

Statistics Commission



Revisions to Economic Statistics

Annexes to Review by National Institute of
Economic and Social Research

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Review of Revisions to Economic Statistics

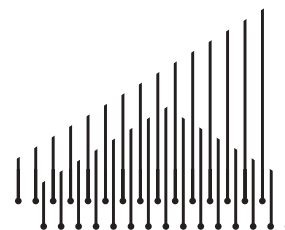
Annex 1: Transcripts of the Interviews

Annex 2: Submission by
Drs. Garratt and Vahey

Annex 3: Submission by Office for National Statistics

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Contents

	Page
Annex 1: Transcripts of Interviews	3
Annex 2: Submission by Drs. Garratt and Vahey	11
Annex 3: Submission by Office for National Statistics	13
Preface	15
Detailed Index	16
A. Introduction by the National Statistician	19
B. Revisions to Gross Domestic Product	21
C. Revisions to the Index of Production	53
D. Revisions to the Retail Sales Index	59
E. Revisions to Business Investment	66
F. Missing Trader Intra-Community Fraud	68
G. Responses to NIESR Questions	72
References	99
ONS Annex 1. Balancing the National Accounts	102
ONS Annex 2. The STOI Review	108
ONS Annex 3. The Labour Force Survey Review	111
ONS Annex 4. SPC Paper on Revisions	113
Index to Charts and Tables	118

Annex 1: Transcripts of Interviews

Simon Briscoe; Financial Times

It is useful to repeat Len Cook's mantra that when statistics become the story then statistics are failing. Recently the quality of the statistics has become the story. This has adversely affected the reputation of the ONS. But revisions to economic data explain only part of this; there have been other factors at play, such as the network rail bailout.

Not all revisions are caused by the ONS's "failures". Some revisions, such as those associated with the introduction of annual chain-linking (ACL), have reflected methodological improvements made by the ONS. Such changes are to be welcomed; we might call these revisions "good". Indeed, the ONS did a thorough job at warning users about the likely revisions associated with ACL well in advance of its introduction. However, ONS did commit a presentational mistake by introducing other changes at the same time, such as corrections for both VAT fraud and the initial construction estimates. These corrections made it difficult to isolate the "good" revision associated with ACL.

However, other revisions are "bad", and reflect failures by the ONS, given the large resources made available to it. Notable examples, are those revisions associated with the Census. The ONS took too long to admit there were problems with the Census; it should have been more pro-active in admitting there were mistakes.

When the ONS publishes a number it is not clear how reliable it is. The ONS could therefore help users by indicating how reliable or robust estimates are. Given that the ONS produces quick estimates of GDP, for example, users expect a couple of revisions. They are aware of the trade-off between reliability and timeliness; the current balance is fine. Indeed, once a decade one may experience more pronounced revisions that break the general revision pattern. However, better advice on how reliable estimates are could help users. Economic data used to be graded A or B, for example, according to their reliability. This was a sensible idea and, despite its shortcomings, grading was better than no indication of reliability at all. The suspension of grading was a backward step.

Annex 1

Transcripts of Interviews

Ed Crooks; Financial Times

Revisions have affected analysis as they have changed the picture of recent economic history. Revisions are a natural feature of data. There is not a fundamental problem. No one is to blame. We know revisions should be expected. Analysis based on the first estimates of data is always preliminary. That said there: (i) is a systematic bias in GDP estimates in the sense that on average the first GDP estimate is later revised upwards. This seems strange; such a bias ought to be correctable; (ii) some revisions have been particularly large, such as the Q2 GDP growth estimate. This revision appears to be an outlier. If this sort of thing happened a lot that would be a cause for concern; but if it is a one-off then one should not be too worried.

The ONS does a good job at advertising revisions to users. But information on typical revisions would be useful. Perhaps this could be published at the time of the first estimate; perhaps it could also be flagged up more. ONS advertised the introduction of annual chain linking (ACL) well. It was thought that the impact of ACL would be to depress growth; in effect this effect was outweighed by other factors. Maybe methodological and other changes should not all be done at once, but maybe they should be brought in one-by-one. This would let users separate out the impact of the changes. Perhaps they could observe, say, ACL leading to growth estimates being revised down, but then see clearly how other factors have outweighed this effect. As it was, users were a little surprised by the upward revision to historical GDP growth estimates as the ONS had lead them to believe that there would be a downward revision due to ACL.

The production of timely data is important. It is better to have imperfect official numbers than spurious ones from unofficial sources. The ONS is 'better' than the Eurozone, where data are published very slowly.

Kevin Daly and David Walton; Goldman Sachs

First, it is important to emphasize that the ONS performs well relative to statistical offices in other countries. Any criticism of the ONS should be viewed in this context.

Second, there is no evidence of revisions becoming an increasing problem. In fact, our analysis suggests the opposite. Third, the ONS is transparent (in the sense that its methodology is public information). Some "surprise" revisions – and we are thinking of the revision to 2003 Q2 GDP growth, in particular – could have been anticipated if analysts had factored in all publicly available information (in this case the substantial revision to estimated construction output).

On a related point, not all revisions are the "fault" of the ONS. In this case, the inaccuracy of the initial estimate was due to the DTI's construction estimate.

However, the ONS might want to consider the following suggestions:

- (1) Timely data are useful as long as they are meaningful. There is no point to the first estimate/release if it contains no 'useful' information. The revisions to some first estimates – business investment comes to mind – are so large that it might be worth delaying the release.
- (2) It would be useful if the ONS made data vintages available. Such data sets are useful tools for economists. The Bank of England had to construct its own real-time data.
- (3) Experienced users are aware of revisions, as the information is available, and they are not surprised when revisions happen. But perhaps better dissemination by the ONS would ensure more users are not taken by surprise. For example, the briefing notes could be included in the press release.

Geoffrey Dicks; Royal Bank of Scotland

Large revisions, seen with the GDP data, affect the dynamics of economic relationships, and perhaps even their cointegrating properties. Revisions, therefore, influence economic modelling. GDP revisions are of primary importance as GDP estimates are the standard measure of the 'whole' economy. Moreover GDP estimates, and revisions to them, have a special importance as they are seen to affect the interest rate setting behaviour of the MPC.

Revisions, and their direction, are not a surprise. An upward revision to GDP growth estimates is expected. But the revision from 0.3% to 0.6% to the 2003 Q2 estimate did take users aback. It is appreciated that with the passing of time a better split of a nominal variable into price and quantity can be obtained. There is a trade-off between timeliness and accuracy. But the effect the revisions had on dynamics was surprising. The cause of the Q2 revision was the construction estimate produced not by the ONS but the DTI.

Even small revisions to key data can have a significant affect on financial markets; the markets care whether a number is either 0.7% or 0.8%, even if, to national account statisticians, the revision is within the normal margin of error.

It appears sensible to believe that the ONS has improved its performance over time, in the sense that revisions have got smaller.

Revisions do not affect the confidence placed in the statistical system. Earlier estimates are welcome even if they are revised.

Gary Duncan; The Times

There is a "perception of extensive and frequent revision to economic data". It is recognised that data need to be revised. But explaining this to others is difficult. The timeliness versus accuracy trade-off is difficult to explain to a general audience.

Annex 1 Transcripts of Interviews

Revisions can reach a scale such that revisions to initial estimates are so misleading that the sign of the estimate is wrong. To make an analogy, it is better to have a speedometer than none at all; but this speedometer is of little use if we cannot even tell if we are going forwards or backwards.

Revisions cause problems for the public. They have an impact on the real economy via perceptions.

Perhaps there should be more quality control at the ONS. A confidence indicator for data could be published saying how much weight/confidence ought to be attached to, or placed, in the data. The ONS should provide more prominent health warnings with its data: the first release of regional sales contains, say, 70% of the data. This sort of information is not widely known by users.

The GDP data look authoritative. For example, they are published to several decimal places and there is a sectoral break-down. So users need to be experienced to know there is (likely to be) a problem.

The scale of the revisions to the Q1 and especially the Q2 GDP growth estimates were surprising. The cause of this revision was construction (DTI). Why were the estimates so wrong? If the ONS are aware of problems why were they not mentioned before. ONS seems to react after the horse has bolted.

Even if ONS did, say, publish confidence intervals around estimates it is not clear how this information could be used by journalists. They need to make a headline; they need to state the 'facts'. Unreliability would be mentioned, at best, further down the article, but they would lead on the headline figure.

Need to change the climate, so that people expect changes/revisions to economic statistics. People think numbers are the truth so they do not understand why revisions occur.

A number of errors have been spotted quickly; e.g. the MPC has spotted them. They saw the GDP numbers earlier this year did not make sense. No-one believed the ONS's numbers. The problem is that the ONS has a bottom up approach. Need a top down approach too: let macroeconomists see if the numbers look right from a macroeconomic perspective. The ONS mechanises the compilation of the numbers; perhaps they need an overseer to help spot any likely errors. The ONS does not, it is thought, do this at the moment.

Faisal Islam; The Observer

[JM: What effect have these revisions (in your "list of key revisions") had, and have they affected your analysis?]

At a time of cyclical noise there will be revisions. These recent revisions illuminate how reliant first estimates are on extrapolations of survey data. The compilation of national accounts data is more than just adding up the numbers.

A health warning needs to be attached to economic data; for example this estimate is based on only 60% of survey returns. Users of data need to be better educated. It is not just the ONS but economic journalists who could do better. Users of data need to know how big a pinch of salt to take when they use data.

One does not begrudge the fact that revisions occur. Need timely figures – there is a trade-off between the timeliness and reliability of economic data.

It is worrying if revisions to figures impact on the rate of interest set by the MPC. Changes at the margin can make a difference.

The whole issue of revisions draws on a more fundamental philosophical question: is economics an art or a science? Economics is not precise; routinely assumptions are made, modelling is undertaken etc.. This is perhaps not appreciated widely. Like economics, the production of economic statistics is not a science. Again assumptions are necessary, and modelling is undertaken. This needs to be better appreciated.

Although there are health warnings associated with the use of data, users need to be educated about them too. It is useful to know what constitutes a 'first', 'second' estimate etc.

It would be worrying if there were evidence of bias in the production of economic data; but there does not appear to actually be any evidence for such a bias.

Have things got worse? Economic data are constantly revised. Lots of revisions around the period 1995 and 1996 are still going on.

[JM: Are you aware of ONS plans for methodological change?] Went to an event organised by ONS on annual chain linking designed for journalists etc. This event was very useful. Need events like this every 6 months or so. Data are basis of information, so it is important to understand them properly.

Adam Law; Barclays Capital

Impact of revisions is short-lived. Some stand out, but others are forgotten quickly. So although revisions are important at the time, in general, aside from the very big ones their impact does not persist.

ONS makes the right mix of timeliness versus accuracy in its provision of economic statistics. Analysts/economists work on a short time scale so to be of use 'hard' data, such as ONS data on GDP growth, need to be published quickly. Already have 'soft' survey data.

Annex 1

Transcripts of Interviews

There does seem to be an issue associated with the fact that the first estimate of GDP is persistently too low – there appears to be a bias. Even if this is not understood, maybe the ONS should have taken this into account by now.¹ Given knowledge about the usual or average bias they should be able to correct for it. Maybe the ONS should indicate when they are more uncertain than usual about their data. Certainly economists in their briefing notes regularly write about recent patterns of revisions and indicate whether they expect the data to be revised upwards or not.

When Reuters and Bloomberg flash the latest estimates on the computer screens of analysts/economists in the financial sector, the users are not forced to think about revisions. So although the ONS publishes its revision tables in its press release, users are not forced to think about them given the way they actually read the data.

It is accepted that revisions will happen. But users do not want to feel that the ONS are hiding revisions from them. Users do not like revisions and would prefer a one-off large revision to smaller revisions in lots of dribs and drabs.

Michael Saunders; Citigroup

Revisions to real GDP growth are “shocking”. ONS says it makes a bias adjustment, but there is still a positive bias. These revisions do affect one’s confidence in the statistical system.

[JM: Were you surprised by these revisions?] An upward revision is expected. But why are the first estimates always revised upwards? The Fed (Faust et al. paper) found the UK makes a bigger adjustment than other G7 countries. We normally pride ourselves on good data in the UK, but this is not true in this respect. The GDP figures do the ONS a disservice. Revisions have stayed the same- similar to in the early 1990s. This is depressing, given the numerous studies there have been on the revision history. The ONS should be improving since we know there is an upward bias; ONS should take this into account and eliminate the bias. Why is there still a positive bias?

The preliminary estimate perhaps is produced too early. This may explain part of the revision although only part as many of the revisions occur well beyond the second release. A later and more accurate estimate would be preferred. Other errors occur 2/3 years down the line. Do the ONS do something odd compared with other producers of data?

How often has, for example, NIESR said data will be revised? Not often. Everyone knows there will be revisions but they do not incorporate the probability of a revision into their economic analysis. How should this be done? ONS should broadcast the probability of revisions better, or reduce the size of revisions. They could say

¹ Subsequent to the interview Mr. Law noted that the ONS appeared to have found a possible cause of the underestimation of the GDP numbers (based on the fact that in recent periods growth for GDP has been higher than for gross value added) and is now adjusting for this.

something along the lines: here is the first or original estimate of 0.6%. But given the pattern of revisions over the last 5 years we expect the true estimate is probably in the range 0.6%-0.8%. This is because we expect an upward revision.

[JM: How aware are you of ONS plans for methodological changes?] These are well documented via the Internet.

David Smith; Williams de Broë

The re-basing of national accounts – including the move to annual chain linking – necessitates the re-estimation of econometric models. This is a big effort/nuisance for analysts/economists. ESA 95, in particular, and the re-writing of economic history this implied, meant one's knowledge about previous sets of accounts did not translate into an understanding of the new accounts.

Re-definitions, e.g. to government consumption/investment, have also contributed to extra work. These changes all have the impact of over-whelming the econometric community. Indeed the smaller macroeconomic models used these days may, in part, reflect this increased burden. These methodological/definitional changes may contribute to policy errors; e.g. the Lawson boom in the 80s. But perhaps we should not say the MPC has misjudged the economic climate due to these changes as policy making is not an exact science anyway. Indeed, one can make the more general point that highly interventionist policies that require perfect numbers are very dangerous.

Markets do react to data surprises, but this should not be overstated as markets are very efficient now and anticipate many of the "surprises"; users of data in the City are experienced in handling, analysing and interpreting data. They are aware, for example, of the regular articles in *Economic Trends* examining revisions to economic statistics. The media, however, focus on recent data; too many changes do affect the general perception of the quality of economic statistics.

It is important to make the distinction between ONS errors and revisions. The ONS have a habit of making errors in their first releases, which they do not own up to but simply re-issue the release without admitting error. This is hard on people in markets who react to the release seconds after it appears.

The ONS could present its data better. The ONS decides to present some data only in growth rates (e.g. unit labour costs), but they should provide data in levels and growth rates and let users decide what they want to use. Also the ONS could publicise revisions better. Revisions should not be 'sneaked out'.

The City, of course, also looks at global data. UK data are not the be all and end all. Although the importance of the UK economy to the financial markets may be 2 or 3 times the UK's share of OECD GDP, but not more, US data are often more likely to move the British markets than domestic figures, for example.

Annex 1

Transcripts of Interviews

Philip Thornton; The Independent

The focus on revisions [in recent articles] is explained by recent revisions both to quarterly GDP growth and the trade figures. Other revisions that the media have focused on recently have been, in part, brought up because of these two revisions.

The extent of the revision to the Q2 GDP growth estimate was to some extent a surprise although it was in part anticipated. Revisions per se are not a surprise; GDP growth is expected to be revised upwards. However, it is not impressive that this particular revision was down to one figure, the one for construction, being wrong. The speed of delivery of GDP estimates is impressive. Quick estimates of GDP are useful. Despite this mistake, and the VAT fraud recently, revisions are not, in general, due to mistakes.

Should there be health warning attached to economic statistics? Yes. Perhaps there should be some discussion of historical revisions. More attention should be given to them. This would help let the reader know that revisions are coming.

Annex 2: “Last quarter’s GDP growth rate revised up by 0.3pp”: a typical revision?

A submission to the “Review of Revisions to Economic Statistics” by Anthony Garratt (University of Leicester) and Shaun Vahey (University of British Columbia)

The revision referred to in the title took place at the end of September 2003. The July measurement of GDP growth for 2003Q2 was revised upwards by 0.3 percentage points, from 0.3 to 0.6 percent per quarter. In this short note, we show that this revision was unusual: outside two standard deviations of its expected value.

Our analysis is based on the methodology used by Garratt and Vahey (2003). We define the revision as the initial measurement minus the measurement at the start of the subsequent quarter for quarterly GDP(E) growth. We use a sample from 1961Q3 to 1999Q2 (152 quarterly observations). The mean revision for this period is 0.0528 with a standard deviation of 0.572.

In general, one would expect revisions to GDP growth to be unpredictable — consistent with the notion that the ONS makes rational forecasts of subsequent measurements. To test this, following Garratt and Vahey (2003) and others, we regressed the revision on the first measurement and a constant.

$$\text{Revision}(t) = 0.0948 - 0.118 \text{ First}(t) \\ (0.0338) \quad (0.0245)$$

where the Newey-West standard errors are in brackets.

This regression indicates considerable bias in the revisions to GDP growth rates. Evaluated at the first measurement sample mean of 0.356 percent, the expected revision of 0.0528 percentage points would cause the initial measurement to be revised upwards to just over 0.4 percent by the start of the next quarter.

The reason for this bias — despite frequent changes in the methodology used to construct GDP figures (see Garratt and Vahey (2003)) — remains a puzzle.

Assuming an initial quarterly measurement of 0.3 percent, the expected revision implied by the regression of 0.0594 percentage points has a 95% confidence interval of [-0.0167, 0.136].

Annex 2 “Last quarter’s GDP growth rate revised up by 0.3pp”: a typical revision?

We conclude that the much-discussed revision is atypical.

The very latest changes in the construction of the GDP measure may have altered the relationship between revisions and the initial measurements. The impact of these changes is not well understood. We note, however, that earlier (arguably, more minor) reforms have had little impact on the bias (see Garrat and Vahey (2003)).

Annex 3: Submission by Office for National Statistics

Recent Revisions to Economic Statistics

ONS submissions to the Review of Revisions
to Economic Statistics undertaken by NIESR
for the Statistics Commission

Preface

On 9 October 2003 the Statistics Commission announced that it was going to undertake a review of recent revisions to official economic statistics.

On 4 December the Commission announced that it had awarded a contract for the review to the National Institute for Economic and Social Research. The Statistics Commission and the National Institute are carrying out the review jointly.

The Office for National Statistics (ONS) has been cooperating actively with the review, providing written material and engaging in a number of face-to-face discussions. The written material is brought together here for reference purposes. There are separate sections on each of the key revisions identified by the Institute in its discussions with users.

In each case: an account is given of how the series is produced; reasons for recent revisions are given; and the way the revisions were communicated to users is summarised.

In addition answers are given to specific questions put to the ONS by the review team.

Detailed Index

Preface	15
Detailed Index	16
A. Introduction by the National Statistician	19
B. Revisions to Gross Domestic Product	21
B1. Introduction	21
B2. National accounts methods and revisions policy	21
B2.1 How the GDP estimates are produced	21
B2.2 National Accounts revisions policy	23
B2.3 Longer term revisions analysis	24
B3. Quarterly GDP estimates	26
B3.1 Recent revisions profile	26
B3.2 The Queen's Jubilee effect	29
B3.3 Construction output	30
B3.4 Construction output – revisions history	40
B3.5 Presentation of recent revisions	42
B4. Annual GDP estimates	44
B4.1 Summary for Blue Book 2003	44
B4.2 Size of revisions	45
B4.3 Causes of revisions	47
B4.4 Contribution of annual chain-linking	49
B4.5 Presentation of recent revisions	49
B4.6 Revisions to earlier Blue Books	51
C. Revisions to the Index of Production	53
C1. How the estimates are produced	53
C2. Recent revisions and comparison with earlier periods	54
C3. Notable revisions	55
C4. Presentation of revisions	56

D.	Revisions to the Retail Sales Index	59
	D1. How the estimates are produced	59
	D2. Revisions arising from methodology changes (in Oct 2003)	60
	D3. Revisions to estimates under the old methodology, and differences in estimates arising because of the change in methodology	62
	D4. Presentation of Recent Revisions	63
E.	Revisions to Business Investment	66
F.	Missing Trader Intra-Community Fraud	68
	F1. Introduction	68
	F2. Open Letter to Professor David Rhind	69
G.	Responses to NIESR Questions	72
	G1. International Studies	72
	G1.1 Overview	72
	G1.2 Faust, Rogers and Wright (2000)	72
	G1.3 Öller and Hansson (2002)	77
	G1.4 Conclusion	78
	G2. User liaison on revisions	78
	G3. Contact with policy users	80
	G3.1 Overview	80
	G3.2 Regional Support	82
	G4. Historical use of bias corrections	85
	G5. Methodological improvements in ONS	86
	G5.1 Overview	86
	G5.2 The role of statisticians and the Blue Book process	86
	G5.3 Statistical Modernisation and National Accounts Re-engineering	88
	G5.4 The National Statistics Quality Review Programme	91
	G5.5 External requirements	92

Detailed Index

G6. Externally provided forecasts	93
G6.1 Overview	93
G6.2 Departmental Agreements	93
G7. MTIC Fraud	95
G7.1 Informing users	95
G7.2 Could the problems have been anticipated earlier?	96
G8. Compliance with draft Protocol On Revisions	96
References	99
ONS Annex 1. Balancing the National Accounts	102
ONS Annex 1.1 Balancing quarterly GDP	102
ONS Annex 1.2 Balancing annual GDP	103
ONS Annex 2. The STOI Review	108
ONS Annex 2.1 Introduction	108
ONS Annex 2.2 Main Findings and Recommendations for Change	109
ONS Annex 3. The Labour Force Survey Review	111
ONS Annex 4. SPC Paper on Revisions	113
ONS Annex 4.1. ONS to provide more information about revisions in its first releases	113
ONS Annex 4.1.1 Introduction	113
ONS Annex 4.1.2 Questions and Answers	114
ONS Annex 4.1.3 The modified t-statistic	115
Index to Charts and Tables	118

A. Introduction by the National Statistician

1. Revisions to key economic series published last autumn by the ONS have attracted a great deal of comment and criticism. However, much of this reaction included a lack of understanding of the nature of the statistical process. The unusual mix of revisions to GDP took place in the context of limited recognition of the complex statistical framework within which revisions take place, or the trade-off between speed of publication and later availability of data. Revisions to official statistics are an expected and inevitable consequence of the explicit trade-off that is made between the reliability of key releases and the need to have statistics available when it is opportune to benefit from them.

2. In any area of public policy or market activity, there is rarely the luxury of being able to wait until a final statistical measure is available. The most timely economic estimates are those in a "first release", which are generally derived from early, indicative outputs of data collections. In the UK, key users value highly the fact that the GDP figure is published around 25 days after the end of the accounting period; other developed nations have to wait until as many as 60 days. As richer and more detailed information subsequently arrives, we are able to increase the precision and richness of the analysis of our measures, and release revised estimates that take account of the new and more extensive information.

3. The recent revisions to the estimate of gross domestic product growth during the second quarter of 2003 provide a useful illustration of this increase in precision as more data become available. The provisional published growth figure of 0.3% incorporated an estimate of activity in the construction industry that was derived from two forecasting models. When survey results subsequently became available, they gave a markedly different picture of construction activity from that used in the initially published growth estimates. This unexpectedly large revision to the construction statistics led to a revision of the growth estimate from 0.3% to 0.6%.

