 1991 in successive Blue Books from 2003 to 2014, with all years scaled so that they are equal in 1997. This shows that the level of GDP was relatively unchanged over the period from 2003 to 2013, except for Blue Book 2011 when a significant methodological change was introduced – the change from using retail price indices as deflators to using consumer price indices. This deflator change caused a level shift in GDP data and, as a transitional step, was only taken back to 1997, with the pre-1997 data subsequently being brought onto the same basis in Blue Book 2012.

The referencing of all CVMs onto 1997 means that the level shift (for the inclusion of ESA 95 GNI reservations and the implementation of ESA 2010) seen in the current price data does not show up here, as 1997 experienced similar revisions to other years and these have been removed by the re-referencing. The strength in the new data in the latest few years can again be seen. The other impact of revisions to levels is at the tail end of the series where a reassessment of the path of the 2008/09 economic downturn and subsequent recovery led to a shallower peak to trough movement from 2008 into 2009 and a faster recovery. The next section will focus more on the economic downturn and recovery.

Figure 3: Chained volume measure GDP at market prices Quarter 1 (Jan to Mar) 1991 to Quarter 2 (Apr to June) 2014 (Blue Book 2003 to 2014) UK



Source: Office for National Statistics

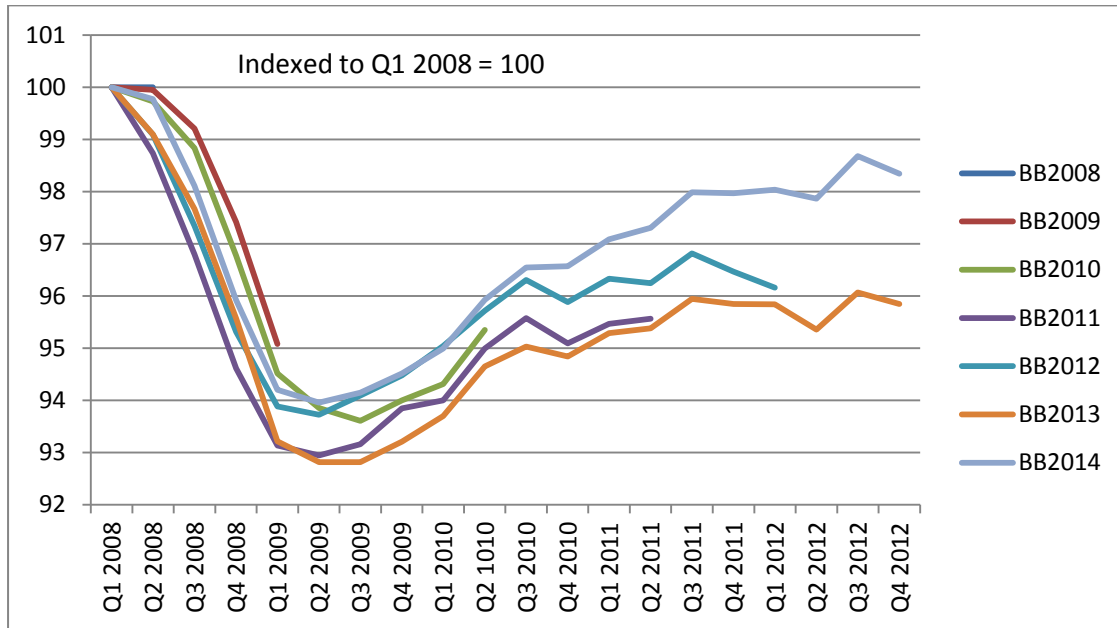
Figure 4 presents the same information as Figure 3 in index form (Q1 2008 = 100) for the period Quarter 1 (Jan to Mar) 2008 to Quarter 4 (Oct to Dec), which was chosen because it features the latest downturn and subsequent recovery and has itself been subject to wider scrutiny and debate by commentators than would be normal in a period of stable growth.

The method for deriving a quarterly path from the annual SUTs is described in annex B, but a summary would be that once the annual levels are set for all years, the quarterly path of growth through these years is somewhat constrained by the annual position, especially when consecutive years move from positive growth to negative growth and then back again.

The revisions to annual current price and CVM levels allowed for a reassessment of the quarterly path of GDP through the economic downturn and recovery, with the quarterly movements constrained by the annual position as explained above. The resultant quarterly path showed that the economic downturn was not as severe as previously thought – in Blue Book 2013 the peak to trough was estimated at -7.2% and this was revised to -6.0% in Blue Book 2014, but the revisions did not change the broad economic story being presented over this period.

The recovery phase from 2009 onwards shown in Blue Book 2014 retains a similar growth profile as that published in Blue Book 2013 – the Blue Book 2013 and 2014 levels shown by the lines are almost parallel from 2010 onwards but with the gap between them widening slightly by the time we reach 2012, reflecting a stronger recovery period than previously thought following the later data sources becoming available. Blue Book 2014 GDP starts from the new higher level, hence GDP is now estimated to have recovered more ground from the trough point than previously thought.

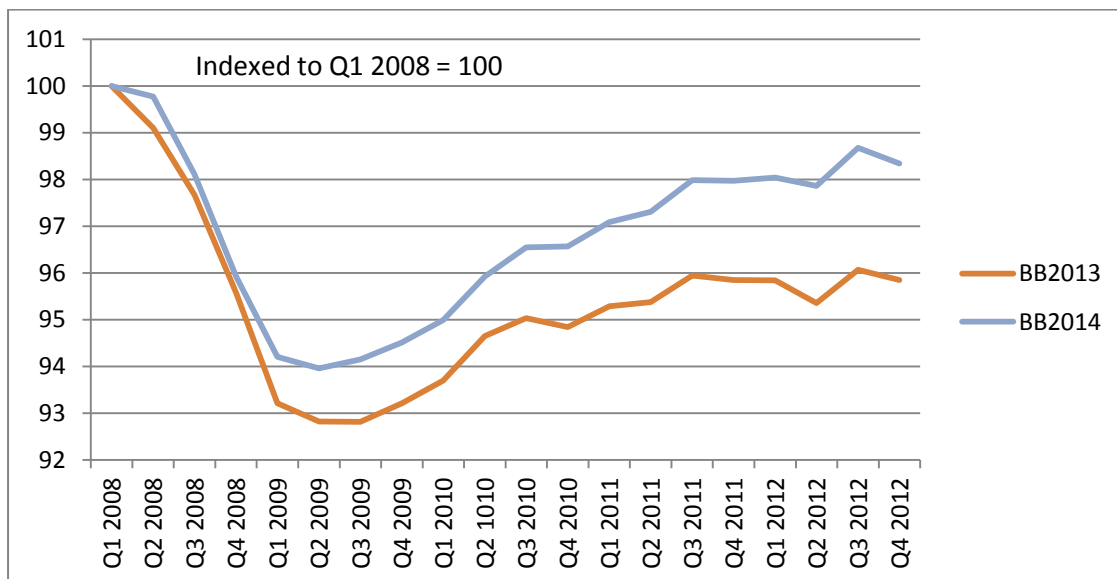
Figure 4: Chained volume measure GDP at market prices Quarter 1 (Jan to Mar) 2008 to Quarter 4 (Oct to Dec) 2012 (Blue Book 2008 to 2014), UK



Source: Office for National Statistics

It is easier to see key revisions when just looking at Blue Book 2013 and Blue Book 2014 as shown in Figure 5.

Figure 5: Chained volume measure GDP at market prices Quarter 1 (Jan to Mar) 2008 to Quarter 4 (Oct to Dec) 2012 (Blue Book 2013 to 2014), UK



Source: Office for National Statistics

Section 14 will look at whether the revisions performance during the economic downturn and recovery was statistically worse than during a period of stable economic growth.

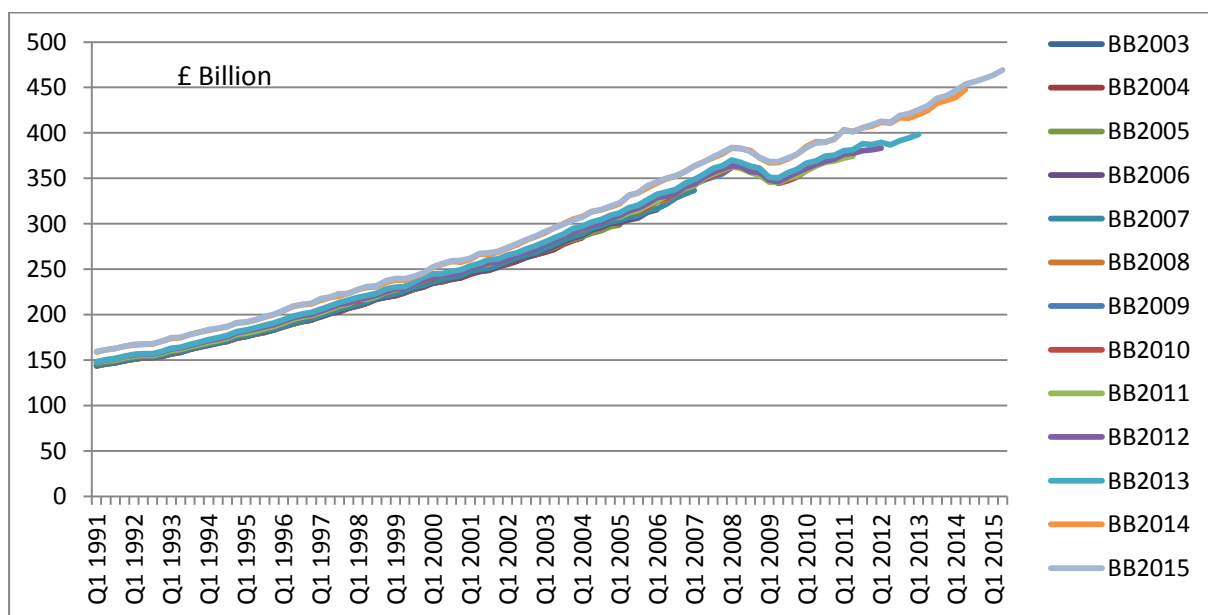
10. Current price GDP level revisions at Blue Book 2015

In comparison with Blue Book 2014 there was relatively little change in the level of current price GDP in Blue Book 2015. There were no further ESA 2010 changes required in Blue Book 2015, so the major changes were to complete work on the remaining ESA 95 GNI reservations (these were for exhaustiveness adjustments for concealed income and under-coverage of unincorporated businesses, new estimates within the NPISH sector and a rebalance across all sectors, improved measurement of cross-border property income, improvements to the estimation of spending on repairs and maintenance of dwellings by householders, improvements to the estimation of the consumption of fixed capital on roads, and finally, a change to the recording of vehicle registration tax which is a fee paid on a vehicle when it is first registered) and to make other improvements as detailed in this [impact article](#):

- gross fixed capital formation
- reclassifications
- local government pensions
- alcohol and tobacco in household final consumption expenditure
- narcotics
- Consumer Price Index including Housing (CPIH) alignment
- insurance industry measurement

Despite the large number of changes in Blue Book 2015 many of them were offsetting and the impact on the level and growth of current price GDP was very small.