4. In order to reflect developments in a sufficiently timely manner, official statistics involve a good number of simplifying assumptions. An important example is the assumption of structural stability, essential to the production of timely economic statistics but rarely well understood. We reduce the short-term variability of our estimates by measuring economic change while assuming that the underlying economic and industrial structure is stable. When we do move to a new set of structural assumptions, discontinuities are created in key economic series. These are inevitably larger where there has been a lengthy delay in updating our structural

A Initial audit/research programme

measures. We expect that annual chain-linking of the National Accounts and the main supporting surveys will reduce discontinuities that have been associated with each five-yearly rebasing in the past.

5. Very few statistical revisions arise as a result of “errors” in the popular sense of the word. All estimates, by definition, are subject to statistical “error”, but in this context the word refers to the uncertainty inherent in any process or calculation that uses sampling, estimation or modelling. Most revisions reflect either the adoption of new statistical techniques, or the incorporation of new information which allows the statistical error of previous estimates to be reduced. Only rarely are there avoidable “errors” such as human or system failures, and such mistakes are made quite clear when they do occur.

6. The expectations of the Monetary Policy Committee have led to a greater emphasis on more exact and robust measurement of the real economy. Not surprisingly, the Bank is aware that revisions are a natural part of the statistical process, and stated in its August Inflation Report that “the MPC takes account of the likelihood that GDP data will be revised when deciding how much weight to put on the latest data”. However, its expectations rightly remain high. The Statistics Commission’s review of revisions will add to our understanding of whether or not we are matching our users’ expectations.

7. For regular economic statistics, the ONS initial published estimates are usually very close to the revised estimates, even though they often differ in how they are prepared. Analysis of GDP revisions shows that, over a decade, the difference between first and third estimates of quarterly growth (irrespective of sign) was 0.1 percentage points on average. International studies of longer run annual revisions in the 1990s show that the UK’s revisions are amongst the smallest in the world.

8. In the UK, we establish the priorities of statistical work through extensive consultation processes, and major users (particularly the Bank of England and HM Treasury) are closely involved in setting our priorities. Generally, this has given the UK a strong competitive advantage as we develop National Accounts, facing up to the same challenges that other countries face. This is reflected in the fact that we often are in the lead or amongst the best when compared with our counterparts in other countries.

Len Cook

National Statistician

An article containing a more comprehensive explanation of revisions by the National Statistician has been published on the National Statistics website,

http://www.statistics.gov.uk/about_ns/downloads/economic_revisions_article_len_cook.pdf

B. Revisions to Gross Domestic Product

B1. Introduction

9. This note explains the reasons for recent revisions to quarterly and annual growth rates of GDP, compares them with the longer history of revisions to GDP and summarises how we communicated them to users.

10. The note is structured in three sections. The first outlines how the estimates are produced (both quarterly and annual) and the National Accounts revisions policy. It also summarises the latest revisions analysis results. The second section looks at revisions to quarterly GDP growth in more detail, while the third section concentrates on the annual growth revisions arising from the 2003 Blue Book.

B2. National accounts methods and revisions policy

B2.1 How the GDP estimates are produced

B2.1.1 Quarterly GDP

11. There are three successive monthly releases after the end of each quarter: the Gross Domestic Product Preliminary Estimate, the UK Output, Income and Expenditure release, and the Quarterly National Accounts; known for short respectively as Month One (M1), Month Two (M2) and Month Three (M3).

12. *Gross Domestic Product Preliminary Estimate* – usually released around 25 days after the end of the reference quarter. The preliminary estimate for gross domestic product provides estimates of the growth in the volume of GDP on the previous quarter. It is based on the Monthly Production Inquiry (MPI) for the first two months of the quarter, the Monthly Inquiry into Distribution and Service Sector (MIDSS) for two full months and partial data for the third, and the retail sales estimates for the three months of the quarter, together with limited information on the output of the rest of the economy. Although at this stage estimates for most individual industry series are not sufficiently reliable for publication, the preliminary estimate provides a broad indication of the level of growth in quarterly GDP, which will become firmer at later stages in the process.

B Revisions to Gross Domestic Product

13. *UK Output, Income and Expenditure* – released around 55 days after the end of the reference quarter. A single estimate of GDP with its income, output and expenditure components is produced, replacing and revising the preliminary estimate. Revisions between M1 and M2 arise mostly from more complete output data. At this stage this quarterly GDP estimate is improved by the addition of, for example: the complete MPI and fuller MIDSS returns for the third month of the quarter.

14. As with the annual GDP estimate, the production of a single quarterly estimate requires the balancing of the information from the different approaches. However, because the detailed information which feeds into the Input-Output process is not available at this stage a different approach has to be taken (see ONS Annex 1).

15. *Quarterly National Accounts* – released around 85 days after the end of the reference quarter. In this release the ONS produces a full set of quarterly economic accounts, revising and expanding the information made available in the earlier estimate as well as revising estimates for earlier quarters in the current year and normally the previous year.

16. Fuller survey data for components of each of the expenditure, output and income measures are available. Revisions between M2 and M3 arise from more complete output data (e.g. construction estimates are based on full survey results in M3, replacing forecasts in M1 and M2) and newly received data for the expenditure and income measures, adding detail and replacing imputation (e.g. Expenditure and Food Survey (EFS) data are available in M3 replacing forecasts for the household consumption of services).

17. By this stage in the estimation process the full final employment figures are usually available. These feed into both the income and to a lesser extent the output estimates of GDP. The quarterly profits inquiry has supplied its final balance, and improved data is available for UK oil and gas production along with revised estimates for inventories and capital expenditure. In addition, some Balance of Payments data become available for the first time at this stage.

18. As with the GDP estimate produced earlier in the quarter, the fully integrated quarterly accounts estimate is balanced using the process described in ONS Annex 1. However, in addition, because of the integrated nature of this estimate, any imbalance in the sector accounts has to be part of the evidence considered in this process

B2.1.2 Annual GDP

19. The annual GDP process effectively begins in February, when the previous year is opened for revisions to ensure that the Seasonally Adjusted (SA) and Non-Seasonally Adjusted (NSA) series are consistent. Again, there are a number of distinct stages.

20. *Blue Book One (BB1)* – This is defined in Richardson (2002) as the first time the estimate appears in the annual Blue Book publication, typically after new and more comprehensive annual data sources have begun to become available. This is usually around June – September, four to seven months after the first annual estimate published in February. Revisions are primarily new data, and some methodological changes to ensure recent estimates are consistent with the back series.

21. *Blue Book Two (BB2)* – Typically around 16-20 months (depending on the time of the Blue Book) after the estimate is first published. Revisions may occur prior to this stage, as the annual estimate is open in M3 of the quarterly round. The key feature of the BB2 stage is that it brings in further annual data sources, such as Inland Revenue and the preliminary Annual Business Inquiry (ABI) data, and also this is the stage at which Supply-Use balancing is applied to the current price components of GDP for the first time. After this stage, revisions are not normally permitted to the annual balanced estimate until the next Blue Book.

22. *Post Blue Book Two (Post BB2)* – The Supply-Use balance is run for a second time (taking on final Annual Business Inquiry data) and longer run methodological changes may be introduced to the current data and back series. Recent examples of longer-term methodological revisions have been the introduction of annual chain linking (ACL) in BB 2003, and the adoption of the European System of Accounts (1995 edition) in BB1998. Finally, data and methodology revisions in ‘closed years’ (see National Accounts revisions policy below) where revisions were not allowed are often delayed and fed into the Blue Book revisions in open years.

B2.2 National Accounts revisions policy

23. The National Accounts revisions policy was most recently outlined in Wroe (1993). The aim of the National Accounts is to provide accounts that are timely, reliable and internally consistent. Obviously, these objectives are at times conflicting.

24. The National Accounts are built from numerous sources, some monthly, some quarterly, and some annual. While a majority of series are derived from ONS surveys, some series are provided by outside bodies, such as other government departments and the Bank of England. Although the ONS has made considerable improvements to quarterly surveys, some detailed information is not available for early estimates (for example, some businesses do not produce detailed financial information on a quarterly basis). So the ONS tries to balance the need for early information against the cost to businesses of supplying it. It is thus unrealistic to think that early estimates will not require revisions.

25. The National Accounts revisions policy is based around the arrival of new data, coupled with the need to be able to make methodology improvements. Initially the growth estimate for a given quarter is subject to revisions (or open to revisions in the ONS terminology) for the first two months following the publication of the preliminary estimate (i.e. the Preliminary release (M1) is revised in the Output, Income and Expenditure (M2) and Quarterly National Accounts (M3) releases).

B Revisions to Gross Domestic Product

26. However, in a given quarter the ONS also takes the opportunity to revise earlier data, as well as the most recent estimate. Generally revisions to earlier quarters are only allowed in the Month 3 release. The exception to this rule is February, when revisions to the whole of the previous year to ensure we get a better quality annual estimate, and ensure that seasonally adjusted and unadjusted data are in line. Revisions to the previous two years may also be allowed in March if new data on public sector are available prior to the Budget.

27. Annual data sources, for example used in benchmarking, typically take around 14 months to deliver results, and consequently there is an annual as well as quarterly revisions cycle. When the ABI and Inland Revenue data are first taken on, the annual current price GDP estimate is balanced using the Supply-Use framework. For example, the 2003 Blue Book took on ABI data for 2001. There may be further revisions from this source to 2001 in the 2004 Blue Book, dealing with late returns and administrative data. Once an estimate is balanced in the Supply-Use framework, the estimate and the quarterly path for the year are not subject to revisions until the following year's Blue Book, when they may be re-balanced.

28. So in October and November 2003, the only estimate open for revision was the latest 2003Q3 figure, but in December, the whole of 2002 and 2003 was open to revision. Estimates for 2001 were not, as they have been balanced in the Input-Output framework. Any revisions to earlier periods are stored and are input into an annual revisions process carried out by a Revisions Task Force. This process also allows for exceptions where a significant revision may be incorporated during the next quarterly round.

29. The scope of revisions is announced prior to the annual reassessment, usually in form of an article in Economic Trends. First Releases for monthly activity indicators such as the Index of Production, Retail Sales index and UK trade follow the same revisions policy for consistency.

B2.3 Longer term revisions analysis

30. This section aims to provide a summary of GDP revisions performance, to provide a background for the discussion of revisions to particular periods in the following sections.

31. Akritidis (2003) is the most recently published ONS analysis of GDP revisions. It updates previous work on GDP revisions, and looks at revisions to GDP by the stage of the production process (month one, month three, first Blue Book, second Blue Book, post Blue Book two, and latest). Early revisions tend to reflect the arrival of new data. Later revisions (mainly post-Blue Book two) are more likely to be methodology changes, such as the introduction of Annual Chain-linking in Blue Book 2003 or the introduction of the European System of Accounts (ESA, 1995 edition) in Blue Book 1998.

32. The article covers quarterly data from 1993Q1 to 2000Q4. 1993 was the first time that preliminary month one estimate was published. 2000Q4 was chosen as the end point as the data inputs up to this quarter should be ‘finalised’, that is no revisions are expected except for possible future methodological reasons.

33. The “latest” data used was September 2003, and therefore includes revisions caused by the introduction of Annual Chain-linking (ACL), as well as VAT Missing Trader Intra-community (MTIC) fraud. To assess the impact of these changes, the article also presents results using June 2003 as the latest data. The breakdown of the mean revision is shown in table 1.

Table 1: Mean revision to GDP by stage of production process

1993 Q1 – 2000 Q4	Mean
Month Three (M3) less Month One (M1)	0.013
Blue Book One (BB1) less M3	0.059
Blue Book Two (BB2) less BB1	0.013
Post Blue Book Two (Post-BB2)	0.103
Total revisions	0.188
<i>Pre-Blue Book 2003 (fixed-base method)</i>	
Post-BB2 (fixed-base method)	0.078
Total revisions (fixed-base method)	0.163

34. For GDP, the largest total revisions to quarterly growth rates irrespective of sign occurred in 1997 Q4 and 2000 Q1 and were 0.8 percentage points in both cases. In both of these cases the post-Blue Book two stage is the largest contributor to the revision.

35. The mean of the total revisions between the first (Preliminary) estimate and the latest estimate was 0.188 percentage points. The contribution of the revisions at each stage indicates moderate positive biases of 0.013 percentage points in the month one to month three and Blue Book one to Blue Book two stages, and large bias of 0.103 percentage points in post-Blue Book two stage.

36. The introduction of the ACL and the other changes published in the Blue Book 2003 increased the mean revision at the post-Blue Book two stage from 0.078 percentage points (using June 2003 as latest data) to 0.103 percentage points (using September 2003 as latest data), and as a result, the average of total revisions also increased from 0.163 percentage points to 0.188 percentage points.

37. The Blue Book one to Blue Book two stage shows how important it is to look beyond a mean when assessing bias. The mean revision of this stage is low (0.013 percentage points), which would seem to indicate no substantial bias. However, the fact that it had relatively high absolute mean revision (0.163 percentage points) shows that there are relatively large revisions applied at this stage, but that they mainly offset one another.

B Revisions to Gross Domestic Product

38. A widely used method to test whether the observed mean is statistically significant from zero is the t-statistic. It is also standard practice to use the t-statistic adjusted for the existence of serial correlation between quarters. The adjusted t-statistic shows post-Blue Book two and total revisions as statistically significant at the 95 per cent level.

39. One can also consider revisions to the annual estimate of GDP and its growth rate. We see in this case that revisions to annual growth tend to be relatively small, often just 0.1 or 0.2 percentage points. Notable exceptions to this are generally Blue Books, which have introduced substantial changes in methodology. For example, the upwards revision of 0.7 percentage points to 2000 and of 0.4 percentage points in the 2003 Blue Book, which introduced annual chain-linking etc. Another example is the 1998 Blue Book, which introduced ESA 1995, and which saw upward revisions of 0.6 to the estimates for 1991 and 1992.

B3. Quarterly GDP estimates

B3.1 Recent revisions profile

40. As the previous section has illustrated, revisions to the initial estimate tend to be small on average in the first three months following the quarter in question (see Tables 2 and 3). However, there have been notable incidents recently that have led to revisions larger than one might otherwise expect given the revisions history of the early estimates.

Table 2: Estimates of Quarterly GDP Growth (%)

Estimates for Period	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03
2001Q4	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2002Q1				0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.2
2002Q2							0.9	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.4
2002Q3										0.7	0.8	0.9	0.9	0.9	1.1	1.1	1.1	0.9	0.9	0.9	0.7	0.7	0.7	0.8
2002Q4													0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2003Q1																0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2
2003Q2																			0.3	0.3	0.6	0.6	0.6	0.6
2003Q3																						0.6	0.7	0.8

Table 3: Revisions to Estimates of Quarterly GDP Growth (percentage points)

Revisions to Estimates for Period	First Estimate	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Latest
2001Q4	0.2	-0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
2002Q1	0.1				-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	-0.1	0.2
2002Q2	0.9							-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.4
2002Q3	0.7										0.1	0.1	0.0	0.0	0.2	0.0	0.0	-0.2	0.0	0.0	-0.2	0.0	0.0	0.1	0.8
2002Q4	0.4													0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5
2003Q1	0.2																0.0	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.2
2003Q2	0.3																			0.0	0.3	0.0	0.0	0.0	0.6
2003Q3	0.6																						0.1	0.1	0.8

B Revisions to Gross Domestic Product

41. *2002Q1* – May and June 2002 – Growth was revised down by 0.1 to 0.0 in M2, then revised back up by 0.1 in M3. The downward revision to growth at M2 was mainly due to a lower estimate of the output of services, revised downwards to 0.2% from 0.5%. The main areas behind the change were in finance and business services. Output of distribution, including catering, was also been revised downwards to show 0.2% (from 0.4%). The revision was also partly due to lower output of manufacturing industries, compared with the data available last month. The upward revision to growth at M3 reflects new information on construction output from the Department of Trade and Industry and already published data from the Index of Production.

42. *2002Q2* – August 2002 – The M2 estimate revised down quarterly growth by 0.3, from 0.9 to 0.6. This quarter includes the Jubilee effect, which is outlined in more detail in section 3.2. This downward revision was due almost entirely to revisions to the manufacturing sector compared to those anticipated in the production of the preliminary estimate at Month One. Here output fell by 5.3 per cent between May and June, a much larger fall than that estimated in the preliminary GDP release. This manufacturing figure had already been published in the Index of Production release the previous month, which also warned of potential large revisions to the GDP estimate for the latest quarter.

43. *2003Q1* – June 2003 – The M3 estimate of the quarterly growth rate for 2003Q1 at constant market prices was revised down to 0.1 per cent, from the estimate of 0.2 per cent published in the M1 and M2 releases. This downward revision was a result of lower estimates of construction output following updated information from the Department of Trade and Industry (the construction issue is discussed in more detail in section 3.3). Construction output in M3 showed a fall of 1.9 per cent in 2003Q1, compared to a rise of 2.1 per cent published at M2. This revision to construction output was offset by other revisions, for example services output was revised upwards, with growth in M3 estimated to be 0.4 per cent, compared to 0.3 per cent in M2. This reflected updated survey information for the telecommunications industry and higher estimates of output for public administration and defence.

44. *2003Q2* – September 2003 – The M3 estimate revised quarterly growth up from 0.3 to 0.6 percent. This largely reflected the large upward revision to construction that occurred in this quarter. However, manufacturing output was also revised up by 0.4 per cent as a result of higher estimates for the transport equipment and chemicals industries. The output of services was revised downwards by 0.1 per cent.

B3.2 The Queen's Jubilee effect

45. On 26 July 2002 the Month One preliminary estimate for 2002Q2 was published showing a rise in Q2 GDP of 0.9 per cent.

46. Quarter 2 included the Queen's Jubilee. The celebrations for the Jubilee included replacing the usual May Bank holiday with a two day Golden Jubilee Bank holiday on the third and fourth of June. These changes in work patterns were predicted to increase production in May and reduce it in June.

47. At the time of production of the GDP preliminary estimate, data on the output of the production industries is available for the first two months of the quarter only (i.e. April and May for Q2). Data for June only became available for the Month Two release. When this was received industrial production was significantly lower than had been predicted for the month one estimate. This resulted in a downward revision to GDP of 0.3 percentage points to 0.6 per cent in the M2 release on 23 August.

48. This downward revision was due almost entirely to revisions to the manufacturing sector compared to those anticipated in the production of the preliminary estimate at Month One. Here output fell by 5.3 per cent between May and June. The cause of the greater than expected drop in output has been attributed to factories shutting for longer than predicted; many closing for the entire Jubilee week.

49. A first warning of increased uncertainty in the figures was made in the Index of Production (IoP) first release for May 2002 (published 10 July) with users being urged to treat May and June figures with caution.

50. After the size of the revisions became apparent, attention was drawn to this in the release of the June IoP figures on 5 August. Accompanying the release was a special note (see below) explaining the revisions cause and giving advance warning of the likely effects on GDP.

"The first estimate of GDP for the second quarter of 2002, was produced during July, 25 days after the end of the quarter. Compared with the later releases of second quarter GDP, the first estimate involves assumptions and projections that can be revised quite quickly. In particular, firmer data become available for production for the final month of the quarter and for changes in inventories during the whole quarter.

Last month ONS urged caution in interpreting monthly movements in the Index of Production for May and June. This was because changes in work patterns caused by the Jubilee bank holidays might have increased production in May and reduced it in June.

B Revisions to Gross Domestic Product

While uncertainties remain, there is evidence that factories were shut down for longer periods than expected – in some cases for the whole of the Jubilee week. Results for industrial production for June show a fall of a size that ONS did not anticipate when projecting GDP growth for the preliminary estimate for the second quarter of 2002.

The next estimate of GDP growth for the quarter, to be published on 23 August, will include surveyed information on agriculture, construction and services, as well as today's industrial production data. The net impact on total GDP of any changes in these sectors is not known, but the contribution from industrial production would result in a downward revision to the GDP growth estimate of about 0.3 per cent."

51. In the Month 2 GDP release on 23 August, attention was drawn to the revision and an explanatory note included. A warning to users on the Jubilee effect was carried on the front page of the IoP release until the first publication of the November figures in January 2003. A note on the effect remained in the background notes to the IoP until the release of the July 2003 data.

B3.3 Construction output

52. As noted in paragraph 44 the revision to GDP growth in 2003 Q2 was largely due to a substantial upward revision to construction output. This section describes what action DTI and ONS took in response to the revision including establishment of a joint review. It also includes the report on the first stage of the review. This report describes the methods used by DTI to produce estimates of construction output, including the models used and their use in producing the estimates in 2003 Q1 and Q2.

53. The DTI provided a first estimate of construction output for use in the M3 estimate of GDP on 5 September. This showed an increase in construction output in 2003 Q2 of 5.3%, well above the DTI estimate of 0.9% provided in August for M2. Given this unusually large revision the ONS's Director of National Accounts and DTI's Head of Statistics met on 18 September, before publication of the M3 estimate, to discuss construction data. This meeting agreed that a project board should be set up to review the early estimates of construction output. On 15 October when giving evidence to the Treasury Committee the National Statistician explained that ONS was seriously considering the options with DTI.

54. The Review Project Board met on 27 October and discussed the project plan. The existence of the Review was formally announced in the M2 GDP release on 26 November. The report on the first stage of the Review was published by DTI on 12 February. The following section reproduces the report in full.

B3.3.1 DTI Review of early estimates of construction output for GDP in 2003

Introduction

55. The Department of Trade and Industry (DTI) is responsible for the main official information on the output of the construction industry in Great Britain, which is both published quarterly by DTI and is supplied to the Office for National Statistics (ONS) to inform their releases on quarterly National Accounts. DTI publish a National Statistics release on quarterly construction output in the first week of the third month following the end of the quarter, and these figures are supplied to ONS for their *Quarterly National Accounts First Release*, published towards the end of the third month (Month 3 or M3).

56. DTI also supply ONS with estimates of construction output for their estimates of GDP published in the first and second months following the end of the quarter, known as the Month 1 (M1) and Month 2 (M2) estimates. In the first two quarters of 2003, these estimates did not accurately predict the figures published by DTI at M3, leading in the second quarter to a revision to GDP growth from 0.3% to 0.6%. Following the publication of the *Quarterly National Accounts First Release* for Q2 2003, ONS and DTI announced that they would be carrying out a joint review in two phases; firstly to identify the causes of the revisions; and then to identify options for improving the early estimation of construction output. This paper completes the first phase of the review.

Summary of Conclusions

57. The main conclusion of this part of the review is that it was the unforeseen fall in construction output in Q1 2003 that largely contributed to the revision in the estimate of both Q1 and Q2 construction output. This was both because of the effect it had on the estimation models, and because it caused DTI to be more cautious in forecasting a return to positive growth in Q2 2003 than might otherwise have been the case. This downward revision in the estimate of Q1 construction between M2 and M3 was not apparent in the Q1 GDP figures because of an upward revision in the services sector.

58. The following recommendations are made:

- Work should continue on the development of the Activity Balances model and to improve the understanding of the relationship between early survey data and that available at M3;
- Research should be undertaken to explain the unexpected fall in Q1 2003;
- Further work should be undertaken to identify other methods of producing accurate early estimates of construction output, such as a small monthly survey.

B Revisions to Gross Domestic Product

Background

59. Construction is responsible for about 5.4% of national GDP, and is one of the largest economy sectors not included in the ONS monthly collections of data which result in the Index of Production and the Index of Services. DTI produces official information on construction, and so provides ONS with information for inclusion in the estimates of GDP published at M1, M2 and M3. However, DTI do not have full survey information available at M1 and M2, and so supply ONS with estimates produced using economic models and accessing incomplete survey returns. These estimates are produced specifically for ONS. DTI do not provide them to other users.

The Month 1 estimate

60. The Month 1 estimate of GDP, *Gross Domestic Product – preliminary estimate First Release*, is published by ONS at the end of the first month following the relevant quarter, and so DTI have to provide information on construction to ONS within two weeks of the end of the quarter. At this stage, DTI typically have received no more than 5% of survey returns, and so uses economic models to provide ONS with the M1 estimate.

61. The first model uses the results from a monthly survey of construction orders and contracts (also published by DTI as a National Statistic). The second model, introduced in autumn 2002 following the recommendations of an interdepartmental working group, uses monthly information on activity balances. More detailed descriptions of the models used are provided in section B3.3.2.

The Month 2 estimate

62. The Month 2 estimate, *UK Output, Income and Expenditure First Release*, is published by ONS at the end of the second month following the relevant quarter, and DTI provide information within the first week of that month. This estimate was historically produced by rerunning the orders model described above, with revised orders information. Over the last few quarters DTI has accessed early survey returns to supplement the model, and it is hoped to place increasing reliance on early survey returns as a picture of their relationship to final survey returns is established. More information on the results of early survey returns is provided in section B3.3.3.

The Month 3 estimate

63. The DTI publish a quarterly National Statistics release *Output and Employment in the Construction Industry*, which reports on the output of the industry during the latest quarter, including an analysis by region, sector and subsector. The information from this release is provided to ONS for inclusion in their *Quarterly National Accounts First Release*. The information from this release is compiled by combining three sources of information:

- a quarterly survey of construction companies, covering 12,000 of the 168,000 VAT-registered construction companies in Great Britain and stratified by employment;

- a quarterly census of 236 public sector Direct Labour Organisations (DLO), mostly local authority maintenance teams;
- an estimate of the output of self-employed construction workers and companies not registered for VAT, known as the unrecorded estimate.

64. This release is published by DTI just over two months after the end of the relevant quarter, on the first Friday of March, June, September and December each year.

The 2003 estimates

65. The estimates provided to ONS at M1 and M2 in the first and second quarters of 2003 were subject to greater than usual revision at M3 when the full survey results became available. The table below gives the estimates provided to ONS – this may differ slightly from those published in the various GDP releases, as adjustments are made for Northern Ireland and definitional differences between the DTI information and National Accounts requirements. The effect on GDP is the estimated result on GDP growth of the construction estimate.

Table 4: DTI Construction Estimates provided to ONS

	Month 1		Month 2		Month 3		
	DTI estimate	Effect on GDP	DTI estimate	Effect on GDP	DTI estimate	Effect on GDP	Revision M1-M3
Q1 2003	3.1	0.2	3.1	0.2	-2.6	-0.1	-0.30
Q2 2003	-0.4	0.0	0.9	0.1	5.3	0.3	0.30
Q3 2003	1.2	0.1	2.5	0.1	1.9	0.1	0.04

66. The construction-related GDP revisions at Q1 and Q2 2003 were the largest ever. The revisions at Q2, which were published in conjunction with revisions to manufacturing and services, as well as the rebasing of GDP figures from 1995 prices to 2000 prices, caused much comment.

Revision to Q1 2003

67. The M3 estimate of construction change in Q1 was a fall of -2.6%. This was a surprise fall, following over two years of continuous industry growth, and was not foreseen at the M1 or M2 stages. On its own, the revision to the estimate for construction output revised GDP growth down by -0.3%, although offsetting revisions elsewhere, notably in the service sector, resulted in an overall revision to GDP growth of just -0.1% (from 0.2% to 0.1%).

B Revisions to Gross Domestic Product

68. The M1 estimate of Q1 growth was 3.1%, following strong orders growth over the previous year, and output growth of 2.1% in Q4 2002. When early survey returns were considered at M2, they showed a fall of 7.7%. However this was discounted because:

- The relationship between early and final survey returns was still to be established. This was only the second quarter for which early returns had been considered, and performance in Q4 2002 was not strong, giving change of -0.4% compared to a final M3 change of +2.1%;
- The response rate by strata at M2 does not show the same pattern as that at M3 – the middle strata are faster to respond than both the smallest and largest firms and it seemed probable that the later returning large firms, responsible for 50% of industry output although forming just 2% of firms on the DTI Register, would show stronger growth (see section B3.3.3. for response rates);
- Given strong orders figures over the past year and continued output growth over the past two years, a large fall seemed unlikely.

69. However, when M3 information was produced for the DTI release on 6th June 2003, it became obvious that the higher strata had not shown the growth expected once the returns were in. The following table shows the change at M3 in each component of total output – for an explanation of the strata see Section B3.3.3.

Table 5: Construction – change between Q4 2002 and Q1 2003 by component, current prices

Component	Share of total in Q1	% Change
Recorded output		
– Strata 0–5	30%	+2.5
– Strata 6–13	51%	-7.5
Total Recorded Output	81%	-4.3
Unrecorded Output	16%	-10.4
Direct Labour Organisations	3%	+10.8
Total		-4.9

Revision to Q2 2003

70. Following the surprise fall in Q1 2003, the M1 estimate for Q2 2003 was that construction output would fall again, by -0.4%. This was reported as 'unchanged' given the extremely provisional nature of the estimate². This was largely based on the New Orders model. The Activity Balances model showed a rise of 0.9%, which seemed high given the fall in the previous quarter. The Activity Balances model was also run with an adjustment to remove the fall at Q1, and gave a rise of 4.4% for the second quarter. This seemed at the time to be even less likely.

² ONS Comment: The figure actually used by the ONS for the compilation of GDP was +0.3%, as described in paragraph 55.

71. When early survey returns were considered at M2, they again showed a rise of 4.5%. This still seemed too large an increase, however it did now seem likely that there would be a rise at Q2, and so the M2 estimate supplied to ONS was a rise of 0.9%. However when M3 information was produced for the DTI release on 5th September, it became clear that the industry had more than just recovered from the Q1 fall, it had returned to its previous trend with a rise of 5.3%.

72. This change in the estimate was partially responsible for a revision to GDP of 0.3%.

Conclusions

73. Consideration of the recent performance of the construction industry in Great Britain suggests that it was the Q1 output figure which was the outlier, not Q2. However, a small upward revision to the much larger services sector of the economy balanced the downwards movement of the construction estimate between M1 and M3, and minimised the overall effect on GDP to a revision of growth from 0.2% to 0.1%.

74. The M1 estimate for construction in the second quarter was then far too low, as no one anticipated that the industry would recover as quickly as it did, and the inaccuracy of the Q1 M1 and M2 estimates caused more cautious estimates to be made. Publication of the revisions to construction coincided with the publications of revisions to other important economic series, including to historic GDP figures, generating widespread concern about the quality of economic data used for policy purposes.

75. In both quarters, the early survey data used at M2 reported the correct direction of change, although it sometimes over-estimates the level. This was also shown when the third quarter estimates were made, and suggests that although there is still great variation between M2 and M3 results, this data will become increasingly useful as it is better understood.

B3.3.2 – The DTI month 1 estimate

76. The Month 1 estimate is used by ONS to inform the GDP figures published in the *Gross Domestic Product – preliminary estimate First Release*. DTI are required to provide this estimate usually within the first week following the end of the quarter, at which point very few survey forms have been returned. Because of this, the Month 1 estimate is model based. The detailed figures are those used before the rebasing to 2000 prices, and will have to be reworked before the next Month 1 estimate.

77. The Orders model has been used for several years and uses information from the DTI Monthly Inquiry of Contracts and New Orders (results of which are published monthly as a National Statistic) to model New Work output. At the time at which ONS request the data, two months of the relevant quarter are available, and the third is estimated from previous trends. For each of the 6 new work sectors, a series known as composite orders is calculated using the weighted sum of orders placed over the last few quarters, excluding orders over £150 million.

B Revisions to Gross Domestic Product

78. The weights and number of quarters used varies between sectors to reflect the different size and type of work carried out – for example infrastructure contracts tend to take longer than other types of work – and are calculated using information on duration and work flow from the DTI's monthly new orders inquiry and quarterly survey of projects in progress. The weights used for each sector are given in the table below.

Table 6: Weights for composite orders in DTI Construction model

Sector	Composite Orders
Public Housing	$0.24*q(t) + 0.24*q(t-1) + 0.19*q(t-2) + 0.14*q(t-3) + 0.1*q(t-4) + 0.06*q(t-5) + 0.02*q(t-6) + 0.01*q(t-7)$
Private Housing	$0.21*q(t) + 0.18*q(t-1) + 0.16*q(t-2) + 0.14*q(t-3) + 0.1*q(t-4) + 0.1*q(t-5) + 0.06*q(t-6) + 0.03*q(t-7) + 0.02*q(t-8)$
Infrastructure	$0.17*q(t) + 0.23*q(t-1) + 0.19*q(t-2) + 0.14*q(t-3) + 0.11*q(t-4) + 0.08*q(t-5) + 0.04*q(t-6) + 0.02*q(t-7) + 0.01*q(t-8) + 0.01*q(t-9)$
Public Non-housing	$0.12*q(t) + 0.21*q(t-1) + 0.19*q(t-2) + 0.17*q(t-3) + 0.15*q(t-4) + 0.11*q(t-5) + 0.04*q(t-6) + 0.01*q(t-7)$
Private Industrial	$0.26*q(t) + 0.3*q(t-1) + 0.19*q(t-2) + 0.12*q(t-3) + 0.07*q(t-4) + 0.03*q(t-5) + 0.01*q(t-6) + 0.01*q(t-7) + 0.01*q(t-8)$
Private Commercial	$0.15*q(t) + 0.26*q(t-1) + 0.22*q(t-2) + 0.16*q(t-3) + 0.09*q(t-4) + 0.07*q(t-5) + 0.02*q(t-6) + 0.02*q(t-7) + 0.01*q(t-8)$

Where q is the quarterly orders total for the tth period and t is the relevant quarter.

79. A series of sector-specific equations are then applied to the composite orders figures for the reference quarter to estimate New Work output in that sector for the quarter. These equations have been calculated by regressing composite orders against actual output in the Long Term (since 1983) and the Short Term (since 1990), and are reworked regularly. The equations used are given below:

Table 7: Regression Coefficients for DTI Construction model

Sector	Long Term	Short Term
Public Housing	$-4.339 + 1.0849y$	$13.035 + 1.0825y$
Private Housing	$538.236 + 0.6532y$	$953.282 + 0.3502y$
Infrastructure	$-267.812 + 1.5629y$	$119.374 + 1.2019y$
Public Non-housing	$-77.156 + 1.2221y$	$215.288 + 0.9490y$
Private Industrial	$37.637 + 1.0914y$	$109.554 + 1.0496y$
Private Commercial	$12.6274 + 1.0876y$	$-47.788 + 1.2321y$

Where y is the composite orders total for the relevant sector.

80. The values produced by both models are well below actual output levels, so the growth over the previous quarter estimate is taken, and applied to previous actual output to produce a sector estimate. These are then summed to produce a New Work estimate.

81. Orders figures are not available for Repair and Maintenance (R&M) output, and hence each sector (public housing, private housing, public non-housing and private non-housing) is extrapolated from previous output trends. These sectors are summed to produce a Repair and Maintenance estimate. The New Work and R&M estimates are combined to produce an estimate of total construction output.

The Activity Balances Model

82. The Activity Balances model was developed by Experian on behalf of DTI following the recommendations of an interdepartmental working group in 2002. It uses the results of a monthly survey of activity balances within the construction industry to estimate the performance of the whole industry (rather than by sector as the DTI model does). Details are given below – adjustments are made to data for Q1 1998 and Q1 2000 to smooth out spikes in the output series:

Ordinary Least Squares

QUARTERLY data for 38 periods from 1991Q3 to 2000Q4

Date: 10 JUL 2002

dlog(OTOT)

$$\begin{aligned}
 = & 0.01682 * \text{spike}(98,1) & - 0.03713 * & \text{spike}(98,1)[-1] \\
 & (2.35815) & (-5.27479) & \\
 & + 0.01973 * \text{spike}(100,1) & - 0.02879 * & \text{spike}(100,1)[-1] \\
 & (2.80353) & (-4.09570) & \\
 & + 0.00023 * \text{CFR} + 0.00688 & & \\
 & (4.99657) & (4.52983) &
 \end{aligned}$$

Sum Sq 0.0015 Std Err 0.0069 LHS Mean 0.0017

R Sq 0.7322 R Bar Sq 0.6903 F (5, 32) 17.4942

D.W.(1) 1.9906 D.W.(4) 2.1178

Chow test of stability for break after 1997Q4

12 observations from end of sample

F(2, 30): 0.6070 (based on three regressions)

Where:

OTOT All work, 1995 prices, seasonally adjusted

Spike(yy,q) a dummy variable for year "yy" quarter "q"

CFR The seasonally adjusted CFR (Construction Forecasting and Research, now part of Experian) all work output balance for the first two months of the quarter and the last month of the previous quarter.

B Revisions to Gross Domestic Product

83. During the development of this model, several other possible input variables were analysed, including economic data, materials deliveries, rainfall data and other work or activity measures. These did not prove successful, although activity data from the Construction Confederation also showed a good relationship. However the CFR data were preferred because they are timelier and are available monthly. Experian continue to experiment with other input series as they become available – for example recent work has looked at temperature and hours of sunshine.

B3.3.3 – The DTI month 2 estimate

84. The Month 2 estimate is supplied to ONS at the beginning of the second month following the reference quarter, for inclusion in the *UK Output, Income and Expenditure First Release*. Originally it was based on the DTI model rerun to include complete quarterly orders data. However, following the recommendations of an interdepartmental working group in 2002, work was carried out to make it possible to access early returns to the DTI Quarterly Inquiry of Construction Activity. At the same time, working practices were changed within DTI to ensure that as many returns as possible had been validated by the time the Month 2 estimate was due, rather than simply focusing on the DTI publication deadline a month later.

85. The results of these early survey returns have been used since the estimate for Q4 2002. They have been of varying accuracy and DTI are still building up an understanding of how the information received at this stage compares to that received by a month later. In addition, the Quarterly Inquiry is the source of around 81% of output, and hence any changes to the unrecorded estimate (16%) or the estimate of Direct Labour Organisation output (3%) will not be picked up at M2 stage. However, for the last two quarters this information has been used to increase the estimate of growth made at Month 1.

Table 8: Response Rates for DTI Construction survey at M2 and M3 in Q1 and Q2 2003 by Strata

Strata	Employment	Month 2	Month 3	Month 2	Month 3
		Q1 2003	Q1 2003	Q2 2003	Q2 2003
SG0	1	0.53	0.75	0.29	0.56
SG1	2-3	0.52	0.77	0.29	0.62
SG2	4-7	0.51	0.76	0.28	0.65
SG3	8-13	0.50	0.74	0.31	0.69
SG4	14-24	0.51	0.75	0.30	0.66
SG5	25-34	0.48	0.76	0.33	0.68
SG6	35-59	0.52	0.75	0.33	0.68
SG7	60-79	0.45	0.70	0.30	0.66
SG8	80-114	0.47	0.74	0.26	0.70
SG9	115-299	0.39	0.67	0.25	0.62
SG10	300-599	0.38	0.65	0.25	0.67
SG11	600-1,199	0.36	0.65	0.14	0.60
SG12 & 13	1,200 +	0.40	0.58	0.24	0.70
Total		0.50	0.75	0.30	0.66

Notes

1. This table shows the percentage of responses returned and validated at the relevant stage
2. SG stands for Size Group. Size Groups 6 and above are sampled at 1 in 1
3. Size Groups 12 and 13 are combined here because of their small size – in 2002 there were just 57 firms in these two strata. This also means that a few returns can make a large difference to their response rate.

B3.3.4 How the ONS use DTI estimates in compiling GDP

86. The production of the preliminary estimate of GDP is not an automatic process. The statisticians responsible for the industrial output data produce a first estimate based on the data they have available and the usual forecasting methods. These are aggregated to produce an estimate for the growth in gross value added for the economy as a whole. The estimates are then presented to a meeting which is normally chaired by the Director of National Accounts Co-ordination. Others attending include the Directors of National Expenditure and Income and Short Term Output Indicators and a senior ONS economist. The meeting considers the data presented to it alongside other information, most notably an assessment of external indicators including surveys produced by CIPS, BCC and the CBI and some information on the demand side of the economy.

B Revisions to Gross Domestic Product

87. The meeting examines all the information and comes to a view on the overall growth rate in GDP. In doing so it considers the data, the external information and the history of revisions. Once a view has been taken on the overall level of growth, any changes to components needed to achieve this growth figure are decided.

88. In July 2004, the original dataset presented to the meeting, which included the construction estimate of –0.4 per cent growth, showed growth of 0.2 per cent. The meeting decided that there was evidence to suggest that growth was higher than that and that a figure of 0.3 per cent would be less likely to be revised. The component which was most changed to achieve this figure was construction output. The external evidence did not support a decline in construction output. Further, the early estimates of construction had, for a number of quarters, been poor predictors of later, more firmly based data. For these reasons, it was decided to put in an estimate of construction output growing in-line with total GDP. This was not inconsistent with DTI advice that construction output was unchanged in the quarter.

B3.4 Construction output – revisions history

89. This section provides a brief summary of the revisions history of the construction series. It should be read alongside section 3.3; the DTI report on the Review of early estimates of construction output for GDP in 2003.

90. Chart 1 shows the revisions made to these estimates between Month 2 and Month 3 over the period 1993Q1 to 2003Q3. The average revision to the construction growth rate between the second and third month estimates, as published by the ONS, was 0.2 percentage points over the whole period. The average absolute revision was 0.8 percentage points. However, if we only look at 2000Q1 to 2003Q3, we see that both the average revision and the average absolute revision are much higher, 0.6 and 1.7 percentage points respectively.

91. The revisions history shown in Chart 1 should be looked at in the context of the behaviour of the time series of construction activity (Month 3) shown in Chart 2. This shows that the largest revisions occur around irregular movements in the series (1997Q4 and 1998Q1, most of 2000, and 2003Q1 and Q2) and during the period of strong growth during 2001 and 2002. To put the size of the revisions into context, Chart 3 shows the estimates of construction growth published by the ONS for the same period. As can be seen in Chart 1, there is an increase in the size of the revisions in 2000. Concerns about the reliability of estimating changes in output based on new orders prompted an inter-departmental working group (consisting of ONS, DTI, HMT and the Bank of England) in 2002 to introduce the Activity Balances model to supplement the existing New Orders model.

Chart 1: Revisions to construction output as published by ONS, Month 2 to Month 3 estimates of GDP

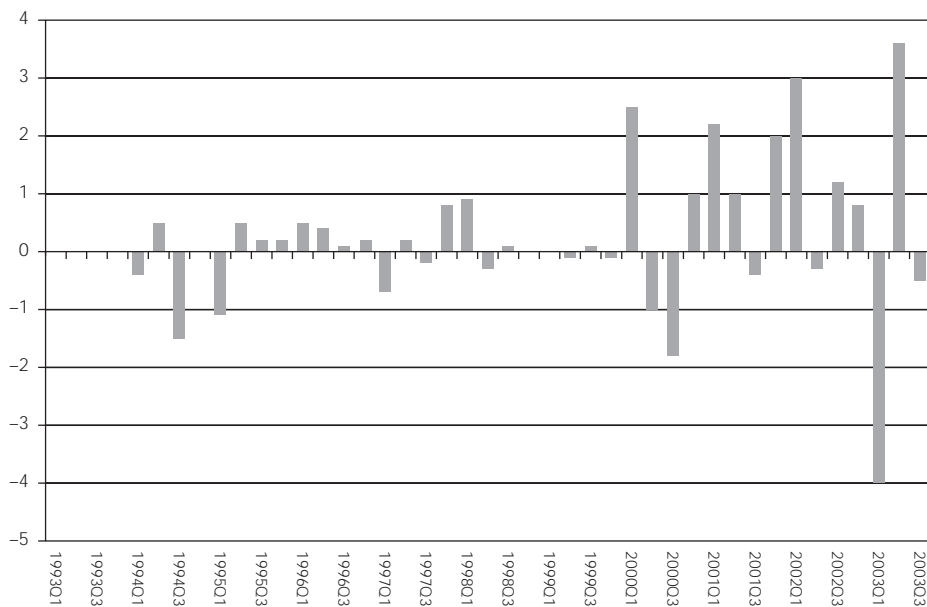
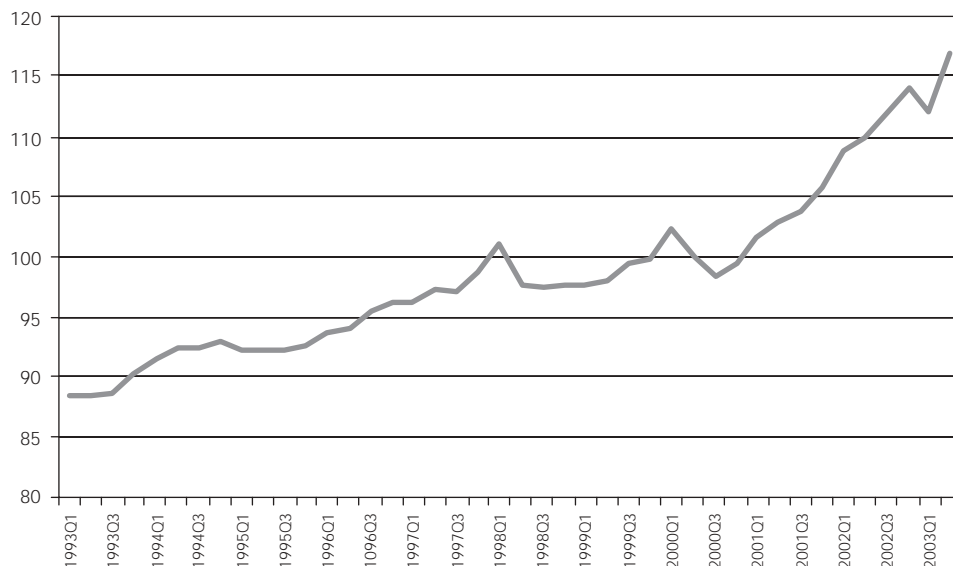
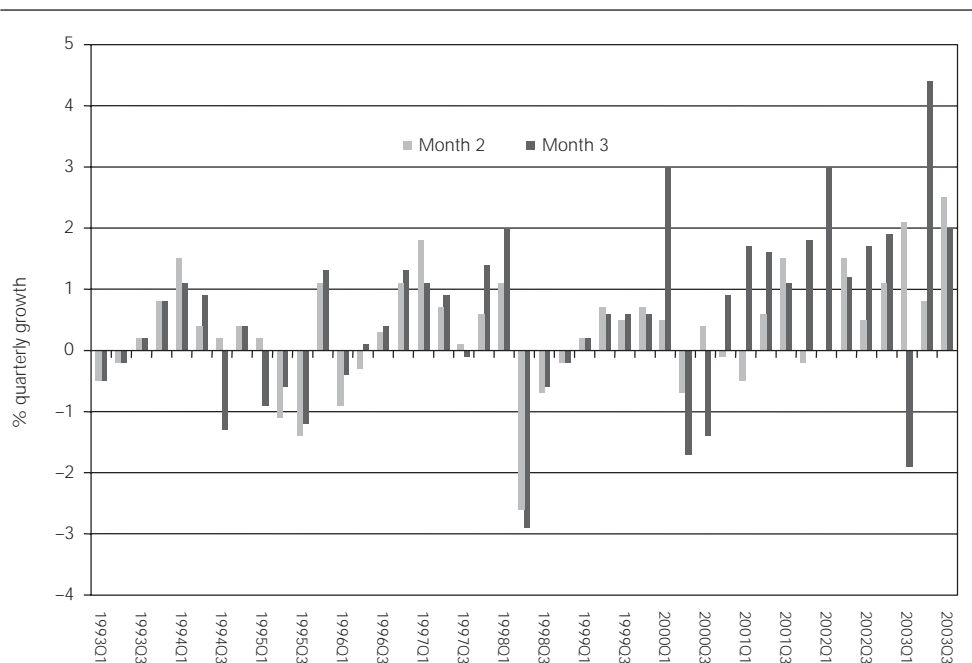


Chart 2: Level of construction activity (index, 2000 = 100)



B Revisions to Gross Domestic Product

Chart 3: Construction growth as published by ONS in M2 and M3 estimates of GDP



92. The unusually large revisions in 2003 Q1 and Q2 need to be seen in the context of the reasons for the fall in Q1 and the recovery in Q2, as portrayed by the final DTI estimates. The fall in Q1 was a widespread effect mainly affecting large firms. The sectoral breakdown for the first quarter shows that in particular, the falls in Private Commercial new work and Repairs and Maintenance more than accounted for the overall fall in the first quarter.