Figure 6: Current price quarterly GDP, Quarter 1 (Jan to Mar) 1991 to Quarter 2 (Apr to June) 2015 (Blue Book 2003 to 2015), UK



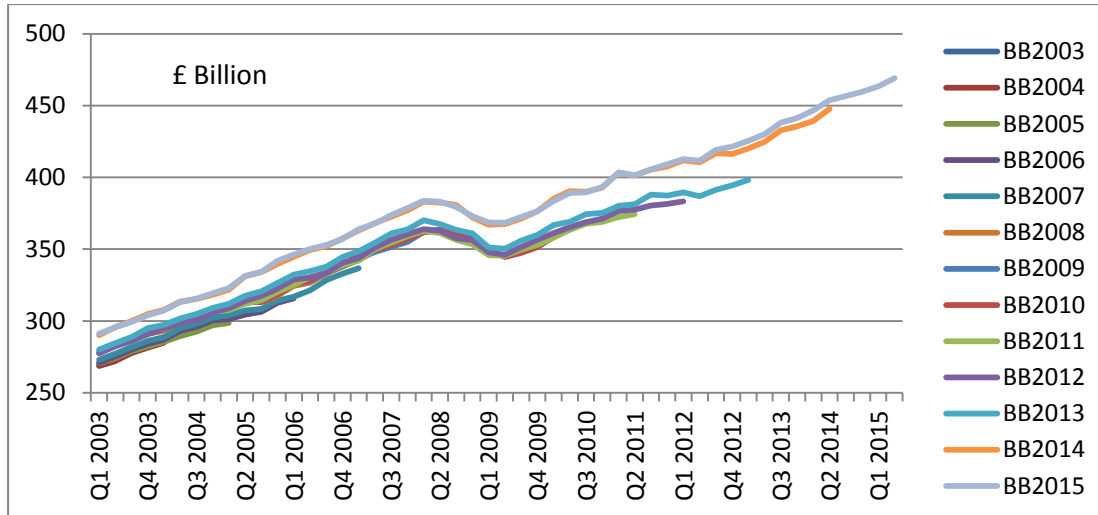
Source: Office for National Statistics

The main difference between the Blue Book 2014 and the Blue Book 2015 current price lines appears from 2012 onwards, and this is mainly due to a combination of the exhaustiveness

adjustments for concealed income and under-coverage of unincorporated businesses and the addition of later data which came in higher than early indicators had suggested.

Figure 7 shows the same information but for a shorter time period to show more clearly how Blue Book 2014 was a level shift from previous estimates, but Blue Book 2015 retained this new level almost throughout the time period apart from the arrival of stronger estimates from 2012 onwards.

Figure 7: Current price quarterly GDP, Quarter 1 (Jan to Apr) 2003 to Quarter 2 (Apr to June) 2015 (Blue Book 2003 to 2015), UK

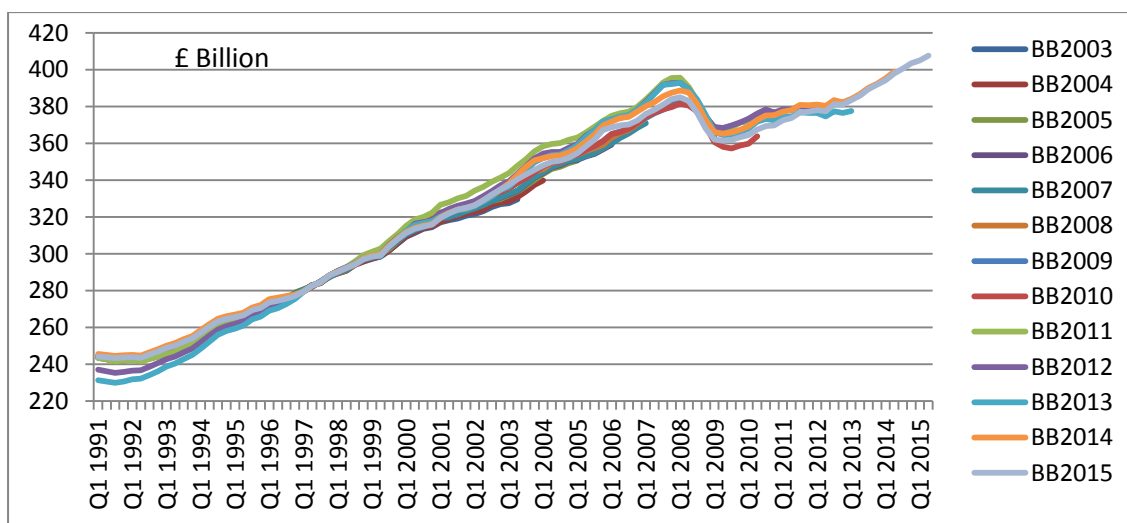


Source: Office for National Statistics

11. Blue Book 2015 GDP chained volume measure revisions

As discussed in the current price section above, there were a range of methods changes which broadly offset at the GDP level and this can be seen in Figure 8 for CVMs as well. The data in this chart are all set equal in 1997 to avoid the level shifts which artificially occur when moving the reference year on as part of each Blue Book process.

Figure 8: Chained volume measure GDP at market prices Quarter 1 (Jan to Mar) 1991 to Quarter 2 (Apr to June) 2015 (Blue Book 2003 to 2015), UK

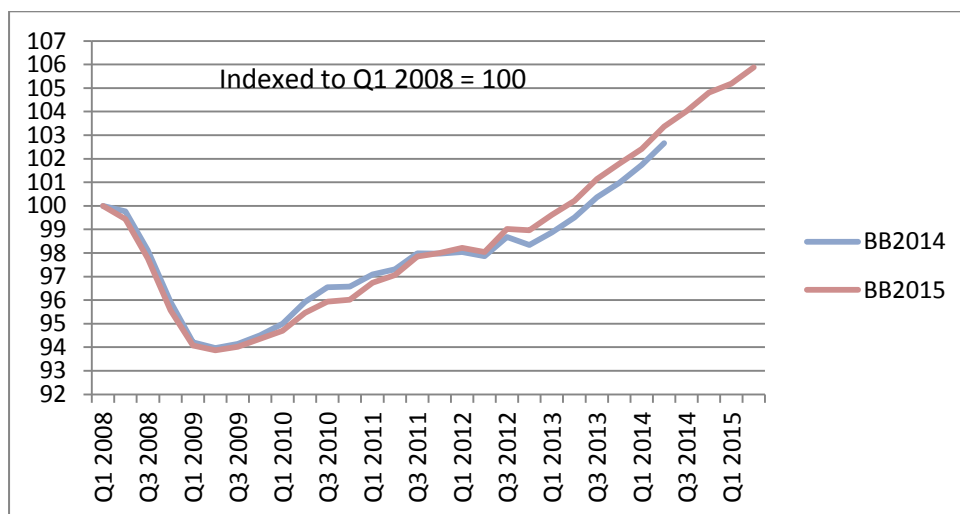


Source: Office for National Statistics

The slightly stronger 1997 position shown in Blue Book 2015 means that when the adjustment is made to the graph to set 1997 equal, the later periods actually end up being scaled down, but the overall shape of the Blue Book 2015 line is very similar to that of Blue Book 2014.

Blue Book 2015 also left almost completely unrevised the shape and depth of the economic downturn of 2008/09 (now -6.1% peak to trough, rather than -6.0% at Blue Book 2014) but the impact of the increases from 2012 onwards from the exhaustiveness ESA 95 GNI reservation and stronger late data meant that the GDP recovered at a faster pace than previously thought post downturn.

Figure 9: Chained volume measure GDP at market prices Quarter 1 (Jan to Mar) 2008 to Quarter 2 (Apr to June) 2015 (Blue Book 2014 vs. Blue Book 2015), UK



Source: Office for National Statistics

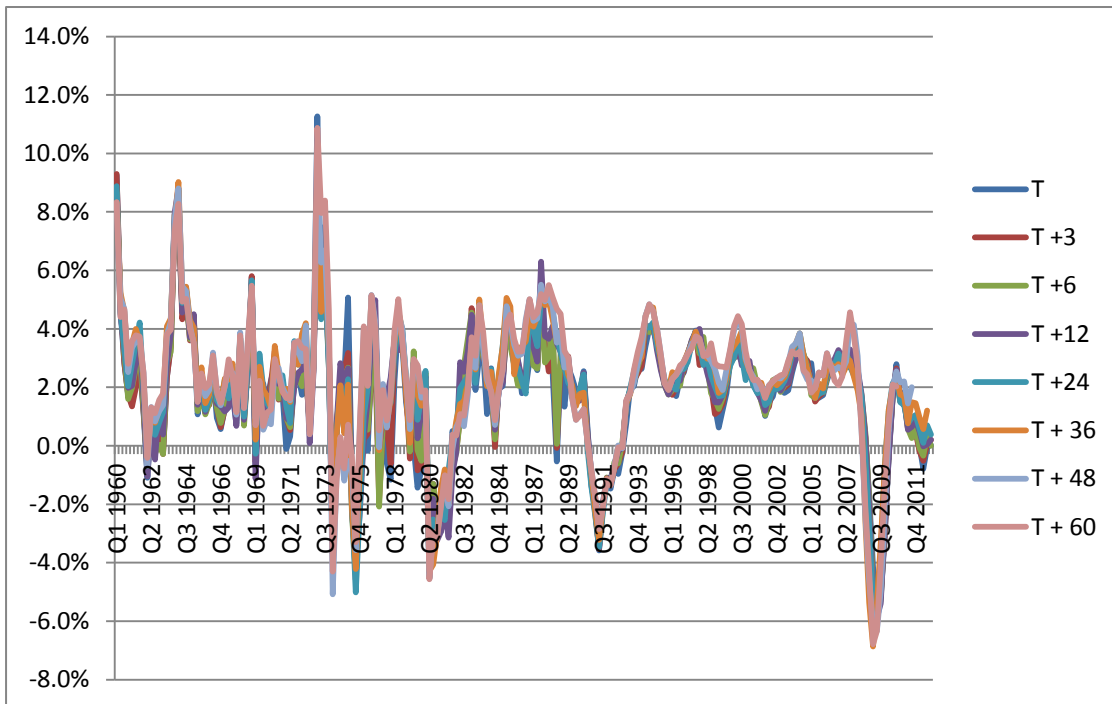
12. Quarterly GDP growth rates

As discussed in section 5, revisions to the first quarterly estimates of GDP growth are usually due to more information becoming available, whereas the subsequent annual revisions are usually due to new data sources and improvements in methodology.

For completeness the updated quarter on a year ago growth rates of CVM GDP at each vintage from initial publication (T) to the revised position 5 years later (T + 60 months) have been included as Figure 10. T + 60 was chosen as it equates to between 3 and 4 annual Blue Book revisions and will be sufficient for all data revisions to have been included, leaving only further definitional and methodological revisions to follow.

The data to create Figure 10 are included in the [Real Time GDP database](#), which publishes successive estimates of CVM GDP in £ millions for each quarter since Quarter 1 (Jan to Mar) 1955. This database is just one part of an expanding set of regular analyses of growth rate revisions for the period since 1992 which are published after each GDP release. These databases enable transparency and give users the tools to analyse revisions for themselves. In 2013 we launched a current price GDP real time database with estimates in £ millions back to 1989 and in 2014 we released the first real time databases for the income and expenditure components of GDP. Output revision triangles are now published for the Index of Construction, in addition to both the Index of Production and the Index of Services and links to these can be found in the reference section.