93. The strong growth between Q1 and Q2 was largely a result of the low base in Q1. Growth between Q4 2002 and Q2 2003 was more modest, and was actually below the trend growth over the recent period. The strongest growth between Q1 and Q2 was in those sectors which had been particularly sluggish in Q1: notably Repair and Maintenance and other new work in the public sector. The growth between Q1 and Q2 was therefore largely a 'bounce back' from the low Q1 figure. A rise in Repair and Maintenance was expected (although the timing of this was uncertain) following the release of money to housing associations, and public new housing and new non-housing saw the strongest growth, reflecting the money made available to departments in the comprehensive spending review.

B3.5 Presentation of recent revisions

94. Each preliminary estimate release is accompanied by a briefing note which clearly states that the industrial detail described in the qualitative briefing is presented to help understanding of the figures, but that the industry detail is likely to be revised in subsequent months. Since late 2001 the briefing has also included a short

comment on the source of the estimates of construction output and the DTI model. The note also explains that the service figures are not shown for the latest quarter, since they are not of publishable quality.

“Note on quality of data

Some components of this First Release, particularly for the service sector and construction, include a large proportion of estimation. The qualitative commentary should be treated with caution as the industry detail may subsequently be revised. As more survey and administrative data become available they may also lead to revisions to the overall estimate of GDP growth.”

95. The M3 Quarterly National Accounts First Releases for both the first and second quarter of 2003 attributed the revision to GDP largely to a change in the construction estimate. Following on from this, the style and content of the website briefing was reviewed and improved for the 2003Q3 release. Additionally stronger “health warnings” were included for Construction. The note was redrafted to give further prominence to construction and to warn that there may be revisions to the overall estimate of GDP growth:

“DTI quarterly output survey results for 2003Q3 are not available at this stage. This early construction estimate takes account of a number of other sources. These include: a DTI estimate covering GB, based partly on monthly new construction orders for the first two months of the quarter and partly on information on construction activity from a “Euroconstruct survey” ... As the quarterly construction output survey results become available they may lead to revisions to the estimate of growth in construction output.”

96. The 2003Q3 M2 release also included a joint ONS/DTI briefing note, giving more details on the models, the revisions, and the project that the ONS and DTI had put in place to quality assure the model and estimates.

97. More generally, since 2001Q1 it has been standard practice for the Output, Income and Expenditure briefing to start with an analysis of revisions. The First Release also includes a table (R1) which summarises revisions made to the key components over the open period. The briefing usually takes the form of a table presenting initial versus latest estimates for aggregate GDP, highlighting any revisions made. In recent quarters it has become the practice to explain the causes of revisions to the latest quarter’s growth rate in the briefing, highlighting which industry figures have changed. The analysis in the First Release also presents the causes of the longer-run revisions (usually over the previous year) in terms of the output, income and expenditure approaches.

98. The month 3 release, Quarterly National Accounts, presents not only revisions information on the components of output, expenditure and income, but also to the sector accounts components (such as net lending etc).

B Revisions to Gross Domestic Product

99. 2003Q2 was a special case, in that it was the first QNA to be consistent with the new Blue Book, with the introduction of chain linking and other methodological improvements. This was covered extensively in an annex to the briefing note. These methodological changes had been preannounced in a series of articles in Economic Trends, seminars, e-mails to user groups and website pieces. A limited historical dataset showing the revised numbers had been released 18 days earlier on the 12th September, to give users time to adjust to the change.

100. The Quarterly National Accounts is also accompanied by a meeting of the National Accounts User Group (NAUG). Organisations represented on this group include:

- Halifax, Lehman Brothers, Barclays Capital, Goldman Sachs, Citibank, Morgan Stanley, CSFB, PWC
- National Audit Office, Inland Revenue, Bank of England, HM Treasury, DTI, Scottish Executive, HM Customs and Excise,
- Institute of Fiscal Studies, Newcastle University, National Institute of Economic and Social Research, Society of Business Economists, Cambridge Econometrics, Ridge Economics, Confederation of British Industry

101. This meeting gives users an opportunity to question recent movements in the data and revisions to the data.

B4. Annual GDP estimates

B4.1 Summary for Blue Book 2003

102. GDP growth in nominal terms (**current prices**) was broadly unchanged over the whole time series with no revision greater than + or – 0.2 percentage points on annual growth. **Real GDP** growth has been revised up in 1998, 1999 and 2000. The most significant revisions are in 1999 and 2000 (+0.4 per cent and +0.7 per cent respectively). Revisions of a comparable size were last made in the 1998 Blue Book data-set when growth in real GDP was revised up by 0.6% for both 1991 and 1992 compared with the previous year's Blue Book estimates.

103. The main causes of the 2003 Blue Book revisions were:

- the introduction of annual chain-linking – the effect on real growth is estimated to have been relatively small,
- rebasing of deflators and lower level volume aggregation from a 1995 base to a 2000 base – comparable to the previous five-yearly re-basing exercises,
- adjustments for the effect of VAT missing trader intra-community (MTIC) fraud – upward revisions to imports of goods data for 1999 onwards,

- new information across a range of series – a usual part of the annual Blue Book process.

B4.2 Size of revisions

104. GDP growth in **current prices** was broadly unchanged since 1949 with no revision greater than + or – 0.2 percentage points on annual growth. As anticipated, in the most recent years, upward revisions to imports as a result of the MTIC fraud adjustments was offset by upward revisions to gross fixed capital formation (GFCF) and exports, and small upward revisions to household consumption. Thus, in most recent years the level of current price GDP was only marginally higher.

105. The upward revisions in 1999 and 2000 are driven largely by downward revisions to imports of goods, and upward revisions to GFCF.

- The downward revisions to imports of goods in 1999 and 2000 is due to the downward effects from the 5-yearly re-basing (1995 to 2000) of the lower level aggregation of volume indices and the associated application of annual chain-linking. An increase in the direct collection of prices for imports of goods has resulted in more appropriate prices being used to deflate imports, but this in itself has not generated significant revisions.
- The upward revisions to GFCF from 2000 onwards are due largely to the rebasing of PPIs and the high level at which the price information is incorporated into the GFCF deflators. This results in the opposite effect to that expected from the application of annual chain-linking to growth estimates

106. The revisions triangle below shows that revisions of a comparable size were last made in 1998 when growth was revised up by 0.6% for both 1991 and 1992 compared with the previous year's Blue Book estimates. 1998 was also a year of significant methodological change involving both rebasing and the move to the European System of Accounts (ESA95). Rebasing was previously undertaken in 1993 and larger than average revisions were seen here too.

B Revisions to Gross Domestic Product

Table 9: Annual Blue Book GDP growth rates

Data Year	Blue Book											
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1986	3.8	4.0	4.0	4.0	4.0	4.0	4.2	4.2	4.2	3.9	3.9	4.0
1987	4.6	4.6	4.6	4.6	4.6	4.6	4.4	4.4	4.4	4.5	4.5	4.6
1988	4.5	4.9	4.9	4.9	4.9	4.9	5.2	5.2	5.2	5.2	5.2	5.0
1989	2.1	2.3	2.3	2.3	2.3	2.3	2.1	2.1	2.1	2.2	2.2	2.2
1990	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.8	0.8
1991	-2.4	-2.3	-2.1	-2.1	-2.1	-2.1	-1.5	-1.5	-1.5	-1.4	-1.4	-1.4
1992		-0.4	-0.5	-0.5	-0.5	-0.5	0.1	0.1	0.1	0.2	0.2	0.2
1993			2.0	2.2	2.3	2.2	2.3	2.3	2.3	2.5	2.5	2.3
1994				3.9	4.0	4.5	4.4	4.4	4.4	4.7	4.7	4.4
1995					2.5	2.8	2.8	2.8	2.8	2.9	2.9	2.8
1996						2.5	2.6	2.6	2.6	2.6	2.6	2.7
1997							3.5	3.5	3.5	3.4	3.4	3.3
1998								2.2	2.6	3.0	2.9	3.1
1999									2.1	2.1	2.4	2.8
2000										2.9	3.1	3.8
2001											1.9	2.1
2002												1.7

Table 10: Revisions to annual GDP growth in Blue Books

Data Year	Blue Book											
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1986		0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-0.3	0.0	0.1
1987		0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.1	0.0	0.1
1988		0.4	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	-0.2
1989		0.2	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.1	0.0	0.0
1990		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
1991		0.1	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.1	0.0	0.0
1992			-0.1	0.0	0.0	0.0	0.6	0.0	0.0	0.1	0.0	0.0
1993				0.2	0.1	-0.1	0.1	0.0	0.0	0.2	0.0	-0.2
1994					0.1	0.5	-0.1	0.0	0.0	0.3	0.0	-0.3
1995						0.3	0.0	0.0	0.0	0.1	0.0	-0.1
1996							0.1	0.0	0.0	0.0	0.0	0.1
1997								0.0	0.0	-0.1	0.0	-0.1
1998									0.4	0.4	-0.1	0.2
1999										0.0	0.3	0.4
2000											0.2	0.7
2001												0.2

B4.3 Causes of revisions

107. The main sources of the **current price revisions** were:

- New and revised source data – the main sources were; the new and revised results of the Annual Business Inquiry (ABI); the improved International Trade in Services (ITIS) inquiry, the coverage of which has been substantially expanded; the use of actual government expenditure data to replace estimated budget data; revisions to wages and salaries data; revisions to data on smuggled goods; and Pension Fund Inquiry revisions.
- Current price **Input-Output supply and use** balancing – annual data for the three approaches to GDP (production, income and expenditure) are balanced through the supply-use framework. The estimates for 2001 were balanced in this way for the first time including the annual benchmarking of various components, data for 2000 were re-balanced to accommodate new data, and selected revisions to 1996-1999 were also allowed, necessitating re-balancing of these years.
- **VAT MTIC fraud** – upward revisions to imports of goods data were made to account for under-recording in 1999-2003. The revisions involved upward adjustments to imports of £1.7 billion in 1999, £2.8 billion in 2000, £7.1 billion in 2001 and £11.1 billion in 2002. The upward revisions to imports had a downward impact on the level of the expenditure measure of GDP. The effect on balanced GDP cannot be seen directly, however, due to the effects of related revisions made to components of demand, household consumption and GFCF, during the supply-use balancing process, and the effects of other, unrelated revisions.

Table 11: Gross domestic product by category of expenditure at current market prices: revisions

	£ million								
	Final consumption expenditure			Gross fixed capital formation	Exports		Imports		Total
	H/H final consumption expenditure	Government final consumption expenditure	Other ¹		Total goods and services	Total goods	Total services		
	ABJQ	NMRP	NPQS	IKBH	BOKH	IKBC	YBHA		
1996	511	-590	529	-49	878	0	203	1,076	
1997	439	-971	-387	-94	1,405	0	515	-123	
1998	698	-922	-302	-65	1,533	0	890	52	
1999	959	-277	1,146	-83	2,185	1,679	845	1,406	
2000	-208	-7	2,292	-165	1,872	2,650	284	850	
2001	1,837	-311	2,353	2,444	3,975	7,110	2,275	913	

¹ Includes NPISH final expenditure, change in inventories, acquisitions less disposals of valuables and the statistical discrepancy

B Revisions to Gross Domestic Product

108. The main sources of the revisions to **real growth** were:

- **Annual chain-linking** – economic theory suggests that the introduction of annual chain-linking will tend to have a *downward* effect on growth, compared with a fixed-base (constant price) system. This was borne out by the ONS study (Tuke and Beadle, 2003) in which a chain-linking test-run of the Blue Book 2002 dataset led to a small negative effect on growth in recent years (1997 onwards). The effect was largely due to increased volumes and falling prices for expenditure on and trade in computers, telecommunication equipment and other high-tech goods.
- **Rebased deflators** – the price indices (producer price indices (PPIs), import price indices (IPIs) and export price indices (EPIs)) used to deflate nominal values of GFCF, changes in inventories and trade in goods, and in compilation of the index of production, were updated so that their internal weights reflect the values of 2000 rather than 1995. This updating was done from 1998 onwards, with 1998 as the link year. The deflators were re-referenced to 2000=100. This rebasing generally resulted in downward revisions to the price indices, so that when they are used for deflation, the result is *upward* revisions to the constant price value series.
- This result appears counter-intuitive: we might expect all rebasing activities to reduce the substitution bias in growth estimates and thus lead to downward revisions to growth. In fact we see the opposite effect because the price indices used as deflators are of the Laspeyres form whereas they should, in theory, be of the Paasche form. Rebasing a Paasche price index generally causes it to be revised upwards, and thus growth downwards. The SNA93 and ESA95 recognise that the use of Paasche price indices is usually impossible for practical reasons and therefore recommend deflating at a detailed level and rebasing as frequently as possible to minimise the counter-intuitive effects of using Laspeyres deflators. This effect is identical to that seen as a result of the five-yearly rebasing exercises carried out in the past.
- **Rebased lower-level volume series** – since chain-linking is generally not performed at the lowest level for which volume series are available, these detailed series need to be aggregated before the annual chain-linking procedure can be applied. The 1995 weights previously used for this aggregation were therefore replaced by 2000 weights. This rebasing tended to have a downward effect on growth estimates. This effect is identical to that seen as a result of the five-yearly rebasing exercises carried out in the past.
- **Methodological improvements** – the introduction of a major methodological change such as chain-linking is the obvious time to make a wide variety of more minor methodological improvements. Thus major improvements were made in the deflation of imported capital goods. The import prices survey was expanded leading to the introduction of import price indices (IPIs) for deflation, in the place

of import-adjusted PPIs. Previously, IPIs were used for only 31% of imports of goods, whereas this has now been expanded to 61%. The introduction of IPIs and annual chain-linking has caused the deflators to fall less quickly, particularly in the area of office machinery, computers and telecommunication equipment. i.e. the deflators have been revised upwards leading to *downward* effects on the growth of imports (upward effects on GDP). The weights for these commodities have also increased significantly further increasing the downward effect on growth, through the lower-level aggregation process described above.

B4.4 Contribution of annual chain-linking

109. Overall, the introduction of annual chain-linking is estimated to have had relatively little effect on the growth of GDP, no more than + or – 0.2 percentage points in any year. The revisions to growth in 1999, 2000 and 2001 from chain-linking are smaller than those due to other factors.

110. The theoretical effect of chain linking is expected to be highest where high-tech goods are purchased, as in capital formation. The fact that no effect is observed in the later years for GFCF is due to the high level at which annual chain-linking weights are applied – the underlying weighting structure is not sufficiently detailed to allow all the expected effects of annual chain-linking to affect the final aggregate estimates. Future development will seek to increase the level of detail at which annual chain-linking is applied for GFCF, to be more consistent with the levels used elsewhere in the accounts. This will require an investigation of well the annual weights for the structure of GFCF can be updated.

B4.5 Presentation of recent revisions

B4.5.1 Chain Linking

111. The largest recent (and major) change to the compilation and presentation of the National Accounts was the introduction of Annual Chain Linking in the 2003 Blue Book. A fully developed communications strategy was in place for this exercise. Over a period of two years four articles were published in Economic Trends and two elsewhere. In addition, there were three press briefings, and 14 presentations to both government and non-government users.

112. Communication to users of the change started in September 2001. News of the development, the publication of articles, notification of open seminars, details of press coverage and development updates were highlighted in a series of monthly bulletin e-mails to an extended list of National Accounts users, collated for this purpose. The existing National Accounts User Group mailing list was extended to include academics and all external NA users who responded to the information on the website by mailing the project team, as well as to journalists who had asked questions about annual chain-linking or mentioned it in articles. The list of approximately 240 users included representatives from government departments, the Bank of England, financial institutions, academics, journalists and research firms.

B Revisions to Gross Domestic Product

113. An annual chain-linking 'homepage' was set up on the website to show the differences between annual chain-linking and the existing method using explanatory spreadsheets and with links to all articles. Consistent with the draft Protocol on Revisions, a historical dataset covering 1948 – 2001 was released on the 12th September 2003, in advance of the release of the Quarterly National Accounts on the 30th September covering the period to 2003 Q2. The release of historic data on 12 September was accompanied by a briefing note explaining the revisions. All recipients of the e-mail updates were invited to take part in a consultation on the deciding the reference year for chained volume measures time series in summer 2002.

114. The likely impact of chain-linking was trailed in a series of articles in Economic Trends: Tuke and Reed (2001), Tuke (2002), Tuke and Ruffles (2002) and Tuke and Beadle (2003). Other articles were published in the Royal Economic Society Newsletter (Rowlatt, 2002) (including information on the April 2002 Economic Trends article and notice of an open seminar) and Tuke (2003).

115. The changes were also highlighted in a series of briefings – for example the chain-linking project manager attended a press briefing on the day the April 2003 Economic Trends article was published- and answered queries on the information in the article and presentations to users.

116. Presentations on annual chain-linking (those with non-government attendees shown with an asterisk*)

DTI statisticians (Sept 2001), HM Treasury (Jan 2002), Bank of England (April 2002) ONS New Economy Workshop at Bloomberg, (*April 2002), Society of Business Economists and Royal Economic Society (*May 2002), Royal Statistical Society Financial Statistics User Group/Official Statistics User Group (*June 2002), Welsh Office (July 2002), Bank of England, including MPC members (Sept 2002), Bank of England and HM Treasury (Sept 2002), Eurostat Workshop (Oct 2002), Scottish Executive Statisticians (April 2003), Bank of England (May 2003), HM Treasury (May 2003), DTI (May 2003)

117. When historic annual estimates covering the period 1948 to 2001 were pre-released on 12 September 2003 a five page briefing note was published on the National Statistics website. When new estimates to 2003 Q2 were published on 20 September a press briefing was held and briefing notes published on the website.

B4.5.2 Other Blue Book 2003 revisions

118. Tuke and Beadle (2003) also took the opportunity in April 2003 to preannounce other changes to be made to the National Accounts dataset in the October 2003 Blue Book. These preannounced changes included:

- Rebasing of detailed volume measures – below the level of ACL, the volume measures needed to undergo standard 5 year rebasing from 1995 to 2000.
- CPIO Balancing – leads to revisions to most current price GDP components.

- Data improvements to Output data – number of methodological changes made, mainly affecting distribution industries.
- Trade in services (both exports and imports) – took on improved data from the ITIS inquiry, the coverage of which has been substantially expanded from 10,000 to 20,000 companies.
- Expenditure on alcohol – took on new data, effect both smuggled alcohol and legal expenditure on alcohol. This also effected imports of goods, output of distribution industries and mixed income.
- Capital consumption – new methodology lead to changes to output of public administration and defence, and final expenditure and gross operating surplus of general Government and non-profit institutions serving households (NPISH).
- Reassessment of deflation in household final consumption expenditure – related to the introduction of data and deflators on the Classification of Individual Consumption by Purpose (COICOP).
- New methodology for estimating National Non-domestic rates – Resulted in changes to general government final consumption expenditure. Treatment of subsidies relating to BSE also reviewed.
- Finally, on wages and salaries – latest estimates of wages and salaries supplied by Inland Revenue were included back to 1998.

119. Pending modernisation of National Accounts systems, it was not possible to give advance guidance of the quantitative effects of changes such as rebasing of detailed volume measures.

B4.6 Revisions to earlier Blue Books

120. ONS usually publishes annual articles (usually in April – June) which highlight forthcoming methodology changes to the National Accounts, to be implemented in that year's Blue and Pink Books, and Supply-Use Tables.

121. 2002 Blue Book – Tse (2001) – 2002 was planned to be a closed Blue Book from a methodological point of view, with only data revisions planned, such as new ABI data etc. ONS plans for the 2002 – 2005 Blue Books were presented, summarising for users the next stages in ensuring compliance with ESA 1995, such as the introduction of annual chain linking and improvements to deflation methodologies.

122. 2001 Blue Book – Tse (2001) – A number of methodological changes to the National Accounts in the 2001 Blue Book were pre-announced in this article. Although ABI data had been available for the 2000 Blue Book, the less restrictive revisions policy for 2001 meant the full dataset could be taken on, with longer-term revisions. Users were pointed to two earlier articles, Jones (2000) and Ahmad (1999) which explored the ABI and the likely impact on the Supply-Use tables in more detail.

B Revisions to Gross Domestic Product

Other pre-announced changes included smuggling adjustments, which would result in increased household expenditure and imports, and an expansion of direct measurement of government output, which had been described in more detail in Baxter (2000). Direct measurement had been implemented in 1998 for education, health and social security, and 2001 added a back series for justice and agricultural intervention. The methodology was expanded to cover local authority personal social services and fire brigades.

123. 2000 Blue Book – Brueton (2000) – this was a “closed” Blue Book, and the only preannounced methodology revisions to go back prior to 1998 were to capital consumption, capital stock and balance sheets (which did effect GDP). These changes were preannounced in Brueton (2000), and capital stocks were covered in more detail in an Economic Trends article (Clifton-Fearnside and West, 1999)

C. Revisions to the Index of Production

124. This note explains how estimates of the Index of Production (IoP) are produced, summarises the historic revisions record, explains reasons for recent notable revisions and how they were presented.

C1. How the estimates are produced

125. Revisions to the (IoP) can arise at a number of stages between the initial and subsequent estimates. The stages can be summarised as follows.

126. An initial estimate is published twenty-six working days after the reference period based on survey results at that point. The main data source for the IoP is the Monthly Production Inquiry, which provides turnover data for around 75 per cent of overall production. Turnover data is deflated using various producer price indices. The remaining 25 per cent is accounted for by series based on volume indicators, such as oil and gas extraction and electricity and gas supply, which are provided mainly by the Department of Trade and Industry. Manufacturing data are adjusted for changes in stock levels. At this stage around 80% of the Monthly Production Inquiry returns have been received and validated. Note that final estimates are based on over 90% response to the MPI. The month-on-month movements can be volatile, so users are encouraged to use the 3-months on previous 3-months growth rate.