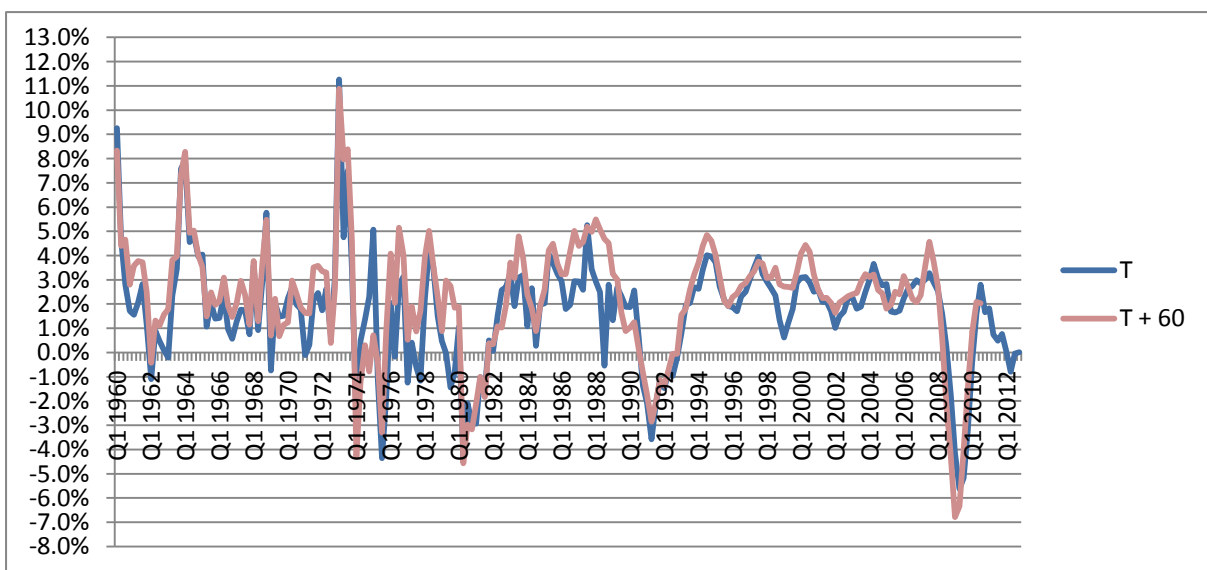
Figure 10: GDP at market prices, chained volume measure, percentage growth, Quarter 1 (Jan to Mar) 1960 to Quarter 4 (Oct to Dec) 2011, quarter on the same quarter a year ago, UK



Source: Office for National Statistics

Figure 10 gives a general impression of the scale of revisions but is quite cluttered and a clearer representation of how data and methodological improvements revise GDP in the period between the first estimate and 5 years later can be shown by using the same figure but with just these two lines on it, as illustrated in Figure 11.

Figure 11: GDP at market prices, chained volume measure percentage growth, Quarter 1 (Jan to Mar) 1960 to Quarter 1 2012, quarter on same quarter 1 year ago, T and T + 60 months, UK

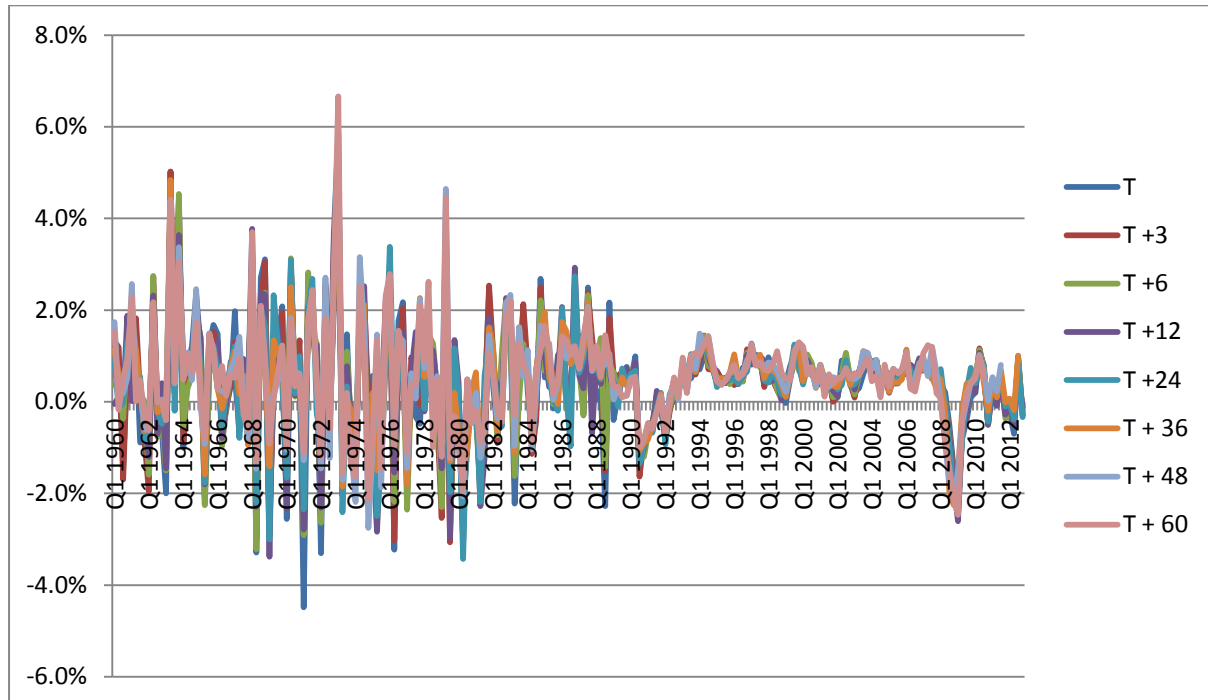


Source: Office for National Statistics

Figures 10 and 11 confirm that for the most part revisions to GDP are small and do not, on the whole, alter the overall economic history portrayed in the initial growth rate estimates. However, there is some suggestion that revisions are larger around turning point, for example, the mid 1970s, 1979 to 1980, 1988 to 1989 and 1998.

The same analysis can be produced from the real time GDP database for quarter on quarter growth rates in CVM GDP, shown in Figure 12.

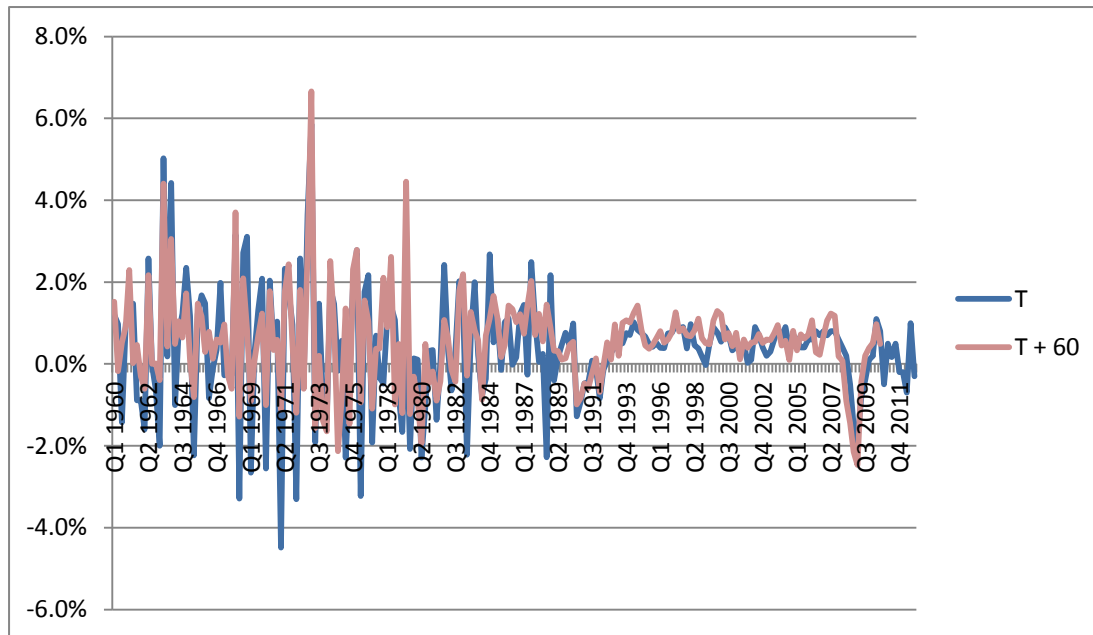
Figure 12: GDP at market prices, chained volume measure percentage growth, Quarter 1 (Jan to Mar) 1960 to Quarter 4 (Oct to Dec) 2012, quarter on quarter, UK



Source: Office for National Statistics

Once again, if we limit the graph to only have the first estimate and the estimate after 5 years, the pattern of revisions to quarter on quarter growth can be seen more clearly. It appears that there is less volatility in the T + 60 month estimates than in the initial estimate made in period T and this will be in part due to the process of supply and use balancing annual data and then producing successive quarterly paths through the time periods within the annual constraints. This graph also shows two quite different pictures of GDP growth through the time-span, with much less volatility in the period from the 1990s to current day, reflecting a range of improvements to the measurement of GDP introduced following the Pickford Review of 1989, see [“A decade of improvements to economic statistics”, Jenkins and Brand, 2000](#) for more details.

Figure 13: GDP at market prices, chained volume measure percentage growth, Quarter 1 (Jan to Mar) 1960 to Quarter 4 (Oct to Dec) 2012, quarter on quarter at T and T + 60 months, UK



Source: Office for National Statistics

The other observation which can be made from Figure 13 is that the T + 60 month line looks to have stronger growth than the original T line, especially through any periods with initially quite negative growth. This can be explained by the latter revisions being caused by methodological changes and changes to the national accounts framework, which tend to improve the accounts by identifying new concepts which can add to both GDP levels and, sometimes, to growth.

Indeed this was picked up by the recent [Independent review of UK economic statistics](#) which gave similar possible explanations for the tendency for GDP to be revised up beyond the 3 to 4 year window of source data revisions; the review suggested that the upward revisions seen beyond the 3 to 4 Blue Book data revisions could be because "...new industries or business models are poorly captured by extant statistical methodology. But over time, as the new industries become better appreciated, so the methodology will be updated to capture them, resulting in an increase in measured activity. In this sense, GDP is a constantly moving target."

Furthermore the review also noted that this was particularly relevant to the UK where a "larger proportion of UK output, relative to other countries, is driven by new and innovative activities...."

The other explanation given by the review team is that "The UK has been slower than some other countries to implement the legislated European statistical standards....with the result that recent revisions include a catch-up element". This is true, we have taken a number of years to address all the ESA 95 GNI reservations (most were received in 2012), but we were not the only member state in this position. Many European countries do not aim for annual updating like the UK but instead implement reweighting (moving the base year forward) and revisions every 5 years. Delays to implementing reservations will not happen again in the future as all ESA 2010 reservations, when raised, will have a strict 4 year window for being completed.

There is another reason why the UK revisions performance is below average when looking beyond the initial data revisions and that is the switch in Blue Book 2011 from using the Retail Prices Indices (RPI) to the Consumer Prices Indices (CPI) as the main sources of deflators for the expenditure

approach to GDP. The growth rate in RPI is typically higher than CPI. This 'wedge' in the annual growth rates of quarterly data averaged just under 0.1 percentage points per quarter over the period 1997 to 2007 (the years not open to full SUT rebalancing). The use of a deflator with a lower growth rate would, all else being equal, tend to produce higher growth rates in the volume estimates of the statistic that is being deflated – in this case consumption, and hence the expenditure estates of GDP. We decided to switch to the CPI to deflate in order to bring it into line with international best practice, and this caused upwards revisions to growth across most periods up to 2011, which were not seen in any other country during the same time period. Our initial research suggests that if the impact of the switch in deflation is removed from the total revisions picture then the UK revisions performance is much more in line with that of other countries over the last 15 years. Work on assessing this change is almost completed and will be included in an upcoming article looking at revisions policies across countries and relative revisions performance across countries which we aim to publish around the end of February.

13. UK revisions performance compared with other countries

The Organisation for Economic Co-operation and Development (OECD) has produced various analyses on revisions performance across various countries. In their [Revisions of quarterly GDP in selected OECD Countries](#) article of July 2015 the UK revisions performance is mentioned for being particularly good in terms of mean revisions; "France, Italy, Norway and the United Kingdom record the lowest mean revisions for both quarter on quarter and year on year growth rates". On the absolute mean revision the UK also performs well; "Canada, France, Germany, Italy, Spain, Switzerland, the United Kingdom and the United States show the lowest revisions (average mean absolute revision below 0.25%-point)".

One of the tests OECD applies is around predicting turning points. The OECD looks at the first published quarterly GDP growth rate and compares this with the latest estimate to see what percentage of first estimates have a different sign from the final estimates (for an early estimate to be useful it needs to provide quick signals of where the economy is heading). For the UK, over the last 127 quarterly estimates the sign of the initial estimates has ultimately been changed in 13 of these estimates, meaning that the sign of the initial estimate is correct just under 90% of the time. This is exactly in line with the average across all the countries studied by the OECD, which also found that on average 90% of initial estimates were of the correct sign.

Further work is continuing to look at revisions policies across countries and relative revisions performance and we will report on that around the end of February.

14. Is GDP Biased?

When looking at revisions to quarterly estimates of GDP growth the focus should first be on the period where new output source data could cause revisions. Table 4 shows, for the period since Quarter 1 (Jan to Mar) 2007, the revision between the preliminary estimate for a quarter and the third estimate published around 13 weeks after the end of the quarter.

Table 4: Revisions to GDP growth between the first (M1 = preliminary) and third estimate (M3 = Quarterly National Accounts), Quarter 1 (Jan to Mar) 2007 to Quarter 3 (July to Sept) 2015, UK

	M1	M3	Revision	Absolute Revision
Q1 2007	0.7%	0.7%	0.0%	0.0%
Q2 2007	0.8%	0.8%	0.0%	0.0%
Q3 2007	0.8%	0.7%	-0.1%	0.1%
Q4 2007	0.6%	0.6%	0.0%	0.0%
Q1 2008	0.4%	0.3%	-0.1%	0.1%
Q2 2008	0.2%	0.0%	-0.2%	0.2%
Q3 2008	-0.5%	-0.6%	-0.1%	0.1%
Q4 2008	-1.5%	-1.6%	-0.1%	0.1%
Q1 2009	-1.9%	-2.4%	-0.5%	0.5%
Q2 2009	-0.8%	-0.6%	0.2%	0.2%
Q3 2009	-0.4%	-0.2%	0.2%	0.2%
Q4 2009	0.1%	0.4%	0.3%	0.3%
Q1 2010	0.2%	0.3%	0.1%	0.1%
Q2 2010	1.1%	1.2%	0.1%	0.1%
Q3 2010	0.8%	0.7%	-0.1%	0.1%
Q4 2010	-0.5%	-0.5%	0.0%	0.0%
Q1 2011	0.5%	0.5%	0.0%	0.0%
Q2 2011	0.2%	0.1%	-0.1%	0.1%
Q3 2011	0.5%	0.6%	0.1%	0.1%
Q4 2011	-0.2%	-0.3%	-0.1%	0.1%
Q1 2012	-0.2%	-0.3%	-0.1%	0.1%
Q2 2012	-0.7%	-0.4%	0.3%	0.3%
Q3 2012	1.0%	0.9%	-0.1%	0.1%
Q4 2012	-0.3%	-0.3%	0.0%	0.0%
Q1 2013	0.3%	0.3%	0.0%	0.0%
Q2 2013	0.6%	0.7%	0.1%	0.1%
Q3 2013	0.8%	0.8%	0.0%	0.0%
Q4 2013	0.7%	0.7%	0.0%	0.0%
Q1 2014	0.8%	0.8%	0.0%	0.0%
Q2 2014	0.8%	0.9%	0.1%	0.1%
Q3 2014	0.7%	0.7%	0.0%	0.0%
Q4 2014	0.5%	0.6%	0.1%	0.1%
Q1 2015	0.3%	0.4%	0.1%	0.1%
Q2 2015	0.7%	0.7%	0.0%	0.0%
Q3 2015	0.5%	0.4%	-0.1%	0.1%
Average revision			0.00%	0.11%

Revision	Count
-0.5%	1
-0.4%	0
-0.3%	0
-0.2%	1
-0.1%	10
0.0%	12
+0.1%	7
+0.2%	2
+0.3%	2

Source: Office for National Statistics

Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December)

It can be seen from the table that revisions over this time period are small, typically 0.1 or 0.2 percentage points in either direction with no evidence of bias. In fact 29 out of the last 35 quarters have only been revised by a maximum of plus or minus 0.1 percentage points and the average revision over the period is 0.00 percentage points.

The economic circumstances can also add an extra focus to the quarterly revisions; for instance, a revision of 0.1 or even 0.2 percentage points in either direction is not material when the economy is growing by between 0.6% and 0.8% every quarter, but when quarterly growth is closer to zero, a movement of 0.1 percentage points in either direction can be interpreted as changing the story completely although, of course, this is not the case. Individual quarters can also be influenced by special events such as the Olympics or an extra bank holiday for the Queen's diamond jubilee, and to lessen the natural volatility we recommend that commentators focus more on the longer run trend of GDP rather than on individual movements between successive quarters.

A longer time-series of quarterly GDP revisions, including the latest estimate for each quarter is shown in annex E. As explained in annex B, the amount of information contained in each successive estimate of GDP (from the output approach) increases from 44% in the preliminary estimate to over 90% by the time of the third estimate, but this does not lead to significant revisions. Delaying the first estimate to either 8 or 13 weeks would not therefore materially change the initial estimate of GDP under the current methodology.

The number of quarters used to monitor revisions performance and the particular quarters selected will both have an impact on the analysis produced. For instance, if we look only at the period from Quarter 1 (Jan to Mar) 2008 to Quarter 4 (Oct to Dec) 2010 (the latest downturn and recovery), the average absolute revision between M1 and M3 is 0.15 percentage points, rather than the 0.11 percentage points over the longer time span in table 4. This is, at least in part because it is generally recognised that it is harder to accurately estimate quarterly movements during the turning points in an economic cycle.

In previous articles, other metrics have been used to assess potential bias and it was said then that it was too early to assess the performance of GDP revisions at measuring the 2008/09 economic downturn and recovery. Since the last article in January 2014, more data are now available during and after the downturn, including supply and use balances for 2012 and 2013 for the first time and the profile of 2009 and 2010 has been reassessed through balancing.

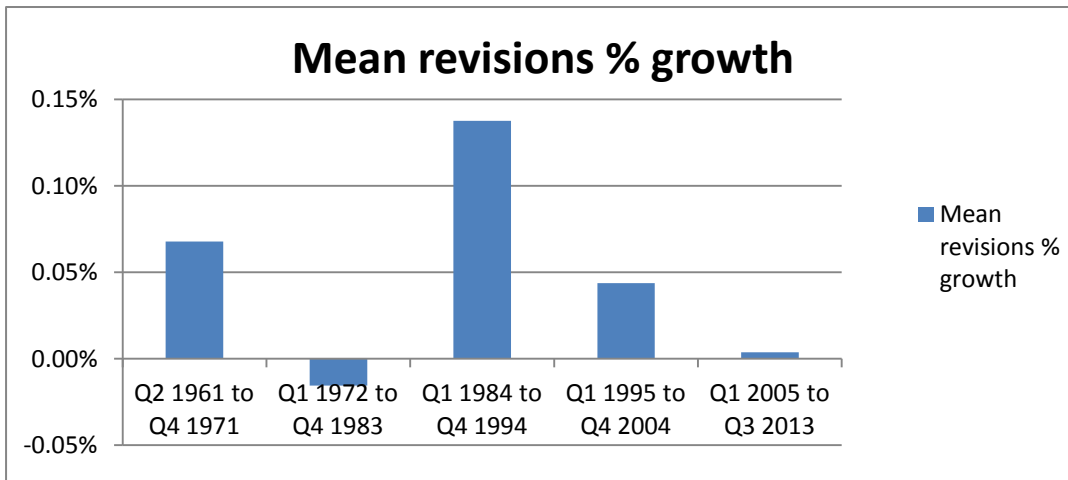
Many different approaches can be used to summarise revisions and this article updates three of the methods used originally in the ONS Brown et al paper.

The first way to analyse revisions is to look at the simple mean (arithmetic) average revision for the estimate of GDP for the period T, between the maturity T + i and the maturity T + j.

Figure 14 presents the mean revisions between the first published estimate and those published 24 months later over 5 sub-samples from the real time GDP dataset. These are calculated as quarter on quarter growth rates for CVM GDP.

Figure 14 shows that the mean revisions have fluctuated over time and in the period Quarter 1 (Jan to Mar) 1995 to Quarter 4 (Oct to Dec) 2004 they were lower than in earlier periods at under 0.05 percentage points which is insignificant from zero. This may be because the economy grew at a steady rate in this period and revisions due to data (rather than methodology improvements) are more likely to be smaller when the economy is behaving in a predictable manner.

Figure 14: Mean revisions to chained volume measure GDP quarter on quarter between T and T + 24 months, UK



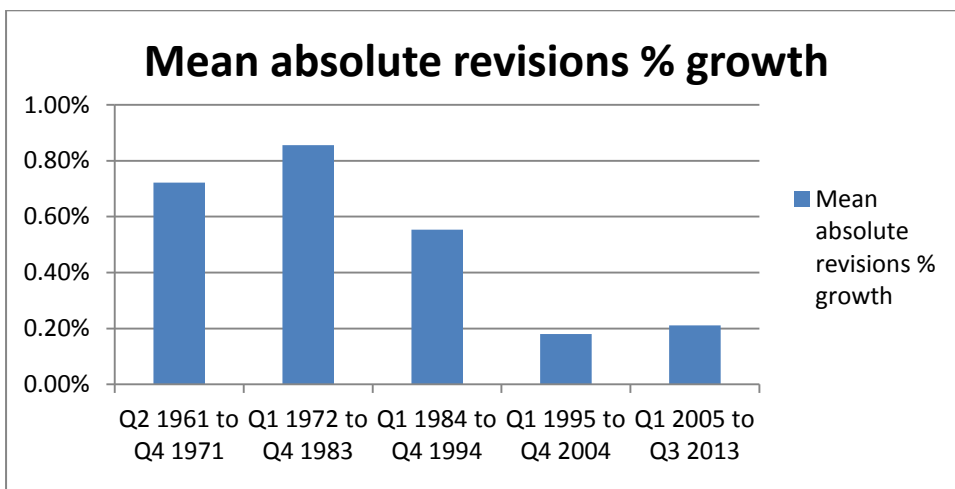
Source: Office for National Statistics

Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December).