127. The following month the initial estimate is revised to take account of late data, changes arising from seasonal adjustment and from revisions to the deflators.

128. Each year, at the time of the publication of the Blue Book, revisions can be made to the period open to revisions under the NA revisions policy. This can be as few as 3 years (as for BB2004) or all periods back to 1948 (as for BB2003). For example, at BB2004, in June 2004, the IoP will be chain-linked using 2001 weights for the period from 2002, and previous years will take on revisions to weights for earlier periods, back to 2001. Any revisions to this period arising from further late data, seasonal adjustment and deflators will also be taken on.

129. Seasonal adjustment in the IoP takes place at the four-digit level of the SIC. The IoP data is re-seasonally adjusted every month, and seasonal factors can and do change every month. However, only the period currently open for revision is revised, other changes (i.e. to earlier data) are stored until the next opportunity to revise. Sometimes the open period can be as little as the month prior to the current

C Revisions to the Index of Production

month, as is the case when February results are produced. Other times, the whole year's factors can be revised, for example for the December and January results. Generally the overall IoP is rarely affected by more than 0.1 of an index point due to recalculating seasonal factors each month.

130. Occasionally the IoP will also benefit from methodological improvements, some of which were introduced in autumn 2003. These will also lead to revisions. Last year these improvements included:

- introduction of chainlinking;
- improvements to the stock adjustments;
- updating the computer system which facilitated some compilation improvements.

C2. Recent revisions and comparison with earlier periods

131. A long run database of revisions to the IoP is not yet available. The average of the absolute percentage revisions to three-month on previous three-month headline rate of growth between first estimate and the last fixed base dataset published in September 2003 for the period from June 2000 – July 2003 was 0.2 percentage points for the IoP, and 0.2 for the Index of Manufacturing (IoM). The average of the absolute percentage revisions between first estimate and the first chain-linked dataset in October 2003 for the period from June 2000 – July 2003 was 0.5 percentage points on the headline rate of growth for the IoP and 0.3 for the IoM. Table 12 shows the revisions triangle for the three-month on previous three-month estimates since September 2001.

132. Six months or so after the first estimate, revisions tend to be very small. Over the period from June 2000 to January 2003 the average revision (with regard to sign) to the 3-month on 3-month headline growth rate for manufacturing between initial estimate and revised estimate 6 months later was very small, -0.04, indicating that there is no significant bias in the revisions.

133. Looking at the headline rates of growth in the twelve months leading up to the publication of the rebased series, it is notable that all but two periods were revised by no more than 0.3 percentage points. In fact, the same is true of the single month on month growth rates, which are generally more volatile.

134. The introduction of the re-developed IoP (of which the introduction of annual chain-linking is a major part) has, of course, led to revisions which are larger than those which are normally associated with late data alone. Overall, the move to Chained Volume Measures has not greatly affected the profile of the series in the last few years, and has had only a small upward impact on growth rates from 1997, primarily in industries where rising volumes are associated with rising prices (or vice versa). This occurred in manufacturing in all of the years from 1997 onwards except

for 1998, when there is a small negative impact from chain-linking. Tuke and Beadle (2003) outlines the industries which provided the extra growth.

135. To aid understanding of the new methodology, a historic dataset of the four main aggregates was released on 12th September 2003. The IoP First Release on 7 October presented the latest data rebased onto 2000=100 and chain-linked from 1994. These methodological changes resulted in differences in growth rates compared with the previous fixed base series. These differences are therefore principally the result of well-understood methodological improvements, although some late data were also taken on at the same time. They are not a consequence of corrections to erroneous data.

C3. Notable revisions

136. In the twelve months leading up to the introduction of chain-linking, the largest revision to *three-month on three-month* growth rates for the Index of Manufacturing was for the period ended June 2003. On the single month growth rates, there were significant revisions to the movements into January 2003 and June 2002. These three revisions are described in more detail below:

137. *3-months to June 2003*: The first published *three-month on three-month* growth rate for the three months to June 2003 was 0.0 per cent. When the chain-linked dataset for August 2003 was published this was revised to 0.5 per cent. The main reasons for this were improvements to the methodology for smoothing industry series, notably for transport equipment, and effect of seasonal adjustment on the chemicals industries.

138. *January 2003*: The first published growth rate was +0.3 per cent. When the chain-linked dataset for August 2003 was published the growth rate was revised to -0.4 per cent – a revision of 0.7 percentage points. The main reason for this difference is the very sharp growth (around 18 per cent) in the computer industry between December and January. The impact of moving to industry weights based on 2000 in the new series significantly reduced the weight on this industry. This is exactly as expected, given the sharp fall in the price of computer equipment between 1995 and 2000. This change in the growth rate is therefore a direct, desirable, and predictable consequence of updating the weights. The new series better represents the current structure of the economy than the previous series.

139. *June 2003*: The first published growth rate was -5.3 per cent. When the chain-linked dataset for August 2003 was published the growth rate was revised to -6.0 per cent. The main reason for this revision was an improvement in the seasonal adjustment methodology to take account of the impact of the Jubilee in June 2002.

C4. Presentation of revisions

140. To help users to understand the new series, two Economic Trends articles were published in July 2002 (Williams and Fletcher, 2002) and June 2003 (Williams and Fletcher, 2003). The first article announced the key changes (chain linking, a new computer system, improved smoothing and constraining etc), outlined the progress to date and informed users of the timetable leading up to the release of new data. The article also announced the intention to publish a follow-up article. The June 2003 article outlined in clear terms the broad nature of and reasons for the revisions to the IoP which would arise from its re-development. It gave a detailed explanation of the methodological and new system changes, and made clear that estimates of growth would be revised upwards as a result of the work. The article further noted that:

- The Index of Production computer system had been updated, with some changes made to the methodology and compilation method. This would affect growth back to 1994.
- Results based on the new methodology would be published as part of the 2003 Blue Book dataset and would appear in the IoP First Release for the first time in October 2003.
- The main methodological enhancements were chain-linking, splining of quarterly stock data, smoothing, and producing current price stock adjusted indices for the first time.
- For chainlinking the article pointed readers to Tuke and Beadle (2003), which provided estimates of the impact at industry level.
- Finally, the article alerted users that, consistent with the new Protocol on Revisions, the back series for this new series was to be released in September to allow users time to study the new series in advance of the 7 October first release which would contain the latest figures on the new basis.

141. The revised IoP was included in the data-set made publicly available on the National Statistics web-site on 12 September. This data-set included the four main IoP aggregates with quarterly and annual data starting at 1948 and finishing at 2001.

142. The IoP release published on 7 October, which presented the new series for the first time, alerted users to the changes made to the methodology and method of compilation of the IoP.

143. More generally, the IoP First Release states the revisions policy for the IoP: *"Estimates for the current month are based on incomplete data and are subject to revisions as more complete information becomes available."* The First Release also flags revisions in a table showing latest and previous month estimates for the two key indicators. Also, in the tables, a symbol is used to indicate that data from this date onwards has been revised.

Table 12: Revisions to 3 month on 3 month IoP Estimates

Revisions to Estimates for Period	First Estimate																									Latest Estimate				
	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	sep-03						
Sep-01	-0.6	-0.1	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	-0.4			
Oct-01	-0.9		-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.3		
Nov-01	-2.0			0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	-1.3		
Dec-01	-2.1				-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	-1.8		
Jan-02	-1.9					0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-1.8		
Feb-02	-1.4						-0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	-1.2		
Mar-02	-1.5								0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	-0.5		
Apr-02	-0.5									0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	
May-02	0.8										-0.2	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	1.0		
Jun-02	0.2											0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	
Jul-02	-0.1												-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	-0.6
Aug-02	-1.4													0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	0.0	-2.2	
Sep-02	0.4														0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	-0.3	
Oct-02	0.3															0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	
Nov-02	0.5																0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.6		
Dec-02	-0.7																		-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	-0.3	
Jan-03	-0.8																			0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	-0.5		
Feb-03	-0.4																				-0.2	0.1	0.0	0.0	0.0	0.3	0.0	-0.2		
Mar-03	-0.5																					0.1	0.0	0.0	0.0	0.1	0.0	-0.3		
Apr-03	-0.2																						0.0	0.1	0.0	0.1	0.0	0.0		
May-03	-0.4																							0.0	0.0	0.1	0.0	-0.2		
Jun-03	0.1																								0.1	0.0	0.0	0.2		
Jul-03	0.5																										-0.1	0.0	0.3	
Aug-03	0.5																											-0.1	0.4	

C Revisions to the Index of Production

Table 13: Revisions to month on month IoP Estimates

Revisions to Estimates for Period	First Estimate		Revisions to Estimates																								Latest Estimate		
	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	sep-03					
Sep-01	-1.2	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	-0.7	
Oct-01	-1.1	-0.3	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-1.3
Nov-01	-0.3		0.2	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.5	
Dec-01	-0.3			0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	-0.2	
Jan-02	-0.5			-0.1	-0.2	0.0	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.6	0.0	-0.3		
Feb-02	-0.2				-0.2	0.3	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1		
Mar-02	-0.4						0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.4		
Apr-02	1.1							0.3	-0.3	-0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	0.4	
May-02	0.9								0.1	0.1	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.5		
Jun-02	-4.3									0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	0.0	-4.9		
Jul-02	3.4										-0.2	0.2	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	0.0	2.5	
Aug-02	-0.3											0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2		
Sep-02	-0.3												-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0		
Oct-02	0.0													0.1	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.4		
Nov-02	-0.5														0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	-0.1		
Dec-02	-0.2															0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.3			
Jan-03	-0.1																0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	0.0	-0.9	
Feb-03	0.7																	-0.2	0.0	0.0	0.0	0.1	0.3	0.0	0.9				
Mar-03	-0.8																		0.0	0.0	0.0	-0.1	0.3	0.0	-0.5				
Apr-03	0.2																			-0.1	0.2	0.0	-0.3	0.0	-0.1				
May-03	0.1																				-0.2	0.2	0.0	0.0	0.1				
Jun-03	0.7																					0.0	0.1	0.0	0.8				
Jul-03	0.3																								-0.4	-0.1	-0.2		
Aug-03	-0.9																									0.0	-0.9		

D. Revisions to the Retail Sales Index

144. This note explains how estimates of the Retail Sales Index (RSI) are produced, summarises the historic revisions record, explains reasons for recent notable revisions and how they were presented.

D1. How the estimates are produced

145. The RSI is based on the Retail Sales Inquiry, which is a monthly survey of over 5,000 retailers, selected from the Inter-Departmental Business Register (IDBR). All retailers with over 100 employees are selected each month, along with a rotating sample of smaller businesses. The sample covers approximately 73% of the total turnover of the retail sector. For each four- or five-week period, contributors report their total value of average weekly sales (turnover) for all their outlets and by mail order, internet etc. From these a weekly average for the period is derived. The statistics include VAT.

146. From this survey the RSI is compiled each month, and results are published for industry groups and all retailers, expressed in base-weighted index form, with the data deflated and seasonally adjusted to produce the headline “RSI volume” series. Provisional results are published within 14 days of the end of the latest reporting period, and are usually based on 60- 65% response rate, representing over 90% of turnover of retailers in sample. The final response rate tends to be around 80% of forms returned.

147. The RSI has recently undergone a methodological change. The rebased RSI introduced in Oct 2003 now uses ratio estimation (i.e. grossing to the Inter-Departmental Business Register), rather than the old methodology of “matched pairs”. The new methodology has also widened the scope for potential revisions as it now uses all of the data returned and takes account of changes in the total turnover of the retail sector, rather than just of the chosen sample.

148. As well as being an indicator in its own right, the indicator is indirectly used to calculate quarterly consumer spending on retail goods and the output of the retail sector which feed into the compilation of the National Accounts.

149. A formal revisions policy was introduced when the new RSI was published in October 2003. The previous practice was to take account of returns received up to two months after the end of the month. Seasonal factors were updated every month by revising results for the previous two months and the same month a year earlier.

D Revisions to the Retail Sales Index

The new policy is the same as for other ONS short-term economic indicators which feed into the National Accounts, except where timing differences require the RSI to adopt a slightly different policy. Long run revisions (for example, methods changes, rebasing) will be introduced at Blue Book. The following table sets out, for each month of 2002, the months that would have been open for revision if the RSI had followed the new revisions policy.

Table 14: Revisions Policy for the RSI

Publication Month	RSI results published	Earliest month open for revision
Jan-02	Dec-01	Jan-01
Feb-02	Jan-02	Oct-01
Mar-02	Feb-02	Jan-00
Apr-02	Mar-02	Jan-02
May-02	Apr-02	Jan-02
Jun-02	May-02	Jan-01
Jul-02	Jun-02	Apr-02
Aug-02	Jul-02	Apr-02
Sep-02	Aug-02	Jan-01
Oct-02	Sep-02	Jul-02
Nov-02	Oct-02	Jul-02
Dec-02	Nov-02	Jan-01

D2. Revisions arising from methodology changes (in Oct 2003)

150. The pattern of 'headline' growth of the new RSI (3-months on previous 3-months) is broadly similar to the old series (Chart 4).

Chart 4: Headline growth in the RSI

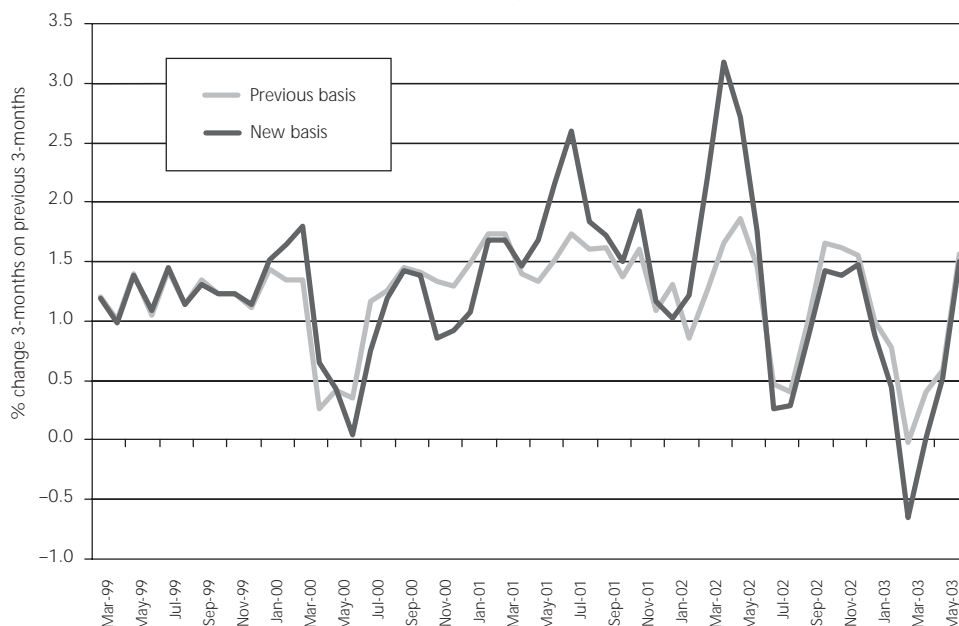


Table 15: Impact of the revisions on the headline RSI growth rates (latest 3 months on previous 3 months)

	Previous basis*	New basis	Difference
Jan-03	1.0	0.9	-0.1
Feb-03	0.8	0.5	-0.3
Mar-03	0.0	-0.7	-0.7
Apr-03	0.4	0.0	-0.4
May-03	0.6	0.5	-0.1
Jun-03	1.6	1.5	-0.1
Jul-03	1.5	1.3	-0.2
Aug-03	1.8	1.4	-0.4

* most recently published data, i.e. revised for any late data (except Aug-03 which was provisional only)

151. The largest difference in 2003, which was picked up by commentators, was in March 2003 (a revision of -0.7), and the new figure is the largest quarterly fall on the new basis since November 1991. It was mainly due to a more appropriate treatment of returns regarded as outliers in the previous series.

152. The revision of 1.5 percentage points in April 2002 comes mainly from the new methodology for treating outliers. In spring 2002 unusually strong growth in garden centre and DIY stores was partially treated as outlier data under the old methodology. Reviewing these decisions lead to an increase in the index under the new method for March, April and May 2002.

D Revisions to the Retail Sales Index

153. Annual growth rates (not the preferred measure) show greater differences between the two methodologies. They saw similar growth over the period 2000-most of 2001, but from autumn 2001 to end 2002 the new series shows consistently stronger growth (by around 1 percentage point). However, growth in the 1st half of 2003 for new series is around 1 percentage point lower than for old series. The differences arise mainly from treating fewer returns as outliers; updated deflators; and taking on late data not available at the time of publication of old series. Effects are described in more detail in the Economic Trends article on RSI development.(Cope and Davies, 2003).

D3. Revisions to estimates under the old methodology, and differences in estimates arising because of the change in methodology

154. It is important to recognise that revisions to the RSI since Jan 2000 have occurred because of two factors: the normal revisions process (taking on late data, re-seasonal adjustment) and the revisions which occurred when the new RSI was published for the first time in October 2003. As the table below shows, revisions caused by the introduction of the new RSI methodology were larger than those which occurred under the previous methodology between first and final estimates.

Table 16: Summary of RSI revisions for the period Jan 2000 to August 2002

	Month on month growth rate (% pts)		3 months on previous 3 months growth rate (% pts)	
	Mean absolute revision	Mean revision	Mean absolute revision	Mean revision
Old RSI: first to last estimate ⁽¹⁾	0.29	+0.08	0.18	+0.05
Old RSI final estimate to new RSI first estimate ⁽²⁾	0.37	+0.06	0.33	+0.17
Old RSI first estimate to new RSI first estimate ⁽³⁾	0.43	+0.13	0.36	+0.22

(1) Represents the effect of the revisions practice employed under the old RSI methodology, i.e. revisions to first published estimates arising from late returned data and re-seasonal adjustment.

(2) Represents the difference between the final estimates under the old methodology and the first estimates from the new methodology, i.e. it shows the impact of the methodology change.

(3) Represents the difference between the first published figures and those resulting from the new RSI methodology.

155. August 2002 is the 'cut off' because this was the last period to be subjected fully to the revisions practice of the old RSI.

D4. Presentation of Recent Revisions

156. Prior to the change in methodology for the RSI there was an intensive programme to brief users in advance:

- Three Economic Trends articles – Interpreting Retail Sales (Davies, 2003a), Retail Sales Index Development (Davies, 2003b), and Retail Sales Index Development: Implementation (Cope and Davies, 2003)
- A special Press Release on 30th September, included a release of backdata on the Web, alongside a methodology article and question and answer briefing (see Davies 2003c and http://www.statistics.gov.uk/about/Methodology_by_theme/retail_sales/qa_30Sep03.asp)
- The methodology was peer group reviewed and presented to ONS statisticians in London and Newport
- Forthcoming changes were presented to HM Treasury (22/5/03) and the Bank of England (9/5/03). They were reminded that this sharing of early information was in line with the Release Practices Protocol, and that it was for quality assurance purposes only and should be restricted to those present
- After release, every caller to the inquiry line was informed of the changes
- On release day, ONS mailed all regular customers with the article and weblink for the new methodology.

D Revisions to the Retail Sales Index

Table 17: 3-month on 3 month % change to RSI

Revisions to Estimates for Period	First Estimate																					Latest Estimate					
	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03		Sep-03	Oct-03	Nov-03		
Oct-01	1.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.5	
Nov-01	1.6		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.9
Dec-01	1.3		-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.2	
Jan-02	0.9			0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	1.0	
Feb-02	0.7				0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.2	
Mar-02	0.9					0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	2.2	
Apr-02	1.7						0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	3.2	
May-02	1.9							0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.8	0.0	2.7		
Jun-02	1.6								0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.3	0.0	1.8	
Jul-02	0.4									0.2	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	-0.2	0.1	0.0	-0.2	0.0	0.3	
Aug-02	0.5										-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.1	0.0	-0.1	0.0	0.3	
Sep-02	0.7											0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	0.9		
Oct-02	1.6												-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.1	0.1	-0.3	0.0	1.4		
Nov-02	1.5													0.1	-0.1	0.0	0.0	0.0	0.0	0.2	-0.1	0.0	-0.2	0.0	1.4		
Dec-02	1.8														-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	1.5		
Jan-03	1.0															0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.9	
Feb-03	0.7																0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.5	
Mar-03	0.1																	-0.1	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	-0.7	
Apr-03	0.4																		-0.1	0.1	0.0	0.0	-0.4	0.0	0.0		
May-03	0.5																				0.1	0.0	0.0	-0.1	0.0	0.5	
Jun-03	1.6																					-0.1	0.1	-0.1	0.0	1.5	
Jul-03	1.4																						0.1	-0.2	0.0	1.3	
Aug-03	1.8																							-0.4	0.0	1.4	
Sep-03	1.1																								0.1	1.2	

Table 18: Month on 3 month % change to RSI

Revisions to Estimates for Period	First Estimate																							Latest Estimate			
	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03		Nov-03		
Oct-01	1.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.5	
Nov-01	1.6		0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.9
Dec-01	1.3		-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.2	
Jan-02	0.9			0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	1.0	
Feb-02	0.7				0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	1.2	
Mar-02	0.9					0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	2.2	
Apr-02	1.7						0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	3.2	
May-02	1.9							0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.8	0.0	2.7		
Jun-02	1.6								0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.3	0.0	1.8		
Jul-02	0.4									0.2	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	-0.2	0.1	0.0	-0.2	0.0	0.3	
Aug-02	0.5										-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.1	0.0	-0.1	0.0	0.3	
Sep-02	0.7											0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	0.9		
Oct-02	1.6												-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	-0.1	0.1	-0.3	0.0	1.4		
Nov-02	1.5													0.1	-0.1	0.0	0.0	0.0	0.0	0.2	-0.1	0.0	-0.2	0.0	1.4		
Dec-02	1.8														-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	1.5		
Jan-03	1.0															0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.9	
Feb-03	0.7																0.1	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.5		
Mar-03	0.1																	-0.1	0.0	0.0	0.0	0.0	-0.7	0.0	-0.7		
Apr-03	0.4																		-0.1	0.1	0.0	0.0	-0.4	0.0	0.0		
May-03	0.5																				0.1	0.0	0.0	-0.1	0.0	0.5	
Jun-03	1.6																					-0.1	0.1	-0.1	0.0	1.5	
Jul-03	1.4																						0.1	-0.2	0.0	1.3	
Aug-03	1.8																							-0.4	0.0	1.4	
Sep-03	1.1																								0.1	1.2	

E. Revisions to Business Investment

157. Business Investment measures the fixed investment of businesses in assets, which are used for production. Both private and public corporations are included. All assets are covered except for land and existing buildings (which are existing assets being transferred to new owners) and dwellings (which are not used in production). Business investment was about two thirds of total gross fixed capital formation in 2002.

158. Business investment (and total GFCF) is a relatively volatile component of national accounts and is also relatively difficult to measure accurately. One key reason for this is that investment by individual businesses can be very lumpy. This makes it more difficult to assess the plausibility of information reported on inquiry forms. Large capital expenditure may be reported by smaller businesses in lightly sampled cells on the register, and decisions are needed on how to treat this when the inquiry results are grossed up to the population. Finally large expenditure may be undertaken by new businesses before they are trading normally and recorded on the ONS Business Register. These factors taken together result in a relatively volatile series, but they also make it likely that early inquiry results will understate the level of capital expenditure. This is allowed for when making estimates but is an additional area of uncertainty.

159. The volatility in the series also results in a high variance for the revisions. Akritidis (2003) gives the variance of the revisions to the expenditure components of GDP. Quarterly revisions to GFCF have the highest variance (2.987 percentage points), which contrasts with Household Final Consumption Expenditure – the largest component of GDP – which has a variance of 0.221 percentage points.

160. Most of the data for business investment comes from the quarterly capital expenditure inquiry (CAPEX). The inquiry covers production and non-production industries with roughly 32,000 forms sent out each quarter, with the sample size doubled about five years ago to increase accuracy.

161. The data are used to estimate quarterly business investment, the results of which are published in two first releases; *Provisional Results* are released just under two months after the end of the quarter and *Revised Results* just under three months after the end of the quarter. The *Provisional Results* First Release contains early estimates for the latest quarter, which are then subject to revisions in the *Revised Results*. Typically inquiry response rates might be around 50-60% for provisional results and 80% for revised results.

162. Volume estimates are produced using deflators based on a range of Producer Price Indices (PPIs), with adjustments taking account of the different prices for imported goods.

163. Revisions to the business investment dataset are made to time periods in line with the prevailing revisions policy for GDP. Reasons for revisions and their timing fall essentially into three categories.

164. **Quarterly** – Each quarter in the revised results release the inquiry results are updated to reflect new returns from contributors. These mainly affect revisions made at revised results stage but there can also be late and corrected returns from contributors after final results which will be used if they are significant. The GDP balancing processes allow the plausibility of inquiry results to be assessed against other components of the accounts including the estimates of the supply of capital goods. Balancing adjustments are often applied to the business investment series, because there is evidence that the early estimates of supply are more reliable than those of demand. These balancing adjustments can affect any of the quarters open for revision.

165. **Annually** – Each year an annual benchmarking process compares the quarterly data with results from the Annual Business Inquiry which has a larger sample size of approximately 70,000 businesses. Revised inquiry estimates are generated. This annual benchmarking process happens twice, once to in April against provisional ABI results and once against the final data. Thus by April 2004, the series will have been benchmarked to the final ABI results for 2001 and the provisional results for 2002. Deflator weights are also usually updated. Benchmarking is followed by annual current price supply use balancing which generates further adjustments and finalises the estimates for these two years, as part of a fully balanced set of accounts. The revised series will be published in the annual Blue Book.

166. **Periodically** – Other changes occur periodically. Many of these affect the deflation of the data – using rebased PPIs and full assessments of weights, lags and import adjustment factors. From time to time there are other methodological changes such as new industrial classifications, new approaches to measurement (e.g. computer software) and annual chain linking. Revisions to other components may also affect Business Investment through the supply use balancing process.

167. Over the period 1999Q1 to 2003Q3 the mean revision between Provisional and Revised releases was 0.40 percentage points, with an absolute mean revision of 1.74 percentage points. Over this period the average revision between the first and latest estimates is 0.65 percentage points, with an absolute mean of 1.73 percentage points. This suggests there is a downward bias in the provisional estimates, but this is too short a period to test whether the bias is statistically significant. A revisions analysis over a longer period will be included shortly in the Business Investment First Release (see ONS Annex 4 for more details).

F. Missing Trader Intra-Community Fraud

F1. Introduction

168. On 9th July 2003, the ONS published revised statistics for imports of goods to the UK from the rest of the EU that took into account for the first time adjustments for the impact of VAT missing trader intra-Community (MTIC) fraud. The revisions went back to 1999. The revisions to the series were made because this fraud impacts on trade statistics through the under-reporting of imports from EU countries.

169. Work by statisticians at ONS and Customs to quantify this under-reporting and ensure UK trade statistics are as accurate as possible, resulted in the revisions published in the UK *Trade First Release*. The revisions were explained in more detail in a separate briefing note, and in an article on the National Statistics website, also published on 9th July and later reprinted in *Economic Trends* (Caplan et al 2003). Finally, the reasons for the revisions, and the process of publishing them, were outlined in an open letter to Professor David Rhind, Chairman of the Statistics Commission (section F2)

170. The upward adjustments to imports amounted to £1.7 billion in 1999, £2.8 billion in 2000, £7.1 billion in 2001 and £11.1 billion in 2002. Therefore the deficit in the UK's balance of trade in goods was larger in those years than previously reported.

171. The published briefing note also acknowledged that these revisions would have an impact on the National Accounts estimates to be published on 30th September. A preliminary analysis was presented to users, which suggested that the impact would be negligible for 1999 and would reduce GDP growth by 0-0.2 per cent in both 2000 and 2001. However, it was noted that other revisions were planned for the 30th September release, and these were expected to offset these downward adjustments, leaving GDP broadly unchanged compared with earlier published estimates.

172. The revisions were published as soon as possible consistent with not creating uncertainty for these market sensitive statistics. To avoid such uncertainty, the article gave some quantitative indication of the effect on GDP and other revisions to be made on 30 September. The briefing note also highlighted the impact of other forthcoming revisions in the *Balance of Payments First Release* (also published on 30th September). It suggested that the revisions would improve the trade in services balance by around £1 billion to £2 billion a year, which would offset a significant proportion of the effect on the overall balance of the adjustments for MTIC fraud in 1999 and 2000, but only a small proportion in later years.

F2. Open Letter to Professor David Rhind

Professor David Rhind
Chairman
Statistics Commission
10 Great George Street
London SW1P 3AE

REVISIONS TO ESTIMATES OF UK FOREIGN TRADE

Dear David,

At 9:30 today the ONS published revisions to imports of goods in the July UK Foreign Trade First Release, a copy of which is attached. The revisions are exceptional in two key respects: their size, and the unusual nature of the cause (criminal activity). We believe they are the largest ever single revisions to the trade statistics. Moreover they have complex ramifications across a range of economic statistics, the Balance of Payments and National Accounts as well as the trade statistics themselves. This represents a unique combination of circumstances which posed considerable challenges. I am, therefore, writing to explain the background and handling. Throughout I have naturally and obviously been concerned to ensure that we proceeded consistently with the Code of Practice and relevant Protocols.

The revisions, which cover the period since 1999, are initial adjustments to reflect the impact on trade statistics of what is known as VAT Missing Trader Intra-Community (MTIC) fraud. Also published today is an article which explains the nature of the fraud, the way it has impacted on intra-EU trade statistics, the basis of the adjustments and their effects on the trade balance and the National Accounts, including GDP. A copy of the article and the associated News Release are attached.

The revisions are substantial, but they are necessary to remove previously unquantifiable weaknesses in the quality and coherence of the trade accounts and the National Accounts. For obvious reasons, measuring the extent of criminal activity is one of the hardest things statisticians have to contend with. The revisions are the result of a lot of hard work over a long period by statisticians in the ONS and Customs and Excise working together, supported by Customs policy officials.

In November 2001 an estimate of the tax loss due to MTIC VAT fraud was first published in a paper by Customs and Excise on Measuring Indirect Tax Fraud published with the Pre-Budget Report. At that time the possible implications for the trade statistics had not been identified. In spring 2002 it was established that the fraud did indeed have an impact on the trade statistics in the form of the under-recording of imports. At that stage, however, we had no method for estimating the impact on the trade statistics. The only estimates that could be made were for the tax loss in the form of wide ranges for financial year totals, implying a very wide range for the possible impact on imports. For trade, Balance of Payments and National Accounts statistics we needed point estimates, for individual months,

F Missing Trader Intra-Community Fraud

disaggregated by commodity and country of origin. This was quite a different matter. I judged at that time that in order to avoid creating uncertainty, we would not make any public comment until we were in a position to quantify the impact of the fraud on all the key statistics affected. The Protocol on Release Practices states that "for market sensitive statistics the process of release of revisions, must not itself create uncertainty". For the same reason I decided not to pre-announce our intention to make the revisions.

By early 2003 we had identified a possible method for estimating the impact of the fraud and in April actual estimates of sufficient quality were available. Given the magnitude of the sums involved, I regarded it as essential to ensure that the methodology, and resulting estimates were subjected to rigorous quality assurance. This involved not only assessing the methodology and estimates in their own right, but evaluating the estimates against other data as a coherence test. This latter process involved assessing the estimates in a wider National Accounts context. The estimates, published today, are still subject to uncertainty, but I am satisfied that they are fit for purpose.

As required by the Release Practices and Revisions Protocols, the revisions have been published as soon as possible consistent with not creating uncertainty for these market sensitive statistics. This latter consideration led me to decide not to publish estimates of the impact on imports without at the same time also giving some quantitative indication of the effect on GDP. Given the magnitudes involved, it was not possible to do that without drawing on the ONS's annual Supply and Use analysis which was not completed until towards the end of June. The Supply and Use analysis is an integral part of the production of each year's Blue Book estimates of national income and expenditure. The Supply and Use analysis looks at supply and demand of 123 products and is particularly useful in the present context as it meant we could analyse explicitly supply and demand for those products most prone to the fraud. We will not, however be able to incorporate the revisions into the National Accounts, until all the analysis undertaken for the Blue Book has been completed and the results published on 30 September. At that time other new information will also be incorporated. However I have attempted to minimise the uncertainty this would otherwise have caused by making available now an approximate estimate of the effect on GDP of the import revisions and by giving some guidance on the effect of other revisions to be made on 30 September.

Throughout this year the published estimates of GDP have been the best available at the time. One consequence of publishing the revisions as soon as possible is, however, that there will be a temporary inconsistency, until 30 September, between the published estimates for foreign trade and the published estimates for the National Accounts including the expenditure components of GDP.

As these revisions potentially impinge on government policy, Treasury ministers were informed at an early stage, consistent with the Protocol on Consultation with Ministers. In December 2002 Treasury ministers were alerted to the fact that the

fraud had a potential effect on the measurement of imports. This was followed up in January this year, by a confidential briefing by the ONS and Customs for a restricted number of officials from the Treasury, Department for Trade and Industry and the Bank of England. At that stage no estimates of the impact of the fraud on imports were available. On 25 February the ONS wrote to Customs about the quality assurance process, also including preliminary estimates of the MTIC fraud adjustment. This letter was copied to two Treasury officials on a personal and confidential basis. A copy was also sent to a Bank of England official for the Monetary Policy Committee. On 16 April, once estimates of the impact had been finalised and I had decided on the publication timetable, Treasury ministers were informed of the timetable and size of the revisions. They were advised that the revisions were market sensitive statistics, and that they should treat the information as strictly confidential and personal. On 2 July they were briefed on the ONS's assessment of the effect of the revisions on GDP.

Privileged early access to the revisions and supporting material has been strictly controlled. Annual estimates of the revisions were communicated to Treasury ministers on a confidential basis in April as just noted. The UK Trade First Release and other material published today were circulated to the list of ministers and named officials at 9.00 am on 7 July, eight hours earlier than usual. I decided that somewhat earlier access was appropriate given the exceptional nature of the revisions and the volume of additional material we were publishing. Two named officials at the Bank of England were added to the list at the request of the Governor so that the Monetary Policy Committee, which meets this week, could be fully briefed as soon as the First Release was published. In addition one Treasury official was added to the list. These additions were for one month only.

In view of the likely degree of public interest in these revisions, I am sending a copy of this letter to the Treasury Committee and making it available on the National Statistics website.

Len Cook

G. Responses to NIESR Questions

G1. International Studies

Do you have anything to add to the papers by Faust et al. and Statistics Sweden that provide international comparisons of statistical offices' revisions to GDP data?

G1.1 Overview

173. ONS welcomes the opportunity to comment on the two international studies of GDP revisions, Faust, Rogers and Wright (2000) and Öller and Hansson (2002). In particular, we feel that international comparisons of revisions performance are important for informing the domestic debate. However, we also feel that the common issues of revisions analysis may be exaggerated by the international dimension. For example, a relatively common trade-off is between timeliness and reliability. When a domestic revisions analysis is carried out, the National Statistics Institute responsible for the numbers knows when it improved the timeliness of its estimates, but this is often missed from international studies, either intentionally or through lack of detailed information. Similarly, different countries have made improvements to their national accounts at different times, so it is hard to find a sample period which will ensure that like is compared with like within countries as well as internationally.

G1.2 Faust, Rogers and Wright (2000)

G1.2.1 Summary of Findings

174. The paper covers revisions to the headline measure of GDP for the G7 economies, comparing quarterly growth published in the initial estimate with a "final" estimate, taken to be April 1999. The paper finds evidence that GDP revisions in the UK (along with Italy and Japan) are highly predictable, in that approximately half of the variance of revisions can be accounted for by information available at the time of the initial announcement. This effectively implies that the UK's revisions are biased, and the variable with the most power to predict the forthcoming revision is the preliminary measure of GDP itself.

175. The key results for what they describe as the augmented regression (i.e. attempting to include all data known to the statistics office at the time of estimation, e.g. oil prices, interest rates etc) and the descriptive statistics for the other 6 members of the G7 are shown in Table 19.

Table 19: Key augmented regression results from Faust et al

Indicator/Country	Canada	France	Germany*	Italy	Japan	UK	USA
Sample Period	65Q1– 97Q1	87Q4– 97Q1	79Q4– 97Q1	79Q4– 97Q1	70Q1– 97Q1	65Q1– 97Q1	65Q1– 97Q1
Descriptive Stats							
Mean revision	0.18	0.01	0.11	0.11	-0.07	0.27	0.10
Root mean square	0.81	0.36	0.97	0.85	0.83	1.14	0.53
Regression Results							
Preliminary coeff.	-0.46	-0.12	-0.45	-0.71	-0.44	-0.51	-0.08
T-stat for prelim	-6.27	-1.70	-3.68	-8.91	-7.48	-9.08	-0.94
Adjusted R ²	0.32	0.27	0.39	0.65	0.45	0.59	0.08

* German results should be treated with caution due to reunification.

176. The data comes from the OECD's monthly Main Economic Indicators Database. The initial estimate is defined as the first time the data for the quarter appears in the database, the final is the April 1999 edition. The sample period stops at the end of 1997 to ensure that all the data has had a reasonable chance to "mature". They acknowledge that no data is truly "final" since base year and methodological changes continue indefinitely.

177. The UK has the highest mean revision, but it also has one of the longest sample periods. Almost all of countries have significant t-statistics when the preliminary measure of GDP is used to forecast the subsequent revisions (excluding the USA and France). However, it is only for the UK and Italy that the adjusted R-squared is significantly large for the authors to claim that over half of the variance of revisions can be accounted for by information known at the time of the initial publication.

178. To try and remove the effect of the differing sample ranges across countries, the paper repeats its basic regression using a 40-quarter sample from 1988Q1 to 1997Q4. The results of this are shown in Table 20. These results are not directly comparable with the results in Table 19, since the additional factors such as oil price, stock returns and interest rates have not been incorporated in this regression.

Table 20: Reduced sample period results from Faust et al, 88Q1-97Q4

Indicator/Country	Canada	France	Germany*	Italy	Japan	UK	USA
Descriptive Stats							
Mean revision	0.01	-0.02	0.20	-0.01	0.05	0.22	0.02
Root mean square	0.34	0.34	1.08	0.52	0.80	0.73	0.33
Regression Results							
Preliminary coeff.	-0.09	-0.23	-0.61	-0.44	-0.38	-0.65	-0.12
T-stat for prelim	-1.24	-1.71	-4.18	-2.62	-3.59	-2.24	-1.01
Adjusted R ²	0.00	0.08	0.56	0.28	0.32	0.46	0.00

* German results should be treated with caution due to reunification.

179. This shows that the UK's mean revision has fallen, and although the regression result is still significant, the level of significance is reduced. From this the paper concludes that there is evidence of strong predictability of GDP revisions for Italy, Germany, Japan and the UK, and in the UK the initial estimates tend to be slightly pessimistic.

G1.2.2 Comments

180. We feel that the forecast efficiency methodology used by Faust et al (2000) is a very useful one for the study of revisions, and the ONS has recently published its own paper applying this methodology to our standard revisions dataset (Richardson, 2003).

181. One of the issues with revisions analysis is that by simply looking at the mean revision (commonly defined as the bias of a series), we ignore the issue that revisions to different quarters (or years if annual data) may cancel each other out. Hence it is possible to have a series with no bias, but which has large revisions in both directions. This prompted Öller and Hansson (2002) and Akritidis (2003) to also study the absolute mean revision (formerly known in ONS articles as the "mean of revisions regardless of sign"), and the variance.

182. A particular strength of the methodology used in Faust et al (2000) is that the F-test for forecast rationality encompasses a number of the descriptive statistics used in the ONS approach, such as variance of revisions (which is what the model tries to explain), absolute revisions (the issue of revisions cancelling out is less important in a time series framework) and mean reversion (by relating the revision to the initial growth rate).

183. The key result of Faust et al with regards to the UK is that revisions to quarterly growth are highly predictable, and the relationship is negative, a high initial estimate is likely to be revised downwards. They find this using both a long run sample of 1965 – 1997 and a shorter sample of 1988 – 1997.

184. ONS analysis has shown that revisions analysis are often dogged by the issue of sample dependency, i.e. the results are often highly dependent on the period chosen for analysis. Ideally, both start and end dates should be chosen objectively, and the period of study should be relevant to the production processes currently used by the statistical institute. Obviously, this complicates any international study, where the aim is often to compare results over the same period for different countries.

185. To maintain a rigid framework of production stages, recent ONS work has used 1993 for the start of the analyses, which was when the preliminary M1 estimate was introduced. This gives us an objectively set start date. As with Faust, the ONS acknowledges the need for the data to be allowed to mature for the revisions analysis to paint a consistent picture.

186. Faust et al (2000) use two samples, one which includes the longest run of data available for each country, and a shorter sample of 1988 – 1997. The relevancy of studying the revisions performance of the ONS in the 1960s is questionable, given the vast changes in data collection and production techniques that have occurred over the last 4 decades. However, this issue also affects Faust et al's shorter sample. The late 1980s saw a number of methodological changes. For example, in 1989 the Pickford review (Pickford (1989)) investigated the large discrepancies that had arisen between the three (supposedly equivalent) measures of GDP since 1986. This review led to a number of changes to the way in which the National Accounts are compiled, for example improvements in the monthly and quarterly collection of data. We do not believe that it is relevant to include revisions from older systems alongside revisions arising from our current practices.

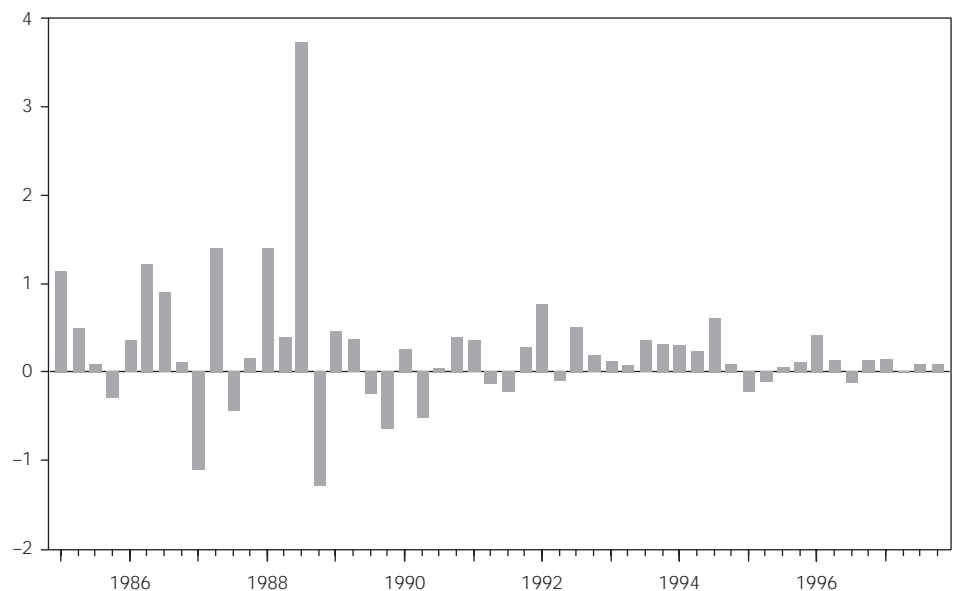
187. One way to study the impact of the choice of start dates on the UK result is to run a series of regressions, starting at different periods. Using the Faust et al dataset, Table 21 shows ONS calculated F-statistics for the basic forecast efficiency regression run on different sample periods for the UK, allowing the start date to vary but keeping the end date fixed at 1997Q4. The Faust regression of 1988Q1 to 1997Q4 is shown in bold.

Table 21: Various Regression samples – Faust et al model

Sample Period Start	F-statistic	Probability	Sample size (quarters)
1985Q1	23.01	0.0000	52
1986Q1	23.85	0.0000	48
1987Q1	22.37	0.0000	44
1988Q1	20.48	0.0000	40
1989Q1	5.42	0.0090	36
1990Q1	6.04	0.0063	32
1991Q1	6.79	0.0043	28
1992Q1	8.86	0.0015	24
1993Q1	5.32	0.0153	20
1994Q1	2.81	0.0943	16

188. As we can see, using a sample of 1988 – 1997 results in a vastly different F statistic when compared to a sample of 1989 – 1997. This is mainly due to a number of large revisions in 1988, as illustrated by Chart 5 below. A recursive residuals test illustrates a break in the Faust et al regression in 1990.

Chart 5: Total Revisions to GDP – 1985 – 1997



189. We believe that this highlights the issue of methodological improvements. ONS data shows that the substantial revisions to 1988 came from the 1989 Blue Book, and represent methodological improvements to the consistency of the accounts. This is a clear example of a trade-off between different aspects of quality, in the case of the revisions arising from the Pickford Review improvements were made to the consistency of the accounts, at the expense of larger revisions. Similarly, revisions arising from the adoption of ESA 1995 in the 1998 Blue Book improved the international comparability of the accounts, but again at the expense of revisions.

190. Another aspect is timeliness. Faust et al (2000) acknowledges that the UK is one of the fastest in the world to publish its preliminary estimate, and advises readers that they should bear this in mind when comparing the magnitudes of revisions. However, this aspect of quality does not feature in the regressions.

G1.3 Öller and Hansson (2002)

G1.3.1 Summary of Results

191. This paper is primarily a study of Swedish revisions to the national accounts. To put their revisions into a wider perspective, the authors carried out a voluntary survey of other National Statistics Offices GDP revisions, to which the ONS responded. Other respondents included Australia, Canada, Denmark, France, Germany and the USA. The study points out that revisions are not a measure of the quality of the outputs, simply a measure of how reliable the preliminary measure is, assuming the latest data is more accurate.

192. The revisions analysis concentrates on revisions to annual constant price data between the first and second annual publication for the period 1980 – 1998. Öller and Hansson (2002) comment that the revisions to all countries generally have an underestimation bias, with the revisions in smaller countries generally more skewed than those of larger countries. They also found that UK revisions (along with France, Germany, Netherlands, Norway and Sweden) are correlated with the cycle. Generally, the non-European countries showed less correlation. Both Finland and the USA comment that not accurately measuring births and deaths at turning points of the cycle could cause revisions in this fashion.

193. They note that the UK has moved from having one of the largest mean absolute revisions in the 1980s, to having the lowest of the countries in the study in the 1990s (Table 22). This fits with UK findings that revisions have decreased following various initiatives such as the Pickford Report (1989).