In the 2014 revisions article the latest period had a negative mean revision, which reflected the difficulties in estimating growth when the UK entered the period of negative growth and that the turning point to negative growth had been difficult to pinpoint. However, with the later years now added and their upward revisions to growth as discussed earlier in this article, we now have a small positive mean revision of +0.004%, which shows both the sensitive nature of this type of analysis, and the sometimes misleading results which can be obtained when negatives and positives cancel out.

To remove this effect of offsetting positive and negative revisions giving an average close to zero it is better to look at the absolute level of the average revision, as seen in Figure 15.

Figure 15: Mean absolute revisions, quarter on quarter growth, chained volume measure GDP, T to T + 24 months, UK



Source: Office for National Statistics

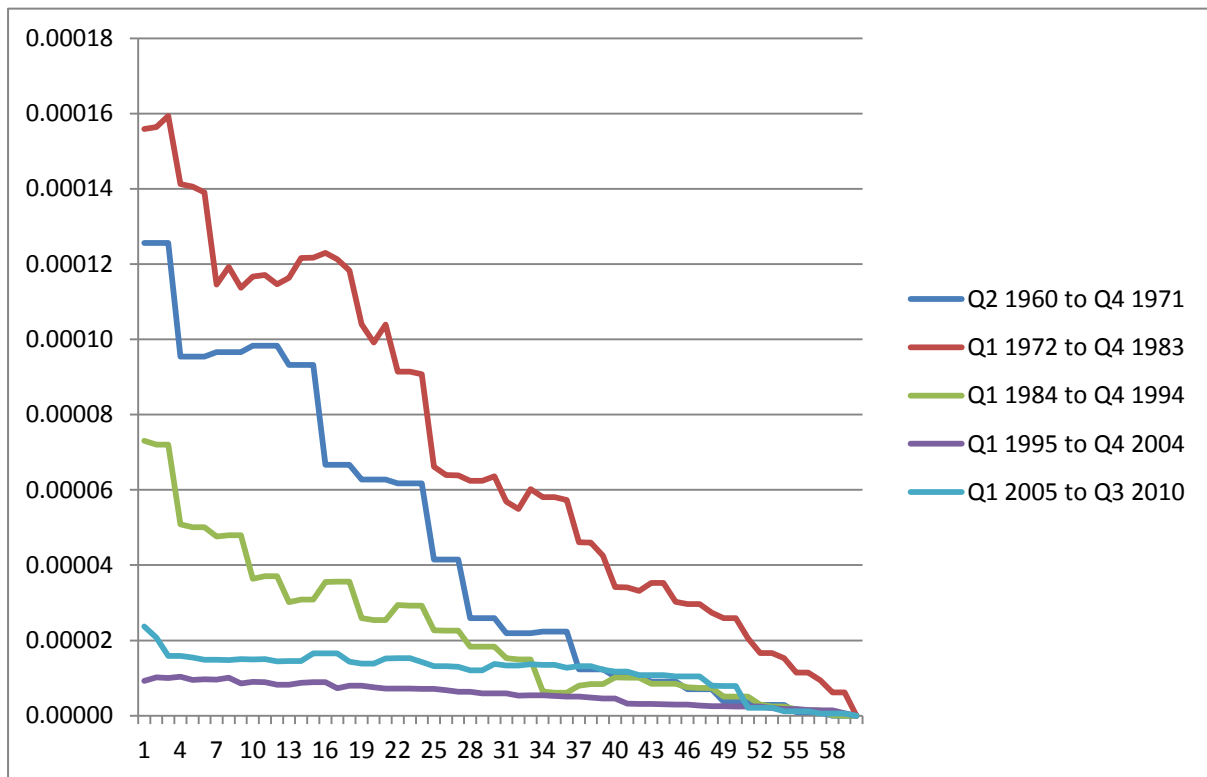
Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December)

Although Figure 15 is to a much larger scale than Figure 14, it is the relative position of the bars on Figure 15 which is more important. While the bar for the latest groups of years seem to perform better than any other period in Figure 14, here the latest period clearly has a larger mean absolute revision than during the stable economic period of Quarter 1 (Jan to Mar) 1995 to Quarter 4 (Oct to Dec) 2004. This shows that there have been slightly more revisions in absolute terms in the latest period, reflecting the more challenging nature of predicting economic growth during the recent period than during the previous ten years of steady growth. Nevertheless, the scale of revision still compares favourably with the revisions performance during the earlier groups of years.

Another way of avoiding negative revisions offsetting positive ones is to use mean squared revisions. For this analysis the revisions for period T for each estimate between T + i months, and T + j months are squared and then averaged. Using this method there is an estimate for each quarter of the 10 year time-span for the mean squared revision of the revision between the 1st estimate and the estimate at say T + 60 months, and then the mean squared revision between the 2nd estimate and T + 60 months and so on. We would expect that as we near the 60th estimate then the mean squared revision will be close to zero, so there should be a decreasing gradient to all the lines, but it is the relative position of all the lines which is more important. Squaring revisions also gives more weight to large revisions than to smaller ones, which is in line with the user perspective where a few large GDP revisions are more likely to disrupt the reading of the economy than a preponderance of smaller ones.

Figure 16 shows the mean squared revisions with respect to T + 60 month maturity, using the same periods as in Figure 12.

Figure 16: Mean squared revisions over different periods at T + 60 months, for quarter on quarter chained volume measure GDP, UK

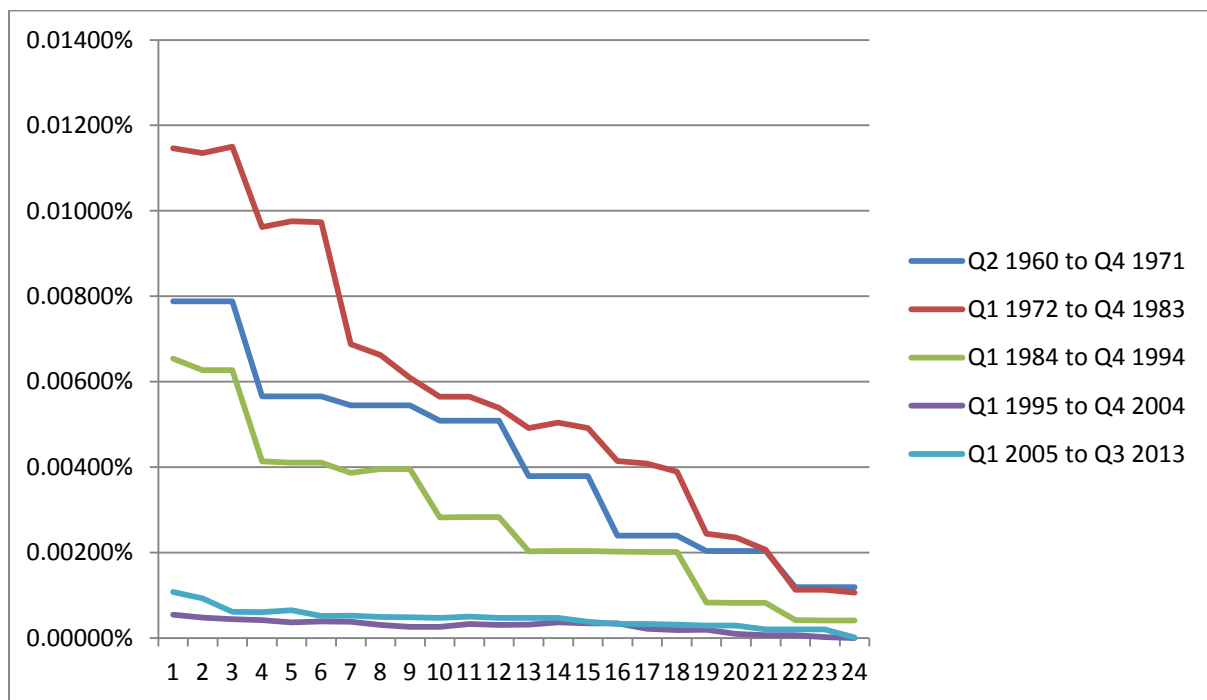


Source: Office for National Statistics

Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December)

Because the T + 60 months test includes all revisions up to 5 years after the initial estimate, it includes the effects of revisions due to methodological improvements as well as data revisions, which makes it quite a harsh test. Nevertheless, the Figure clearly shows a marked improvement in the quality of early GDP estimates in the most recent time spans with both Quarter 1 (Jan to Mar) 1995 to Quarter 4 (Oct to Dec) 2004 and Quarter 1 (Jan to Mar) 2005 to Quarter 3 (July to Sept) 2010 showing smaller revisions and a much smaller incidence of large revisions. For the former period this reflects the economic stability of the late 1990s and early 2000s. For the periods available in this analysis the Figure reflects the fact that the most recent period has been more difficult to predict than the stable period of the 1990s but also that the GDP revisions performance over this period appears to still be significantly better than that in the 3 groupings from 1961 to 1994. The author accepts that this Figure might also be misleading for the latest period as some of the more recent time periods during the economic recovery of 2010 to 2012 will still not have been through the full T + 60 time period so the last grouping ends just shy of an most important period. For this reason the same analysis has been recreated in Figure 17 but for mean squared revisions at T + 24 months.

Figure 17: Mean squared revisions over different periods at T + 24 months, for quarter on quarter chained volume measure GDP, UK



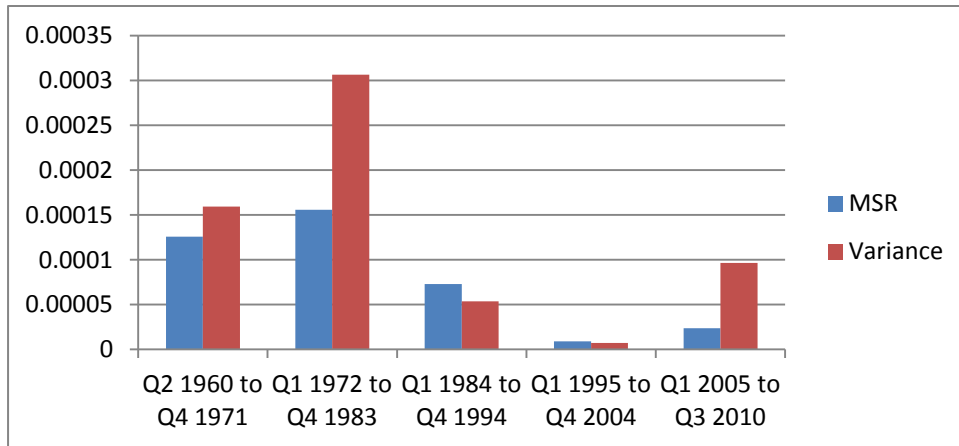
Source: Office for National Statistics

Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December)

Figure 17 highlights that recent GDP revisions performance has continued to be much better than in all periods before 1995 and there appear to be very few signs that the downturn in 2008/09 has led to increased uncertainty in the estimates as shown by the fact that the lines for Quarter 1 (Jan to Mar) 2005 to Quarter 3 (July to Sept) 2013 and Quarter 1 (Jan to Mar) 1995 to Quarter 4 (Oct to Dec) 2004 are almost identical. It therefore appears that the pattern of smaller revisions and fewer large revisions has continued even during the economic downturn and recovery.

The variance in the GDP estimates can be shown alongside the mean squared revisions to indicate how the revision compares with the size of GDP movement. Figure 18 shows that while the variance of the T + 60 month data is larger in the period since Quarter 1 (Jan to Mar) 2005 than over the 2 previous 10 year period, the mean squared error has remained low.

Figure 18: Comparison of the T to T + 60 mean squared revisions with the variance of the T + 60 maturity, quarter on quarter growth of chained volume measure GDP, UK

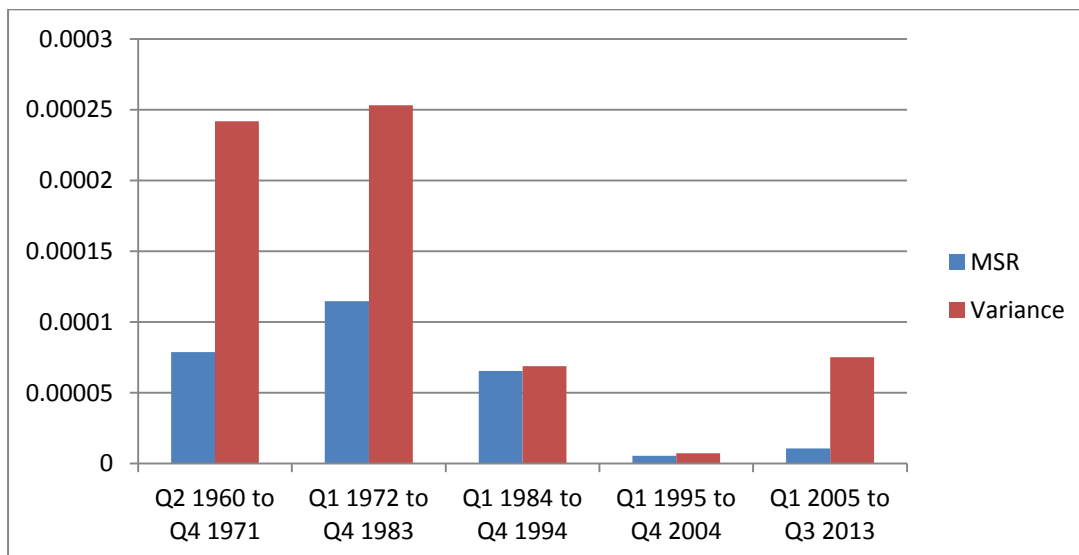


Source: Office for National Statistics

Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December)

Again, by focusing on T + 24 months rather than T + 60 months, the analysis is able to include the recent economic recovery and the focus is on data revisions rather than on long-term methodological changes.

Figure 19: Comparison of the T to T + 24 mean squared revisions with the variance of the T + 24 maturity, quarter on quarter growth of chained volume measure GDP, UK



Source: Office for National Statistics

Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December)

Here we can see much larger variability in the period Quarter 1 (Jan to Mar) 2005 to Quarter 3 (July to Sept) 2013 as the economic downturn and recovery is now fully included within the analysis but this variability is still low compared with historic levels. This increased variability is reflecting the range of positive and negative growth rates seen as the UK entered and gradually exited from the economic downturn, showing that the economy was harder to measure accurately. Reassuringly the mean squared revision has remained relatively low. This indicates that the revisions performance even in these unusual times stands up favourably to comparison with historic revisions. So while the early estimates of GDP may not be as robust during periods of greater volatility or at turning points in the economy as they were during long periods of stable growth, it does seem increasingly likely that the methods used to estimate GDP have performed well under the circumstances.

15. Conclusions

Revisions are a necessary part of the process for producing GDP in order to meet user requirements for timely estimates which reflect internationally agreed standards and definitions. Good revisions management requires regular updates on the reasons for revisions, including articles such as these and access to the underlying revisions databases to enable users of GDP data to produce their own such analyses.

Revisions to GDP quarter-on-quarter growth between the preliminary estimate and the first Quarterly National Accounts continue to be both small in size and unbiased, showing that there would be no benefit to users from delaying the preliminary GDP release to wait for greater data content, under current methodologies and with the current data sources, but we are looking at alternative data sources which might lead to a reassessment of the timing of GDP releases.

Annual Supply and Use balancing and revisions due to methodological improvements drive the largest revisions, and users suggested it would be helpful if ONS could distinguish data revisions from methodological revisions. In the impact articles for both Blue Books 2014 and 2015 we provided users with detailed analyses of the types of revisions. These analyses were very well received and are now an established part of the annual process.

The implementation of the European System of Accounts 2010 regulation added 2.3% to the level of UK current price GDP in the year 2010, which was exactly in line with the European Union average of 2.3%.

Until now there was an incomplete picture on revisions performance during the 2008/09 economic downturn and recovery. This article has shown that the revisions performance during these more volatile and difficult to predict economic times has been broadly comparable with the more stable 1990s period, but work continues to see if making more use of the expenditure and income approaches during the initial quarterly estimates could have prevented some of the revisions seen at the turning points of the economic downturn and recovery.

The UK compares favourably with other countries for revisions performance during the early estimates and up to around 4 or 5 years after the first estimate of GDP. However, after this the UK seems to have larger revisions than other countries. Three reasons for this are given; firstly it can be shown that the move from using RPI to CPI to deflate the expenditure approach to GDP caused upward revisions to GDP growth which were not seen in any other country; secondly it is probable that the UK is more likely to get upward revisions beyond the typical 5 year revisions analysis period due to the composition of the UK economy towards more innovative activities which methodological improvements take time to catch up with; and thirdly the UK received a number of ESA 95 GNI reservations during 2012 which took several Blue Books to complete. Going forwards, ESA 2010 GNI reservations will be issued in a more timely manner, and all member states will be expected to complete the actions within 4 years of receipt of the reservations.

16. Next steps

The main next steps are:

- international comparisons – this article has touched upon the UK’s revisions performance relatively to other countries, we are continuing this work (the data gathering stage is proving to be quite difficult as few countries publish as much information on revisions as the UK) and aim to report on this around the end of February. This will include a look at the impact of the switch from RPI to CPI to deflator the expenditure approach to GDP on the overall revisions performance in the UK
- presenting revisions – we are continuing to investigate ways of presenting revisions information as part of the quarterly round and annual publications
- methodology during a downturn – work continues to see if making more use of the expenditure and income approaches during the initial quarterly estimates could have prevented some of the revisions seen at the turning points of the economic downturn and subsequent recovery

Annex A: Some background to national accounts gross domestic product (GDP) and the supply and use approach

Production

Production (or Output) is estimated as the value of the output of goods and services produced across the whole economy. Output less intermediate consumption is known as gross value added (GVA).

Expenditure

Expenditure is estimated as the value of the final expenditure by consumers, non-profit institutions and government; plus gross capital formation; plus exports of goods and services; minus imports of goods and services.

Income

Income is estimated as the income earned by individuals and corporations in the production of goods and services: that is, compensation of employees plus gross mixed income plus gross operating surplus; plus taxes on production and imports; minus subsidies on production.

Supply and Use

Whilst each of the 3 approaches is attempting to measure the same economic value, the different sources and the statistical and non-statistical errors associated with these sources means that the totals arrived at by the 3 measures are not equal. The Supply and Use framework represents a structure that enables you to confront these sources in a coherent way, with the aim of achieving a single measure of GDP.

More information

Further information is included in "[A short guide to the UK National Accounts](#)", published on 30 September 2015.

Annex B: Background to the compilation of gross domestic product**Introduction to compiling GDP**

In common with other countries, and following methods and principles agreed by international statistical bodies, the UK National Accounts are built up from a variety of surveys and administrative sources, which measure activity in the economy in different ways. In particular, GDP can be measured in terms of 3 distinct approaches: production, expenditure and income. The sources used in compiling the National Accounts are shown in annex C.

In understanding the nature of revisions to GDP and their source, it is helpful to have in mind the framework and timetable for publishing successively improved estimates. Broadly, the main steps are:

- preliminary estimates are published shortly after the end of the quarter to which they relate, based on partial output information
- second and third estimates are published 1 and 2 months later, respectively, based on fuller output information but presenting evidence from expenditure and income sources
- estimates are further refined in the annual "Blue Book" after application of Supply and Use table balancing at detailed sector and product level

These steps are described more fully in the following sections.

Preliminary estimate

In the UK the first or preliminary estimate of GDP in a particular quarter is published just three and a half weeks after the end of the quarter and is one of the fastest in the world (and the fastest in Europe). This estimate is based exclusively on output data. No information on the income or expenditure measure is available in this timescale and indeed, there is no information on intermediate consumption. The assumption therefore is that changes in output are a good proxy in the short-term for value added, that is, changes in intermediate consumption are the same as changes in output. Further, the preliminary quarterly estimates of output are based on the monthly indicators that are published for each of the three main industrial sectors of the economy (production, services and construction).

At the time of publication of the preliminary estimate, estimates of the first 2 months of the quarter are available for many industries but the estimate of the quarter includes a "nowcast" of the third month of the quarter, based on recent trends refined by around a 30% response from businesses for that third month from the Monthly Business Survey. For some industries however, the short term estimate of GDP is based on a quarterly indicator, which typically has to be nowcast at the time of the preliminary estimate. Overall, the preliminary estimate contains around 44% of real data content by weight, a figure that rises to 80% by the time of the second estimate and 90% by the third publication.

Second estimate and Quarterly National Accounts (third estimate)

The aim of the quarterly balancing and adjustment process is to reduce inconsistencies in the accounts and to come to a firm view on movements in main aggregates. The published accounts show all three approaches with similar movements and levels with credible explanations for movements in components. Our current judgement is that generally in the short term the output approach gives the best estimate of growth in GDP. This judgement is in part based upon the availability of source data for the various components of the output, expenditure and income measures. To achieve this balance, we:

- scrutinise the initial estimates of each component from the source data
- apply judgmental adjustments to the estimates based on an assessment of the quality of those sources

- apply explicit alignment adjustments to components of expenditure (changes in inventories) and income (gross operating surplus of private non-financial corporations) as these components are judged to have the widest error margins (alignment adjustments are made to sum to zero for a calendar year where all 4 quarters have been published)

The results of this quarterly balancing process coupled with an explicit “statistical discrepancy” to account for residual differences in years since the latest year in which there are “balanced Supply and Use tables” provides a solution to the discrepancies in the different measures of GDP by putting forward the most coherent estimates that arise from the integrated accounts.

Balanced Supply and Use tables

Supply and Use tables (SUTs) provide the framework that ensures, for any "balanced year" the estimates of industry outputs, inputs and value added are confronted and a single picture of the industry produced. SUTs are currently published for 114 industries and products based on the 2007 Standard Industrial Classification for years 1997 to 2013 and on a current price basis only. 2013 was balanced for the first time in Blue Book 2015. Producing SUTs allows an examination of consistency and coherence of national accounts components within a single detailed framework and, by incorporating the components of the 3 approaches to measuring GDP, enables a single estimate of GDP to be determined. The current methodological approach to determining GDP is based on the assertion that, for years where SUTs have been produced, GDP should be set at the level derived from the balance. For subsequent periods, this level is carried forward using short-term movements in components according to the quarterly balancing process described above. More details of the data sources for the different components of GDP are provided in annex C.