Table 22: Öller and Hansson (2002) – Key results for Absolute Revisions

	AUS	CAN	DEN	FIN	FRA	GER	NL	NOR	NZ	SWE	UK	USA	Total
M(ABS)	0,6	0,3	0,6	0,6	0,3	0,5	0,5	0,7	0,6	0,4	0,4	0,4	0,5
M(ABS) – 1980-1990	0,7	0,3	0,6	0,6	0,4	0,4	0,6	0,8	0,5	0,4	0,6	0,5	0,5
M(ABS) – 1990-1998	0,6	0,3	0,5	0,5	0,3	0,6	0,4	0,6	0,7	0,4	0,2	0,4	0,5

G1.3.2 Comments

194. Whilst Faust et al (2000) concentrated on a dataset compiled from OECD submissions, Öller and Hansson (2002) attempt to compile their dataset and meta-data direct from National Statistics Institutes. Arguably there are pitfalls in both approaches. Here the additional interaction with the Institutes has led to a more detailed study, but it is let down by a lack of information from some countries.

G Responses to NIESR Questions

195. The Swedish study looks at a restricted view of revisions, described as between T+1 and T+2 for annual data. In the UK T+1 equates to the first time the annual data is published (March for 1980 – 1992, and January for 1993 onwards), and T+2 is the third Blue Book. They comment that revisions do arise after T+2, but by ending the sample at T+2, they try to avoid, as much as possible, revisions that are due to changes in definitions or methods.

196. The main result is that the UK for 1980 – 1998 has one of the higher mean revisions, with an average of 0.3 percentage points, compared to an average of 0.2 for all countries. However, the UK's mean absolute revision is much lower. By dividing the sample into two decades, the paper also shows that the UK has moved from a group of countries with the largest $m(\text{ABS})$ in the 1980s (0.6) to the lowest value in the 1990s (0.2).

197. Our main comment on this paper echoes that made by the US Bureau of Economic Analysis, namely that the T+2 end point for revisions is in the middle of a three year data flow, and this is a relatively common phenomena across countries. It would be less of a issue if the data were consistent across the countries in the study. For the US, Canada, and Sweden the end point is T+2, but for the UK and the Netherlands, the end point is in fact T+3. This implies that the UK's revisions may be exaggerated relative to other countries, as the estimates in question have been open for revision for a longer period, and will have taken on more revised data.

198. As with the Faust et al paper, there is also an issue of timeliness. Two countries (UK and the Netherlands) show an improvement in the timeliness of publication, again it would be useful to know if this change led to higher revisions or not.

G1.4 Conclusion

199. International revisions studies are important, and enable individual NSIs to compare their performance with their peers. However, as we have illustrated, revisions studies are complex and often rely in detailed knowledge of the underlying data. This complicates attempts to make studies truly comparable across countries. One way forward may be for an international body, such as the OECD, to take the lead on this issue.

G2. User liaison on revisions

How do you keep users informed about revision procedures? Do you raise the issue face-to-face with Bank of England/HMT/any other users (which?) or in open meetings? Have you interacted with the RSS on it recently?

200. ONS uses a number of mechanisms to inform key users about forthcoming revisions and process. When doing so it is bound by the *Protocol on Release Practices* and the *Protocol on Consultation Arrangements between the National Statistician and UK Government Ministers*. These determine what information can be released about revisions and when (see G.3).

201. Major methodological changes are explained in advance at seminars and through articles in Economic Trends.

202. For National Accounts, there is a formal quarterly meeting with Bank and Treasury which can cover revisions issues. These meetings take place a few days after the month 3 release. Bank and Treasury give notice of questions about the published data. The meeting addresses these, considers the general progress with the round just finished and looks forward to the next quarterly round. Revisions issues may also be raised at the high level liaison meetings, which occur at least once a year under the Service Level Agreements ONS has with the Treasury and Bank.

203. Other fora where revisions are discussed with users include:

- National Accounts User Group meetings on month 3 release days (and sometimes other days) – Treasury and Bank are members and usually attend. The release day meeting comprises presentations about the data plus question and answer sessions.
- Balance of Payments User Group. The meetings follow the quarterly release, and also cover anything of interest going on in the BoP world. Revisions policies, procedures, analyses, etc are certainly included.
- Public Sector Data Quality Group. This meets approximately quarterly and involves ONS and HMT.
- Public Sector Finance meetings which are monthly and part of the production process of the joint ONS/HMT First Release.
- 6 monthly Bank/ONS work programme meetings are held to discuss ongoing developments.
- Index of Services Steering Group. This meets twice a year and includes representatives from the Bank, Treasury and DTI.
- Annual Business Inquiry User Group. When the ABI was introduced the methodology and revisions were shared with an interdepartmental user group. Among the members of the user group are attendees from Bank, Treasury, DTI and DWP.
- New Earnings Survey User Group. Current changes that are being introduced to the survey are being shared through the user group. This has representation from Bank, Treasury, DTI, DWP, Inland Revenue and other government departments.
- Average Earnings Index Advisory Group meets regularly and has been involved in all major changes to the index. It plays a major role in quality assurance of new indicators. Members come from the Bank, Treasury, DTI and DWP.

G Responses to NIESR Questions

204. Above are given some of the more formal channels for dialogue. However, there is also virtually continuous informal communication with users, especially the Bank and HMT. These contacts intensify around the time of publication of First releases.

205. We brief a wider range of users in the regular presentations associated with the release of the quarterly national accounts. Also journalists are routinely updated on what is happening.

206. Formal involvement with the RSS recently has revolved around the Code of Practice and the associated protocols. In particular, they submitted a formal response to the consultation on the Protocol on Revisions. ONS staff also attend RSS seminars. There have, however, been no recent contacts with the RSS about revisions.

G3. Contact with policy users

Do users of your data contact you in advance of drawing up their, say, policy to seek advice about the size and nature of likely revisions? We are concerned about revisions to regional as well as national data. In particular we need to know whether anyone in ONS was consulted before it was agreed to make EU regional support available to regions whose GDP per capita was less than 75% of the EU average.

G3.1 Overview

207. The process for giving advice to users, including policy-makers, about likely revisions is governed by the National Statistics Code of Practice and Protocols, in particular the Protocols on Release Practices and Revisions. Although the Protocols were only issued relatively recently, many of the practices laid down in them are longstanding. Users are fully familiar with them and this affects the guidance they seek in advance about likely revisions. The answer to this question also needs to be seen in the context of the almost continuous contact between the ONS and Treasury and Bank on the latest data and issues arising (see also the answer to G.2).

208. Key provisions in the Release Practices Protocol are that:

- statistics will be released as soon as practicable once they ... are judged fit for purpose;
- National Statistics should be made equally available to all, at the same time;
- planned methodology changes will be notified at least one release period earlier.
- For all recurring releases, back data will be released at least by the time of the release containing the change itself.

209. The effect of the Protocols is that in general users do not get, and do not expect to get, advice in advance about the vast majority of specific revisions, i.e. those due to the receipt of fuller information. (Indeed given the requirement to publish statistics as soon as practicable once they have been deemed fit for purpose, the ONS itself does not get much advance notice.) However, it is common practice when preliminary estimates are published to advise users that data are likely to be revised on receipt of later information. On occasion warnings are given about particular factors increasing the risk of revision, for example the introduction of a new Customs and Excise computer system.

210. There are, however, a number of exceptions and qualifications to the situation described above, and the position in respect of revisions due to methodological changes is different.

211. The exceptions relate to the provision of information to key policy-makers in the Treasury and Bank of England:

- under the Release Practices Protocol the responsible ministers and a limited number of officials get privileged early access, 40.5 hours for market sensitive statistics; this applies to all relevant First Releases whether or not there are revisions; and while privileged early access is so that ministers “can respond completely when questions arise at the time of release”, it also allows them to take account of any policy implications;
- this early access is also given to the Governor of the Bank of England, who, with the agreement of the National Statistician, may extend it to members of the Monetary Policy Committee and officials advising it when the Committee is meeting to decide the appropriate level of interest rates;
- exceptional arrangements are also made for the Budget; once the date of the Pre-Budget Report or Budget itself is announced, the publication timetable for releases is re-examined and early access to certain data may be given to a limited number of Treasury officials;
- finally the Protocol on Consultation with Ministers says that, when potential changes impinge on policy the National Statistician should consult ministers at “an early stage” and “should indicate, where possible, the impact on published series ... well before any changes are implemented”. This provision was invoked in the case of revisions to imports due to VAT fraud.

212. Rather more guidance is possible in the case of methodological changes. Major methodological changes are always fully explained in advance through seminars and articles. During 2003 there were for example extensive discussions between the ONS, Treasury and Bank on the introduction of annual chainlinking in the National Accounts, the effect of VAT fraud on imports and methodological changes to retail sales. Where possible some indication is given about the sign and the magnitude of the changes. Once available, revised back data on the new methodology is always pre-released.

G Responses to NIESR Questions

213. The other source of guidance on likely revisions is from analysis of past revisions. ONS publishes articles analysing revisions to GDP and its expenditure components on a regular basis. Such analyses cover revisions from all sources. It is planned to extend this practice by including details of past revisions in all ONS First Releases of economic time series by the middle of 2004.

214. As a result of this body of material key users are aware that revisions are a natural part of the statistical process. For example the Bank of England stated in its August 2003 Inflation Report that *"the MPC takes account of the likelihood that GDP data will be revised when deciding how much weight to put on the latest data"*.

215. In the past the Treasury and ONS have agreed performance targets for revisions to key economic statistics. Initially these were drawn up in 1991 as part of the targets by which ONS's performance as a Next Steps Agency was monitored. The revisions targets were later subsumed into the Service Level Agreement between the ONS and Treasury agreed in 1998. The targets are, however, no longer operative as it was agreed that the need for them had been overtaken by the National Statistics Code of Practice and Protocols, particularly the Protocol on Revisions which sets out procedures by which revisions are communicated. There was also concern that the targets might have perverse incentive effects for ONS.

216. To sum up, users do not seek advance advice on normal revisions, i.e. those due to later information. This is neither practical nor consistent with the National Statistics Code of Practice. On the other hand there is an active dialogue on revisions expected as a result of planned methodological changes.

G3.2 Regional Support

G3.2.1 Background

217. European regional aid is primarily provided through the Structural Funds. Objective 1 of the Structural Funds provides the highest level of funding, to assist regions "lagging behind". For this purpose, regions are defined as NUTS level 2 areas (Nomenclature of Units for Territorial Statistics, with 37 level 2 areas in the UK, equivalent to individual or groups of English counties, Scottish and Welsh unitary authorities, and the whole of Northern Ireland). If the GDP per head of a NUTS 2 area is below 75 per cent of the EU average, then that region qualifies for Objective 1 status and funding. This criteria, which is included in the Structural Funds regulation, has been used since 1988, and was the main motivation for first compiling regional accounts.

218. Objective 2 of the Structural Funds uses a wider range of indicators, at lower levels of geography, to determine eligibility. There is also more discretion for the Member States to select from the range of agreed indicators and draw their own maps of eligible areas, which then have to be agreed with the Commission. Objective 3 does not have a specific regional focus – it is aimed at cross-cutting initiatives such as training and skills development, which can have a regional impact, but the targeting is not done by area.

G3.2.2 Current and recent Structural Funds periods

219. The current Structural Funds programme runs from 2000 to 2006. Objective 1 decisions were taken based on GDP data relating to 1994 to 1996 (a three year average), using the data available at the time of the Berlin summit in March 1999. The UK data used at NUTS level 2 and 3 were those published in October 1998, based on the newly-agreed NUTS structure for the UK. The areas currently eligible for Objective 1 funding are Merseyside, South Yorkshire, West Wales and the Valleys, and Cornwall. Highlands and Islands and Northern Ireland were above the 75 per cent threshold, and were granted transitional or special status with funding levels equivalent to full status until 2005.

220. The preceding funding period ran from 1994 to 1999, during which Merseyside, Highlands and Islands and Northern Ireland qualified. The latter was above the threshold but was granted special status. In fact, as a result of the negotiations that took place, all NUTS 2 regions with GDP per head between 75 and 80 per cent of the EU average were granted funding during this period as "special cases".

G3.2.3 ONS (and previously CSO) involvement in Structural Funds processes

221. DTI are the lead department for Structural Funds policy. During the late 1980's and early 1990's, the CSO provided statistical support to the DTI. However, the 75 per cent cut-off level was ultimately decided by the Council of Ministers, comprising ministers of all Member States and the Commission.

222. During the mid-1990's, the DTI's statistical capacity was increased, and CSO/ONS statisticians have worked alongside DTI statisticians in providing the support for policy colleagues. This has included both the statistics, and the drawing-up of an entirely new NUTS structure for the UK, following the re-organisation of UK local government in the mid-1990's.

G3.2.4 ONS advice on statistical measures for EU regional policy

223. The ONS has consistently taken the following lines on use of the GDP per head criteria for Objective 1, based on conceptual and quality reasons:

224. A single year's data at NUTS2 level can fluctuate significantly, hence we have supported using at least a three year average, rather than a single year's data.

225. Eurostat used to publish the indices for GDP per head with two decimal places (i.e. 74.54). The UK line has been that this implied spurious accuracy, and we persuaded Eurostat to only publish whole numbers (75 in the above case). This policy reflected concerns regarding variability, accuracy and possibility of revisions, but also recognised the need to have some cut-off for the particular policy purpose.

226. We have raised concerns about the various reasons for revisions to regional data at the EU level. These include the domestic and international causes. Domestic

G Responses to NIESR Questions

causes include revisions to National Accounts or sources such as the ABI and Inland Revenue data, which can lead to regional data being revised as regional accounts are calibrated to the national totals. International changes at the EU level, include revisions to the Purchasing Power Parities (PPPs) used to make regions comparable. Eurostat apply national PPP factors to all the regions within a country, and revisions to PPPs can shift all of the regions of a country by an amount bigger than any domestic factor. Eurostat have been considering compilation of regional PPPs, but this is not being given priority at the moment.

227. GDP per head has been used as a proxy for regional incomes due to the absence of an alternative regional indicator that is available across the EU. However, it has a number of deficiencies in use for this purpose (see below).

228. GDP is a measure of economic activity in an area, and is conceptually a workplace-based measure. However, the denominator for GDP per head is residence-based, and distorts the results. For example, GDP per head for Inner London is the highest in the EU, but a large component of the GDP is generated by labour that commutes into Inner London.

229. When looking at issues surrounding productivity, the measure that should be used is GDP per full time equivalent, or per hour worked. If the policy focus is on the welfare of residents of a region, then the fully residence-based measure of Household Disposable Income per head should be used. This position was endorsed by a Eurostat Regional GDP Task Force in 2001. The Task Force was led by ONS and involved five other member states. The conclusions were then also endorsed by the full Eurostat Regional Statistics Working Party, but the Commission decided not to consider any change to the 75% GDP criteria until the negotiations for the next round of Structural Funds are complete.

230. We have stressed that for fully examining the situation of a region, it may be appropriate to look at a combination of the above two measures, along with other information such as on employment, unemployment, industrial structure, etc.

G3.2.5 Summary

231. We should like to stress that these are Eurostat estimates. They take each country's GDP figures and standardise them (e.g. using PPPs). However, ONS and DTI work closely to ensure that the estimates are fit for purpose. Generally, the ONS has been proactive in the Structural Funds decision-making process, and has played a leading part in the Eurostat Regional Statistics Working Party, which is the main forum for discussing the statistical requirements for Structural Funds. DG REGIO, the Commission directorate responsible for EU regional policy, regularly attends the Working Party meetings, and the ONS have used the forum to promote statistical advice along the lines described above, as well as developing the technical methods for Regional Accounts and other statistics.

G4. Historical use of bias corrections

We understand from you that there used to be bias corrections present in early estimates of GDP. Is this still the case? If not when and why were they dropped?

232. Bias adjustments have only ever been included in the Index of Manufacturing (IoM), never in the early estimates of GDP. The circumstances surrounding the use of the bias adjustment pre-dates the introduction of the preliminary estimate of GDP in 1993 by several years.

233. It is worth considering the data collection system then in place for the IoM. In the mid-1980s we had a system of monthly inquiries which were statutory for engineering firms (and voluntary for non-engineering ones) that were effectively panels, and these were rarely updated. These monthly estimates were benchmarked with quarterly data from the Quarterly Sales Inquiry (now PRODCOM). The panel inquiries did not include new and growing companies since there was no regular updating, and this led to bias with persistent upward revisions, which was highlighted by a revisions analysis of the Index of Manufacturing Output which revealed that estimates from 1983 onwards had been consistently revised upwards.

234. In January 1985 bias adjustments were introduced to the monthly estimates on the basis of historical revision performance. These adjustments were to be withdrawn on a prescribed timetable as later information became available. It was stressed that this was only a temporary measure until the cause of the bias was identified.

235. However, bias adjustments continued to be used, right up until the publication of the Pickford Review in 1989. After 1986, the adjustment was based on the difference between growth in the unadjusted index of manufacturing and the growth of the CBI expectations figures. A six month retirement programme was used to phase out the adjustment as new information became available. It was assumed that the 3-month growth rate of the Index of Manufacturing was equal to the provisional estimate, plus a bias adjustment, proportional to the difference between CBI expectations growth and the provisional growth rate.

236. An analysis of revisions between January 1985 and November 1987 showed that the mean revision of the unadjusted series was 0.53, while the mean revision of the bias adjusted series was 0.16. However, it should be stressed that individual quarters still showed large revisions, and that the range of revisions was not reduced by the adjustment.

237. As a result of the Pickford Review (Pickford, 1989), the sample of the monthly survey used for the Index of Production (and Manufacturing) was increased and the sample design improved, so that the monthly sample was dynamically drawn from the register. The bias adjustment was dropped at this time as it was no longer necessary, and subsequent revisions analyses confirmed that first results from the improved system were not biased, (e.g. Barklem (2000) for IoP bias over 1988-1998).

G5. Methodological improvements in ONS

What procedures are in place to identify when and where methodological improvement is required; what mechanisms do you use to allocate resources to meet these needs?

G5.1 Overview

238. For simplicity, this note concentrates primarily on methodology improvements to the National Accounts. There are four main drivers of methodological improvements for the National Accounts. Informally, individual compilers are responsible for improving the quality of their published series. On a more formal basis, the Statistical Modernisation Programme (SMP) encompasses a number of re-engineering programmes (National Accounts, Labour Market, Prices etc). Thirdly there is the National Statistics Quality Review (NSQR) series, and fourthly there are external requirements from international bodies such as Eurostat.

G5.2 The role of statisticians and the Blue Book process

239. Within the National Accounts Group (NAG), the key driver of methodology changes to individual series is the statisticians responsible for the series. Informal revisions analyses and more formal analyses of quality adjustments to data are often used to highlight the need for methodology improvements. Ideally all statistics would be subject to formal revisions review for these purposes, but we are still in the process of building up the required analytical capacity, and the standardised systems to be able to carry out the work (see Section G5.3 on National Accounts re-engineering).

240. Currently, before large methodology revisions to the Accounts can be incorporated into the next Blue Book, they must be approved by the Blue Book Project Board. The guidelines for submitting a methodology change are as follows:

- All methodological changes must be put through a Peer Group Appraisal (PGA), even if they apply to an open revision period; this includes changes for the quarterly as well as the annual round.
- Compilers wishing to conduct a PGA should contact the Blue Book project co-ordinator who will organise and publicise the event.
- Papers, to be presented at the meeting, should be circulated at least a week in advance by the Blue Book project co-ordinator.
- Papers should include the following issues – methodology, scale of changes, interest from outside ONS, implementation including effect on systems and other compilers and a future timetable of data updates.
- The meeting should be attended by the core peer group appraisal board of lead National Accounts statisticians and any interested parties, particularly other

compilers who need to implement the change, reflecting the nature of the National Accounts as a system.

- Recommendations will be presented to the Blue Book Project Board or the quarterly preview meeting.
- Changes of less than £100m annually need to be documented but do not need to go through a peer group appraisal

241. Revisions the Blue Book open revisions period must be submitted to the Revisions Task Force (also run by the Blue Book project team) as well as a standard PGA. Compilers need to justify the need to make such revisions. The Revisions Task Force is made up of a similar core board as the peer group appraisal to ensure consistency. The role of the RTF is to:

- investigate all revisions outside the open revisions period.
- not examine methodology except to check there have been no changes since the PGA.
- check the actions have been followed up from the PGA.
- check the implementation process more thoroughly, including a sign off sheet that compilers are able to take on change.
- examine the economic significance of revisions to the aggregate data.

242. One overarching criteria is that trivial revisions that are judged to add to work without good reason will not be accepted. The criteria for considering revisions are grouped into the following headings:

243. Economic significance

- What is the size of revisions in terms of final product?
- how far back implementation should go?
- The economic picture of the data should not change without good reason.

244. Interest from outside

- Has there been consultation with users?
- Have we promised (with documentary evidence) to implement the change?

245. Impact on Systems

- Statisticians need to state any system changes required to implement their change on central system or local systems.

G Responses to NIESR Questions

246. Effect on other compilers

- The board needs a list of compilers affected by the change and a sign off sheet completed by other compilers to ensure they can take on the change.
- The compiler responsible must also list steps and timetable to implementation, showing what happens if there are delays to the timetable.
- Ideally, a test version of systems should be run showing effects on other compilers.

247. Methodological review

- Compilers should request a PGA for methodological changes prior to the Revisions Task Force.
- Where a PGA has been completed, actions should be followed up.

248. Timetable

- A crucial element of the taskforce is to ensure that compilers are able to deliver the changes within the agreed Blue Book timetable.
- Compilers need to be able to provide indication of the data at the taskforce, and demonstrate ease of continuing to obtain data.
- The taskforce also needs a reassurance that quarterly data is also available.

G5.3 Statistical Modernisation and National Accounts Re-engineering

G5.3.1 The Statistical Modernisation Programme

249. The Statistical Modernisation Programme (SMP) will update ONS systems – both technical and statistical – to provide a fully modern infrastructure to deliver the full range of outputs for which ONS is responsible. This will be achieved by relocating systems into a robust and enduring shared technical environment, supported by an agreed set of common statistical tools and methods. The SMP is the largest element in ONS' wider Modernisation Programme, which includes other elements such as the modernisation of Human Resource systems and Civil Registration.

250. ONS was formed as a merger of three organisations in 1996 – the Central Statistics Office, Office for Population and Census Statistics and part of the Department of Employment. As such, ONS inherited a wide range of legacy systems, both IT platforms and different statistical practices. In the same decade, ONS made strenuous efforts to increase the range of its statistics and analysis, perhaps with hindsight neglecting to make sufficient investment in the infrastructure to support such products.

251. In the last couple of years, ONS' strategy under Len Cook has been clearly directed towards the renewal of the underlying systems used to produce ONS

statistics. This was recognised in ONS being allocated substantial additional monies in the 2002 Spending Review specifically for this purpose. Even before this allocation was approved (July 2002), ONS had been making headway with initial preparation for modernisation, but the SR 2002 monies permit this to be carried through properly.

252. The overall aim of the SMP is to improve the quality and timeliness of, and access to, the key statistical systems managed by ONS, rendering them better suited to the purpose for which they are intended, whilst increasing the efficiency with which they are produced. The purpose is to create a more robust and comprehensive body of statistical evidence to better meet the needs of Government and inform public policy development and decision-making.

253. This will be achieved by putting systems into a common environment using a standard set of common statistical tools and methods. In some cases, this involves in addition the redesign (“re-engineering”) of the statistical systems to ensure that the quality, accessibility and efficiency benefits are optimised. This overall goal is enshrined in a number of more specific Service Delivery Agreement targets for ONS.