Balancing SUTs is currently an annual exercise that is based on annual sources of data. That is, there is no additional information about the quarterly movements in GDP that comes from producing the SUTs. However, constraining the quarterly path of a component that comes from the short term sources to the annual level that comes from balancing the annual sources can often be challenging, particularly when successive "benchmarks" are taking the estimates in opposite directions. This was particularly true in 2008 and 2009, where the SUTs suggested that the 2008 level of GDP was lower than previously thought but that 2009 was higher. Constructing a quarterly path through those 2 years was a particular challenge.

Annex C: Sources used in compiling estimates of gross domestic product

Preliminary Estimate - Output based	
Output Industry	Organisation
Agriculture, forestry and fishing	Department for Environment, Food and Rural Affairs Forestry Commission Marine Management Organisation
Mining and quarrying	Department of Energy and Climate Change ONS Short Term Employment Survey ONS Monthly Business Survey
Manufacturing	ONS Monthly Business Survey: except, Refined Petroleum from Department of Energy and Climate Change and Iron and Steel from the International Steel Statistics Bureau
Electricity, gas, steam and air conditioning supply	Department of Energy and Climate Change
Water supply; sewerage, waste management and remediation activities	ONS Monthly Business Survey ONS General Government Data ONS Public Sector Data
Construction	ONS Monthly Business Survey
Wholesale and retail trade; repair of motor vehicles and motorcycles	ONS Monthly Business Survey ONS Retail Sales Index
Transportation and Storage	Rail Transport - Office of Rail Regulation Water Transport - ONS International Passenger Survey, ONS Balance of Payments and Department for Transport Air Transport - Civil Aviation Authority ONS - Monthly Business Survey all others
Accommodation and food service activities	ONS Monthly Business Survey
Information and communication	ONS Monthly Business Survey ONS Short Term Employment Survey

Financial and Insurance activities	<p>ONS Financial Inquiries</p> <p>Association of British Insurers</p> <p>London Stock Exchange</p> <p>Investment Management Association</p> <p>Association of Investment Companies</p> <p>Bank of England</p>
Real Estate Activities	<p>ONS Household Final Consumption Expenditure</p> <p>Investment Property Databank</p> <p>ONS Monthly Business Survey</p>
Professional, scientific and technical activities	<p>ONS Monthly Business Survey</p> <p>ONS Short Term Employment Survey</p>
Administrative and support service activities	<p>ONS Monthly Business Survey</p>
Public administration and defence; compulsory social security	<p>ONS General Government data</p> <p>ONS Public Sector Employment</p>
Education	<p>ONS General Government data</p> <p>ONS Short Term Employment Survey</p> <p>ONS Monthly Business Survey</p> <p>Independent Schools Information Services</p>
Human health and social work activities	<p>ONS Monthly Business Survey</p> <p>ONS Short Term Employment Survey</p> <p>ONS General Government data</p>
Arts, entertainment and recreation	<p>ONS Monthly Business Survey</p> <p>ONS Household Final Consumption Expenditure</p> <p>ONS General Government data</p>
Other service activities	<p>ONS Short Term Employment Survey</p> <p>ONS Monthly Business Survey</p> <p>Department for Business, Innovation and Skills</p>
Activities of households as employers; undifferentiated goods- and services- producing activities of households for own use	<p>ONS Household Final Consumption Expenditure</p>

Quarterly Balancing		
GDP component	Organisation	GDP measure
Index of Production and Index of Services	Data sources as at Preliminary GDP above	Output
Household Final Consumption Expenditure	ONS Retail Sales Inquiry, HM revenue and customs, ONS Living Costs and Food survey, ONS International Passenger Survey, Department of Energy and Climate Change, Transport for London, Office of Rail Regulation, Department for Transport, OFCOM.	Expenditure
Government Final Consumption Expenditure	Her Majesty's Treasury, Department of Health, Department for Work & Pensions	Expenditure
Gross Fixed Capital Formation	ONS Capital Expenditure Survey, Capex, buildings and dwellings data imputed from construction data.	Expenditure
Inventories	ONS Stocks Survey	Expenditure
Trade in Goods	Her Majesty's Revenue and Customs and Intrastat	Expenditure
Trade in Services	ONS International Passenger Survey and ONS International Trade in Services, forecasts	Expenditure
Taxes on products less subsidies	HM revenue and customs, Her Majesty's Treasury,	Expenditure
NPISH final consumption expenditure	Forecast from previous periods, Higher Education Statistics Agency, National Council for Voluntary Organisations, Electoral Commission, Trade Union Certification Office.	Expenditure
Gross Operating Surplus of Private Non-financial Corporations	ONS Quarterly Profits Inquiry, forecasts Department of Energy and Climate Change	Income

	administrative data for UK continental shelf profits.	
Gross Operating Surplus of Financial Corporations	Bank of England	Income
Gross operating surplus of Public Corporations	BBC, Scottish Water, Channel 4, Manchester Airport, Post Office, Transport for London, Export Credit Guarantee Department	Income
Mixed Income GOS	HM revenue and customs, rental data (forecast), holding gains obtained from GFCF satellite.	Income
NPISH GOS	Supplied by the GFCF team, based on investment data from the capex survey.	Income
Households GOS	Forecast, FISIM	Income
Government GOS	Government data	Income
Compensation of Employees	ONS Average Weekly Earnings ONS Work Force Jobs	Income

Main Annual Sources Used For Supply And Use Balancing		
GDP approach	Organisation	GDP measure
GDP Production approach	ONS Annual Business Survey	Output
	ONS PRODCOM survey	Output
	ONS Purchases' Inquiry	Output
	ONS International Trade in Services	Output
	Department for Environment, Food and Rural Affairs	Output
	Civil Aviation Authority	Output
	Department of Health	Output
	Bank of England	Output
GDP Income approach	Her Majesty's Revenue and Customs income data	Income
	Bank of England	Income
	ONS Quarterly Profits Inquiry	Income
	ONS Public Corporations' Survey	Income
	Her Majesty's Treasury data	
GDP Expenditure approach	ONS Living Costs and Food Survey	Expenditure
	ONS Monthly Business Survey	Expenditure
	ONS International Trade in Services	Expenditure
	Government internal accounting systems	Expenditure
	Her Majesty's Revenue and Customs	Expenditure
	ONS Trade in Goods	
	ONS Quarterly Capital Expenditure Survey	Expenditure
	ONS Annual Business Survey investment data	Expenditure
	ONS Construction data	Expenditure

Annex D: Current price and chained volume measure annual revisions by Blue Book

Current price

	BB00	BB01	BB02	BB03	BB04	BB05	BB06	BB07	BB08	BB09	BB10	BB11	BB12	BB13	BB14	BB15
1997	6.5%	6.4%	6.4%	6.2%	6.2%	6.2%	6.0%	6.1%	6.2%	6.2%	6.2%	6.2%	6.0%	6.2%	5.1%	5.5%
1998	5.7%	6.0%	6.0%	6.0%	6.0%	6.2%	6.1%	6.1%	5.9%	5.9%	5.9%	5.9%	5.6%	5.5%	5.1%	5.0%
1999	4.6%	4.8%	5.0%	5.2%	5.2%	5.2%	5.3%	5.3%	5.6%	5.6%	5.6%	5.7%	5.3%	5.2%	4.3%	4.3%
2000		4.7%	5.3%	5.2%	5.2%	5.3%	5.1%	5.2%	5.1%	5.1%	5.1%	5.1%	4.9%	5.2%	6.3%	6.2%
2001			4.0%	4.5%	4.6%	4.5%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.5%	3.8%	3.8%
2002				5.0%	5.0%	5.2%	5.2%	5.2%	5.3%	5.3%	5.3%	5.3%	4.8%	4.8%	5.2%	5.1%
2003					5.3%	5.5%	5.9%	5.9%	6.0%	6.0%	6.0%	6.0%	6.4%	6.2%	6.6%	6.2%
2004						5.3%	6.0%	5.9%	5.3%	5.5%	5.5%	5.5%	5.6%	5.6%	5.4%	5.5%
2005							4.1%	4.2%	4.3%	4.2%	4.2%	4.3%	5.2%	5.3%	5.7%	6.0%
2006								5.3%	5.5%	5.7%	5.9%	5.9%	5.6%	5.7%	5.8%	5.7%
2007									6.0%	5.5%	5.8%	5.8%	5.9%	5.8%	5.5%	5.5%
2008										3.4%	2.9%	2.0%	2.0%	2.4%	2.5%	2.4%
2009											-3.7%	-2.8%	-2.7%	-3.1%	-2.4%	-2.2%
2010												4.6%	4.6%	4.8%	5.1%	4.7%
2011													3.4%	3.5%	3.8%	4.1%
2012														2.0%	2.3%	2.8%
2013															3.5%	4.2%
2014																4.7%

Chained volume measure

	BB00	BB01	BB02	BB03	BB04	BB05	BB06	BB07	BB08	BB09	BB10	BB11	BB12	BB13	BB14	BB15
1997	3.5%	3.4%	3.4%	3.3%	3.3%	3.2%	3.0%	3.1%	3.3%	3.3%	3.3%	3.4%	3.9%	4.4%	2.6%	3.1%
1998	2.6%	3.0%	2.9%	3.1%	3.1%	3.2%	3.3%	3.4%	3.6%	3.6%	3.6%	3.8%	3.5%	3.6%	3.5%	3.4%
1999	2.1%	2.1%	2.4%	2.8%	2.9%	3.0%	3.0%	3.0%	3.5%	3.5%	3.5%	3.7%	3.2%	2.9%	3.2%	3.1%
2000		2.9%	3.1%	3.8%	3.9%	4.0%	3.8%	3.8%	3.9%	3.9%	3.9%	4.5%	4.2%	4.4%	3.8%	3.8%
2001			1.9%	2.1%	2.3%	2.2%	2.4%	2.4%	2.5%	2.5%	2.5%	3.2%	2.9%	2.2%	2.7%	2.8%
2002				1.7%	1.8%	2.0%	2.1%	2.1%	2.1%	2.1%	2.1%	2.7%	2.4%	2.3%	2.5%	2.5%
2003					2.2%	2.5%	2.7%	2.8%	2.8%	2.8%	2.8%	3.5%	3.8%	3.9%	4.3%	3.3%
2004						3.2%	3.3%	3.3%	2.8%	3.0%	3.0%	3.0%	2.9%	3.2%	2.5%	2.5%
2005							1.9%	1.8%	2.1%	2.2%	2.2%	2.1%	2.8%	3.2%	2.8%	3.0%
2006								2.8%	2.8%	2.9%	2.8%	2.6%	2.6%	2.8%	3.0%	2.7%
2007									3.0%	2.6%	2.7%	3.5%	3.6%	3.4%	2.6%	2.6%
2008										0.7%	-0.1%	-1.1%	-1.0%	-0.8%	-0.3%	-0.5%
2009											-4.9%	-4.4%	-4.0%	-5.2%	-4.3%	-4.2%
2010												1.8%	1.8%	1.7%	1.9%	1.5%
2011													0.8%	1.1%	1.6%	2.0%
2012														0.3%	0.7%	1.2%
2013															1.7%	2.2%
2014																2.9%

Annex E: Quarter on quarter GDP revisions, CVM

Blue Book quarters	Balanced years up to Q4 2013					
	M1	M3	Latest (23 December 2015)	Total Revision	M1 - M3	Absolute average M1 - M3
Q1 1998	1.0%	0.8%	0.6%	-0.4%	-0.2%	0.2%
Q2 1998	0.5%	0.5%	0.7%	0.3%	0.0%	0.0%
Q3 1998	0.4%	0.3%	0.7%	0.3%	-0.1%	0.1%
Q4 1998	0.2%	0.1%	1.0%	0.8%	-0.1%	0.1%
Q1 1999	0.0%	0.1%	0.5%	0.5%	0.2%	0.2%
Q2 1999	0.5%	0.6%	0.2%	-0.3%	0.1%	0.1%
Q3 1999	0.9%	1.0%	1.6%	0.7%	0.1%	0.1%
Q4 1999	0.8%	0.8%	1.3%	0.5%	0.0%	0.0%
Q1 2000	0.5%	0.5%	1.1%	0.6%	0.0%	0.0%
Q2 2000	0.9%	0.9%	0.7%	-0.2%	0.0%	0.0%
Q3 2000	0.7%	0.8%	0.4%	-0.3%	0.1%	0.1%
Q4 2000	0.3%	0.4%	0.3%	0.0%	0.1%	0.1%
Q1 2001	0.4%	0.5%	1.1%	0.7%	0.0%	0.0%
Q2 2001	0.3%	0.4%	0.8%	0.4%	0.1%	0.1%
Q3 2001	0.5%	0.5%	0.6%	0.1%	0.0%	0.0%
Q4 2001	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%
Q1 2002	0.1%	0.1%	0.4%	0.3%	0.0%	0.0%
Q2 2002	0.9%	0.6%	0.8%	-0.1%	-0.3%	0.3%
Q3 2002	0.7%	0.9%	1.0%	0.3%	0.2%	0.2%
Q4 2002	0.4%	0.4%	0.9%	0.5%	0.0%	0.0%
Q1 2003	0.2%	0.1%	0.7%	0.5%	-0.1%	0.1%
Q2 2003	0.3%	0.6%	0.9%	0.6%	0.3%	0.3%
Q3 2003	0.6%	0.8%	0.8%	0.2%	0.2%	0.2%
Q4 2003	0.9%	0.9%	0.7%	-0.2%	0.0%	0.0%
Q1 2004	0.6%	0.7%	0.7%	0.1%	0.1%	0.1%
Q2 2004	0.9%	0.9%	0.5%	-0.4%	0.0%	0.0%
Q3 2004	0.4%	0.5%	0.2%	-0.2%	0.1%	0.1%
Q4 2004	0.7%	0.7%	0.5%	-0.2%	0.0%	0.0%
Q1 2005	0.6%	0.4%	0.7%	0.1%	-0.2%	0.2%
Q2 2005	0.4%	0.5%	1.1%	0.7%	0.1%	0.1%
Q3 2005	0.4%	0.4%	1.0%	0.6%	0.0%	0.0%
Q4 2005	0.6%	0.6%	1.4%	0.8%	0.0%	0.0%
Q1 2006	0.6%	0.7%	0.4%	-0.2%	0.1%	0.1%
Q2 2006	0.8%	0.7%	0.3%	-0.5%	-0.1%	0.1%

Revision between M1 and M3

Revision	count
-0.5%	1
-0.4%	0
-0.3%	1
-0.2%	3
-0.1%	14
0.0%	24
0.1%	13
0.2%	5
0.3%	3

Revision between M1 and Latest

Revision	count
< -0.5%	4
-0.5%	1
-0.4%	2
-0.3%	4
-0.2%	8
-0.1%	2
0.0%	4
0.1%	4
0.2%	6
0.3%	9
0.4%	4
0.5%	5
>+0.5%	11

Q3 2006	0.7%	0.7%	0.1%	-0.6%	0.0%	0.0%
Q4 2006	0.8%	0.7%	0.6%	-0.2%	-0.1%	0.1%
Q1 2007	0.7%	0.7%	1.0%	0.3%	0.0%	0.0%
Q2 2007	0.8%	0.8%	0.6%	-0.2%	0.0%	0.0%
Q3 2007	0.8%	0.7%	0.8%	0.0%	-0.1%	0.1%
Q4 2007	0.6%	0.6%	0.8%	0.2%	0.0%	0.0%
Q1 2008	0.4%	0.3%	0.2%	-0.2%	-0.1%	0.1%
Q2 2008	0.2%	0.0%	-0.6%	-0.8%	-0.2%	0.2%
Q3 2008	-0.5%	-0.6%	-1.7%	-1.2%	-0.1%	0.1%
Q4 2008	-1.5%	-1.6%	-2.3%	-0.8%	-0.1%	0.1%
Q1 2009	-1.9%	-2.4%	-1.6%	0.3%	-0.5%	0.5%
Q2 2009	-0.8%	-0.6%	-0.2%	0.6%	0.2%	0.2%
Q3 2009	-0.4%	-0.2%	0.2%	0.6%	0.2%	0.2%
Q4 2009	0.1%	0.4%	0.4%	0.3%	0.3%	0.3%
Q1 2010	0.2%	0.3%	0.4%	0.2%	0.1%	0.1%
Q2 2010	1.1%	1.2%	0.8%	-0.3%	0.1%	0.1%
Q3 2010	0.8%	0.7%	0.5%	-0.3%	-0.1%	0.1%
Q4 2010	-0.5%	-0.5%	0.1%	0.6%	0.0%	0.0%
Q1 2011	0.5%	0.5%	0.7%	0.2%	0.0%	0.0%
Q2 2011	0.2%	0.1%	0.3%	0.2%	-0.1%	0.1%
Q3 2011	0.5%	0.6%	0.8%	0.3%	0.1%	0.1%
Q4 2011	-0.2%	-0.3%	0.2%	0.4%	-0.1%	0.1%
Q1 2012	-0.2%	-0.3%	0.2%	0.4%	-0.1%	0.1%
Q2 2012	-0.7%	-0.4%	-0.2%	0.5%	0.3%	0.3%
Q3 2012	1.0%	0.9%	1.0%	0.0%	-0.1%	0.1%
Q4 2012	-0.3%	-0.3%	-0.1%	0.2%	0.0%	0.0%
Q1 2013	0.3%	0.3%	0.7%	0.4%	0.0%	0.0%
Q2 2013	0.6%	0.7%	0.6%	0.0%	0.1%	0.1%
Q3 2013	0.8%	0.8%	0.9%	0.1%	0.0%	0.0%
Q4 2013	0.7%	0.7%	0.6%	-0.1%	0.0%	0.0%

Source: Office for National Statistics

Note: Q1 is Quarter 1 (January to March), Q2 Quarter 2 (April to June), Q3 Quarter 3 (July to September), Q4 Quarter 4 (October to December).

Annex F: The major causes of revision by Blue Book

Blue Book 2001 – Featured major revisions, including new information on sales by manufacturers to final consumers back to 1986, revisions to Producer Prices Indices (PPIs) for computers, from 1996 onwards. Reallocations of income between sectors following methods changes, reviewed allocation of self-employment income, rental income also now in mixed income, and revisions to operating surplus of insurance corporations included within financial corporations' operating surplus.

Blue Book 2002 – No revisions pre-1996 and very closed in terms of revisions.

Blue Book 2003 – A full Supply and Use table rebalance back to 1996. Introduced annual chain-linking and moved from 1995 to 2000 for referencing. Also revised up imports of goods back to 1999 to adjust for impact of VAT Missing Trader Intra-Community (MTIC) fraud.

Blue Book 2004 – Rebalance of 2001 and balanced 2002 for the first time. Reclassified NHS trusts from public corporation sector to central government sector back to 1991. Referenced from 2000 to 2001 and introduced a new method for estimating the output of government health services back to 1996 in CVMs.

Blue Book 2005 – Rebalance of 2002 and balanced 2003, with the reference year moved from 2001 to 2002. Current price revisions back to 1991 for improving the recording of private pension contributions and receipts, and for CVM GDP there was a new methodology for the estimation of government education and social protection from 1996 onwards. Also improved the allocation of central government consumption to reflect machinery of government changes from 1996 onwards in CVMs.

Blue Book 2006 – Full rebalance for 2003 and balanced 2004, with specific current price revisions to earlier years, mainly to apportion adjustments across industries which wasn't completed in BB 2005. Reference year moved from 2002 to 2003.

Blue Book 2007 – closed to all revisions except for revisions to estimates for private investment in own-account computer software back to the 1970s which increased current price levels. No Supply and Use rebalance of 2004, and no balance of 2005. Reference year unchanged.

Blue Book 2008 – FISIM (Financial Intermediation Services, Indirectly Measured). For Supply and Use tables there was a rebalance of 2004, with 2005 and 2006 balanced for first time. Reference year unchanged.

Blue Book 2009 – Rebalance of 2004 to 2006 and balanced 2007 for first time and moved from 2003 to 2005 as reference year.

Blue Book 2010 – Rebalance of 2006 to 2007 and balanced 2008 for first time and moved from 2005 to 2006 as reference year.

Blue Book 2011 – Introduction of SIC 2007, CORD systems and replacing RPI with CPI to deflate main expenditure and output components (Back to 1997 only). Reference year moved from 2006 to 2008.

Blue Book 2012 – Insurance revisions to clear GNI reservation taken back to 1987, deflator changed from RPI to CPI pre-1997 to start of GDP series. Reference year moved from 2008 to 2009.

Blue Book 2013 – ESA 95 GNI reservations for Own account software, improved estimation of artistic originals and imputed rentals of owner occupiers were all addressed back to 1990. The Gross Capital Formation methodological development revised estimates of GFCF and Changes in inventories back to 1997 and improvements were made to the estimates of bonds data, overseas deposits of private non-financial corporations. Improvements were also made to the alignment of national accounts with the Public Sector Finances. Reference year moved from 2009 to 2010.

Blue Book 2014 – ESA 95 GNI reservations relating to the measurement of the Non-Profit Institutes Serving Households Sector (NPISH), household expenditure on new cars, the inclusion of illegal activities into the National Accounts, and improvements made to the measurement of “own account construction”. ESA 2010 implementation including Research and development, weapons, decommissioning costs, small tools and pensions. Other changes included the review of public sector finances and further alignment of national accounts with public sector finances, improved methods for inventories and gross fixed capital formation, Producer Price Index (PPI) and Services Producer Price Index (SPPI) re-basing from 2005 to 2010. Reference year moved from 2010 to 2011.

Blue Book 2015 – ESA 95 GNI reservations for exhaustiveness adjustments for concealed income and under-coverage of unincorporated businesses, new estimates within the NPISH sector and a rebalance across all sectors, cross-border property income, improvements to the estimation of spending on repairs and maintenance of dwellings by householders, improvements to the estimation of the consumption of fixed capital on roads, and a change to the recording of vehicle registration tax is a fee paid on a vehicle when it is first registered. Other improvements related to gross fixed capital formation, reclassifications, local government pensions, alcohol and tobacco in household final consumption expenditure, narcotics, consumer price index including housing (CPIH) alignment, insurance industry measurement. Reference year moved from 2011 to 2012.

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