254. The Statistical Modernisation Programme is a complex programme consisting of a number of linked and inter-dependent projects. The Core Foundation Projects are a set of projects will establish a standard technical infrastructure, based on:

255. A common ONS-wide data repository (CORD) – This entails a single unified database containing all ONS data, both microdata and aggregate information. In turn, this will be controlled and governed via data management policies and also observing the utmost care in relation to confidentiality and security.

256. A comprehensive metadata system – In essence, these are the words and descriptions that accompany data through its lifetime. This is both true at the beginning of the process when data are captured from businesses or households, through to the end of the process when data are published in aggregate form on the web. Clearly the external user will benefit mainly from the latter.

257. Statistical Infrastructure Projects (SIPs) – This is a series of projects to establish common statistical tools to be used wherever possible across ONS. Examples are editing and imputation, estimation, coding tools, disclosure and confidentiality, tabulation and time series manipulation. For example, ONS has already decided that it will use SuperCROSS as its standard tabulation package and will use GES as its standard estimation tool across all business and household surveys.

258. Web dissemination – ONS has already become largely a web-based organisation in terms of its outputs. This project will drive the process much further, for example using a standard content management system in preparing data for web publication.

259. In addition to this, a number of key ONS systems will be re-engineered as they migrate to the new environment. That is to say, all the business processes in the

G Responses to NIESR Questions

construction of these statistics will be reviewed and processing and methodological changes made to optimise efficiency and quality of the outputs. These include four projects where work is already underway:

- National Accounts
- Prices
- Labour Market Statistics
- Population estimates and projections

260. In addition, the re-engineering of other areas is currently under consideration including the Life Events and Inter Departmental Business Register systems.

261. Whilst a number of key systems will be re-engineered, most ONS systems will need to migrate to the new environment without major statistical/methodological changes. A key work-stream therefore is to plan the migration and parallel running of the many such systems, ensuring continuity.

G5.3.2 National Accounts Re-engineering

262. As stated, the National Accounts is currently undergoing a re-engineering programme. Given their importance both domestically and internationally, the National Accounts are one of ONS's most important and most prominent product. However, the systems, methods and processes that support their production have evolved over time in a non-systematic, often non-standard way, leading to:

- over-complicated, poorly documented, time-consuming systems
- non-standard processes that involve a significant amount of manual intervention
- data flows that lack structure and introduce errors and inconsistencies into the accounts
- methods based on out-of-date assumptions
- methodological developments that are often ad hoc, and lacking an holistic view
- heavy reliance on small numbers of experienced staff
- little capacity or functionality to allow proper analysis and understanding of the outputs
- significant business risks to ONS.

263. The Re-engineering programme, in its planning stage, has also endeavoured to take into account the concerns of users, for example:

- on completeness, the absence of some accounts, in particular the quarterly production and generation of income accounts;

- on accuracy, the suggestion of bias in early estimates;
- on coherence, imbalances in sector and financial accounts;
- on clarity, the lack of transparency and documentation for some methods and the subjective nature of some approaches, including annual balancing;
- on data efficiency, the perception that the quarterly process does not make full use of data, or that data sources are not strong enough for the purposes for which they are used;
- on reliability, the revisions to historical data.

264. Through a re-engineering of the methods, processes, data flows and systems used in the production of the Accounts, this programme of change is intended to strengthen and improve the National Accounts and to reduce the current excessive pressures and stress placed on staff. These changes will improve the quality and reliability of the National Accounts, significantly reduce the risks, and strengthen the reputation of the ONS. They will also ensure that National Accounts are fully able to take on the benefits arising from the wider Statistical Modernisation Programme.

265. More detail on National Accounts re-engineering will be provided in a forthcoming Economic Trends article in January 2004, which will inform users of the scope and principles of the review, the initial recommendations, potential causes for revisions, how revisions will be managed, and future communication plans which users are asked to comment on.

G5.4 The National Statistics Quality Review Programme

266. The over-arching methodological review programme for the ONS is the ongoing National Statistics Quality Review programme. The White Paper "Building Trust in Statistics" sets out the framework for quality assuring National Statistics. A key component of the framework is:

"a programme of thorough reviews of key outputs, at least every five years, with the involvement of methodologists and outside expertise, as appropriate";

267. This programme of Quality Reviews is an important way of ensuring that National Statistics and other official statistics are fit for purpose and that we are continuing to improve the quality and value of these outputs.

268. The Programme was introduced in early 2000, and by the end of March 2003 nineteen reviews have been published on the ONS website, covering a wide range of subject areas. The National Statistics programme is structured into 12 themes. Each theme is managed by a Theme Working Group (TWG) which, as one of its tasks, is responsible for developing and maintaining the schedule of reviews to cover the theme's main outputs within the five year period.

G Responses to NIESR Questions

269. A Quality and Methodology Programme Board has been established and is responsible for co-ordinating the development and maintenance of the programme. The Board have issued guidance and aim to ensure that each review addresses the following questions:

- What are there users' needs of the output?
- Do the outputs meet users' needs and are they of adequate quality?

270. In addressing the latter point reviews consider the various attributes of quality, for example; relevance, accuracy, timeliness, accessibility and coherence. In particular they consider:

- Are the methodologies used appropriate and in line with best practice?
- Are the inputs required appropriate and fit for this set of purposes, and is the burden on data suppliers justified?
- Are there aspects of cost effectiveness that can be improved?
- Can the information available to users on quality be improved?

271. Each review is run using effective quality assurance, planning and project structures and tools. The members of the team carrying out each review are recruited from the Department responsible for the output, users (both from within government and external as appropriate) and external experts as appropriate. All of the results of the reviews and the implementation plans are posted on the ONS website. Progress against the recommendations is also published on the website.

272. For information, short summaries of the Short-term Output Indicators Review and the Labour Force Survey Review can be found in ONS Annexes 2 and 3 respectively. A Review of Employment and Jobs Statistics is in progress.

G5.5 External requirements

273. Methodology changes to the National Accounts over the last several years have often been driven by the need to ensure the accounts are consistent with the European System of Accounts (1995 edition, consistent with UN System of National Accounts, 1993 edition). This resulted in a large number of methodological changes in the 1998, 2001 and 2003 Blue Books. Changes driven by the ESA (95) programme include the adoption of annual chain linking (BB 2003), the removal of off-shore territories from the accounts (BB 1998), and the introduction of black-economy measures for exhaustiveness (BB 1998 and BB 2001).

274. Looking to the future, methodological changes are likely to arise from the adoption of the International Standard Industrial Classification (2007 edition), and the 2008 revision of the UN System of National Accounts.

G6. Externally provided forecasts

We understand that some inputs into early estimates of GDP are provided by other Government Departments. What procedures does ONS have for quality control of this work?

G6.1 Overview

275. ONS expects Other Government Departments (OGDs) to quality assure the data they provide and to provide appropriate briefing. The series supplied to ONS are also quality assured by the ONS recipient of the data. Where more than one National Accounts team within ONS uses data from a particular Division of another Government Department, one branch within ONS acts as a gateway for the OGD's data, and takes responsibility for quality assuring the data received and for querying data with the OGD. Where data from an OGD are used by only one National Accounts branch, that branch liaises directly with the particular Division of the OGD.

276. It is the intention of ONS to set out standards for timeliness and quality of data in Service Level Agreements between ONS and the OGDs. In some instances there is one SLA between ONS and an OGD (e.g. with Department of Transport), but in other cases the Agreement is with a particular Division of the OGD (e.g. there is one SLA between ONS and the Agricultural statistics Division of DEFRA which is based in York. This agreement does not cover data provided separately by the London based Fishing Division of DEFRA). ONS is taking steps to ensure that all data provided by OGDs are covered by up to date SLAs.

277. The first (Preliminary) estimate of GDP is compiled using the output measure only. This uses a wide range of data sources including data from OGDs. A large proportion of these data are first delivered to an ONS "gateway" branch where they are quality assured, e.g. Health data from Department of Health is provided to the National Accounts Government branch. Additionally, for all data used within GDPO, analysis tools are used to scrutinise the growth rates and revisions of the published level series and to drill down to lower level data to assess the impact of individual component series. Additionally tables are produced showing the growth rates and revisions to GDPO data at the 4 digit level. There are also systems that present graphs of the current price series and deflators at the 4 digit level and higher. Where this scrutiny of the data reveals unexpected growth rates or revisions to data from OGDs, these are queried with the OGDs either directly or via the ONS "gateway" branch. In this way a detailed examination of the impact of data from OGDs on the preliminary GDP estimate can be carried out and, where necessary, these data can be challenged or qualified.

G6.2 Departmental Agreements

278. HM Treasury provide information on a monthly, quarterly and annual basis for use in the public finances and the national accounts under the terms of an SLA (Service Level Agreement on data on public expenditure and the public finances

G Responses to NIESR Questions

between HM Treasury and the Office for National Statistics). The data provided is rather different to that based on sample inquiries as most of it is generated from departmental accounting systems and should therefore be complete and comprehensive. Nevertheless it isn't always accurate, particularly in the early deliveries, as expenditure (or income) may have been misreported under the wrong codes or recording may have been delayed. ONS carefully scrutinises the data on receipt and queries large movements or revisions. There is then a dialogue with the Treasury to test the robustness of the data and the reasons for such movements. Revisions are made as necessary, sometimes after the data has been further queried with the Department concerned. ONS also test the integrity of the data by putting it through the national accounts system to check whether accounting identities are satisfied, or nearly so. The SLA includes some quality requirements mostly in terms of the size of revisions which are acceptable.

279. Inland Revenue provide information under the terms of a "Firm Agreement". This takes the form of an over-arching top level agreement with 17 mini agreements underneath it, each supporting a particular set of supplies between an Inland Revenue supplier and ONS customer or vice versa. The most frequent and timely data relate to tax receipts and benefit payments which are supplied quarterly and monthly for use in the public finances and national accounts. Annual information is mostly generated from tax systems after returns have been processed. The Firm Agreement specifies timetables and quality standards which are mostly expressed in terms of acceptable revisions. On receipt the data is scrutinised for plausibility, looking at growth rates and revisions, and challenged where necessary. Much of the annual data is compared with alternative data sources including labour market statistics and the ONS profit inquiry. Its plausibility is also checked in ONS's supply use balancing framework. Recently some of the data on wages and salaries has been implausible and it is now being corrected following the identification of errors. Correction of the errors is putting Inland Revenue in breach of part of the Firm Agreement.

280. The Bank of England provides data through a gateway branch. This branch is responsible for the receipt and validation of all deliveries to ONS of banking data collected by the Bank of England. We have a Firm Agreement with the Bank which specifies delivery timetables, format and content, briefing, the querying and response process and targets for many series. If necessary we have a quarterly meeting with them to review all the data, but usually day to day communication is sufficient. We also have a job shadowing arrangement each quarter so that both sides can get experience of, and understand better, the work done by the other institution. The Bank have recently implemented a new processing, analysis and delivery system which has improved the quality and reliability significantly.

281. Data from HM Customs & Excise is managed through a branch which compiles and publishes the UK Trade in Goods statistics. These are used throughout the national accounts. The branch is the gateway for the detailed merchandise trade data collected by, and received, from HM Customs & Excise. We have a Service

Level Agreement with them specifying the checks and validation they do, delivery timetables, content and format, and the process for dealing with queries. We have detailed operating procedures and checking processes on receipt of the data each month. These are audited regularly.

G7. MTIC Fraud

The letter from the National Statistician to the chairman of the Statistics Commission (9 July) [see section E2] indicates that the ONS did provide early indications of the potential unreliability of the import data to selected users (e.g. HMT/BoE), even in the absence of a quantitative indication of the effect on GDP. Why was this same information not shared with other users, the public, for six months – why did the public have to wait until July?

A follow-on question: Could the ONS have anticipated problems with the import data earlier? Could information on the discrepancy with Eurostat trade data, for example, have been exploited in this respect?

G7.1 Informing users

282. The ONS appreciated at an early stage that these were exceptional revisions and that there would be a lot of public interest in them, including in the handling. This is why the National Statistician took the unprecedented step of writing to the chairman of the Statistics Commission to give a detailed explanation of the background and handling. This letter was also sent to the chairman of the Treasury Select Committee and put on the National Statistics website.

283. The letter explained that the National Statistician was *“concerned to ensure that we proceeded consistently with the Code of Practice and relevant Protocols”*. The National Statistics Code of Practice Protocol on Release Practices states: *“Revisions to data are treated as similar to first releases in that, while revisions will usually be made known as early as practicable after they are known, for market sensitive statistics the process of release of revisions must not itself create uncertainty.”*

284. Given the large size of the potential effect on imports, to have pre-announced that we were going to make revisions would have created considerable uncertainty. The already published estimates of the tax loss due to fraud implied a very wide range for the possible impact on imports.

285. Under the draft Protocol on Revisions the change constitutes an *‘exceptional revision’* as in para 4 (a). The change was regarded as a significant change in the UK balance of trade with the rest of the world and it was therefore possible that the change would *‘significantly affect the financial markets’*.

G Responses to NIESR Questions

286. The Protocol on Revisions then provides for privileged early access as in the 'Protocol on Release Practices' and 'Protocol on Consultation Arrangements with Ministers'. Under 4(a) of the latter the National Statistician should consult at an 'early stage' and 'should indicate, where possible, the impact on published series.....well before any changes are implemented.'

287. As these revisions potentially impinged on government policy, and to ensure that incorrect inferences were not made, Treasury ministers were informed at an early stage, consistent with the Protocol on Consultation with Ministers. It is also relevant that Treasury ministers were already fully briefed on VAT fraud as they had policy responsibility. It was neither practicable nor desirable to try and ring fence statistical aspects. For example it was essential to ensure that publication of the revisions did not compromise Customs law enforcement operations. Moreover it would not have been possible to produce estimates of the fraud adjustments without the contribution of law enforcement policy officials in Customs. This was not a matter of using standard statistical techniques.

G7.2 Could the problems have been anticipated earlier?

288. HM Customs and Excise became concerned about the growth in MTIC VAT fraud during 1999. The first estimate of the tax loss was published in November 2001. Len Cook's letter to David Rhind dated 9 July 2003 explained that it then took some time to establish that the MTIC VAT fraud did have an impact on the trade figures. The recent trends in Eurostat trade discrepancies were part of the evidence. It was then a long process to derive reasonably reliable estimates (monthly, by country and in both current and constant prices) of the impact on the trade statistics which were fit for purpose. It would not have been viable to implement adjustments by short-cutting the whole painstaking procedure. It was clear that the conditions for the fraud to work existed in all European countries, and therefore it would have been dangerous to use directly the discrepancies in the Eurostat trade data estimate the impact on UK figures.

289. As far as we know the UK is still the only EU country to have adjusted its import estimates to allow for the effects of VAT fraud.

G8. Compliance with draft Protocol On Revisions

Can you explain whether, and if so how, the revisions post-publication of the Revisions Protocol draft in February 2003 have been handled in a manner consistent with the Protocol?

290. Hitherto, ONS and the rest of the GSS have been handling revisions in accordance with the draft Protocol on Revisions which was published for public consultation in February 2003. The GSS will be reviewing its compliance procedures

when the final version of the Protocol is published later this month on the National Statistics website. Taking each of the current Protocol's principles in turn, ONS's current position is as follows:

P1. Each organisation responsible for producing National Statistics will publish and maintain a general statement describing its practice on revisions.

We plan to publish our general statement once the Protocol on Revisions is finalised.

P2. Key outputs, or groups of key outputs, which are subject to regular planned revisions will have a published policy covering planned revisions.

We plan to publish the policies for key groups of outputs once the Protocol on Revisions is finalised. In the meantime the National Accounts Revisions Policy first promulgated in 1993 (Wroe, 1993) remains in place. This policy is also applied to monthly activity indicators which feed into the National Accounts. Certain first releases have already published Revisions Policies, for example public sector statistics, which can be found here:

http://www.statistics.gov.uk/about/methodology_by_theme/public_sector_accounts/downloads/Public_Sector_Statistics_Revisions_Policy.pdf

P3. A statement explaining the effect of revisions will accompany the release of all key outputs subject to regular planned revisions.

This will be rolled out over the next few months by the inclusion of additional material in First Release Background Notes.

P4. Revisions will be released in compliance with the same principles as other new information.

All revisions published since February 2003 have been fully compliant with the Protocol on Release Practices.

P5. Timeliness of release will be balanced with the need to avoid frequent revisions.

This is already ONS practice. In the case of revisions to imports, account was also taken of the need to avoid creating uncertainty.

P6. Substantial methodological changes will be announced before the release of statistics based on the new methods.

This principle has been fully adhered to through articles in Economic Trends and statements in First Releases. In the past year or so articles have been published on annual chain-linking and methodological changes to both retail sales and the index of production.

G Responses to NIESR Questions

P7. Producers of National Statistics will minimise the possibility of unplanned revisions but if they occur they will be released as soon as practicable and in an open and transparent manner.

There have been no unplanned revisions to major economic series over this period.

P8. Substantial revisions will be accompanied by an explanation of their nature and extent.

This has been fully adhered to.

P9. The long-term effects of revisions on key outputs will be monitored with a view to improving the quality of those outputs.

Full analysis of revisions to GDP and its expenditure components are already published regularly. Work is in hand to extend this to other key series.

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ONS Annex 1. Balancing the National Accounts

ONS Annex 1.1 Balancing quarterly GDP

291. 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 key aggregates. The published accounts should show all three approaches – i.e. output, expenditure and income – with similar movements and levels, with credible explanations for movements in components. ONS judgement is that in general in the short term the output approach gives the best estimate of quarterly growth in GDP. The balancing process itself consists of three basic stages:

- scrutiny of the initial estimates
- judgmental adjustment to the estimates and,
- alignment adjustments.

292. Balancing is undertaken for Month 2 and Month 3 estimates, but not for Month 1 when only output information is available.

Scrutiny of the initial estimates

293. Each GDP component is the responsibility of a statistician who processes and validates the basic data. At fixed times in the quarterly cycle the statisticians provide their best estimates on the basis of their source data and a balance showing the aggregates from the different GDP approaches is struck. When examined the resulting overall picture will typically show income and expenditure figures with a different profile from the output figures. Different levels of output may also emerge from each approach.

294. A period of validation and scrutiny then follows when the statisticians meet and test the plausibility of estimates and the coherence of the estimates across the accounts. Additional information collected by outside organisations is also used to provide an alternative picture of events to that shown by ONS's own statistics. This information may support existing estimates or provide a basis for adjustments.

295. Supply side estimates – estimates of demand for commodities, based on components of output and international trade derived using the latest input-output framework – are also compiled and used to help identify inconsistencies in the accounts at low levels of aggregation. They provide alternative sources of estimates for some investment components, supplementing quarterly survey data, and help to reconcile estimates of output and expenditure.

Judgmental adjustments

296. After scrutiny of the initial estimates there may still be discrepancies between income, output and expenditure components. A decision is taken on the movement in GDP which will be published; In particular this decision takes into account movements in output components, but movements in the other components, and any other available information, are also considered.

297. Judgmental adjustments may then be made to component data so that aggregates match the movement in GDP. These adjustments are made to a variety of components and are within the error range of the components. They should not remove the integrity of the individual component series.

Alignment adjustments and the calculation of GDP

298. After the scrutiny and adjustment process the movements in income and expenditure are still unlikely to match those of output. The final balancing step is the incorporation of the mechanically calculated alignment adjustments which will sum to zero over a calendar year. These adjustments smooth the quarterly paths of income and expenditure totals so that they match, as closely as possible, the movement in output without altering annual totals. In the expenditure analysis, the adjustments are allocated to changes in inventories and, within the income analysis, to the operating surplus of private non financial corporations. These areas are considered to have the widest error margins.

299. The alignment adjustments are published in the quarterly economic accounts release described above and in *UK Economic Accounts*. The results of the quarterly balancing process provide a solution to the discrepancies in the different measures of GDP by putting forward the most coherent estimates that arise from the integrated accounts.

ONS Annex 1.2 Balancing annual GDP

300. By the time annual estimates of GDP are produced fuller information on expenditure, income and output is available. Even so, the different approaches are based on different survey and administrative data sources, and each produces estimates which, like all statistical estimates, are subject to errors and omissions. Typically the three approaches produce different estimates. A definitive GDP single estimate can only emerge therefore after a process of balancing and adjustment. ONS believes that the most reliable 'definitive' estimate of the current price level of GDP is derived using the annual input-output framework. Thus for the years when an Input-Output Supply and Use balance is available, GDP is set at the level derived from the balance. For subsequent periods this level is carried forward using movements in income, expenditure and production totals.

Annex 1

The input-output framework

301. The economic accounts are mainly concerned with the composition and value of goods and services entering into final demand and the incomes generated in the production processes. The UK Input-Output Supply and Use Tables, however, are concerned with the intermediate transactions which form inputs into these processes. The Input-Output analyses are constructed to show a balanced and complete picture of the flows of products in the economy and illustrate the relationships between producers and consumers of goods and services. In addition they show the interdependence between industries; what industries purchase from one another in order to produce their own output.

302. On an annual basis, Supply-Use Tables are used to achieve consistency in the economic accounts aggregates by linking the components of value added, output and final demand. Because the income, production and expenditure measures of GDP can all be calculated from the Supply-Use Tables, a single estimate of GDP can be derived by balancing the supply and demand for goods and services and reconciling them with the corresponding value added estimates.

303. The Supply-Use tables are based on a framework which incorporates estimates of industry outputs, inputs and value added. The balance is composed of two matrices: the 'Supply' table and the 'Combined use' table, each of which breaks down and balances one hundred and twenty-three different industries and products at purchasers' prices. The layout of the accounts is shown in Figure 1, and a full description of the methodology is given in the *UK Input-Output Balances Methodological Guide* (ONS, 1997).

Figure 1: Layout of the Input-Output Supply Use Tables

Supply		Use	
INDUSTRY		INDUSTRY	FINAL DEMAND at purchasers' prices
PRODUCT	DOMESTIC SUPPLY at basic prices	PRODUCT	INTERMEDIATE DEMAND at purchasers' prices
	Note: Supply table industry/product detail is not available due to disclosure rules		Total intermediate consumption
			Households
			General government
			Gross fixed capital formation
	Taxes less subsidies on products	Valuables	Change in inventories
	Imports - goods and services	Exports - goods and services	TOTAL DEMAND
	Distributors' trading margins		
	TOTAL SUPPLY		
		Total intermediate consumption	} GVA at basic prices (Primary inputs)
		Taxes less subsidies on production	
		Compensation of employees	
		Gross operating surplus	
	TOTAL OUTPUT	TOTAL OUTPUT	

Supply table

304. The domestic output part matrix shows estimates of domestic industries' total output, (gross sales adjusted for changes in inventories of work in progress and finished goods) compiled at basic prices. However, for the balancing process the estimates of gross domestic product are required at purchasers' prices, i.e. those actually paid by the purchasers to take delivery of the goods, excluding any deductible VAT.

305. To convert the estimates from output valued at basic prices to output at purchasers' prices requires the addition of:

- the value of imports of goods and services
- distributors' trading margins
- taxes (*less* subsidies) on products

Use table

306. The Use table reveals the input structure of each industry in terms of domestic and imported goods and services. It shows the product composition of final demand and, for each industry, the intermediate consumption.

307. The product purchases are represented in the rows of the table while consumption by industries, and final demands, are represented in the columns. The body of the table, which represents product output, is at purchasers' prices and so already reflects the product-specific taxes added to the supply matrix.

308. The Supply-Use tables are balanced when:

For industries,

inputs (from the Use Table)

equal

outputs (from the Supply Table).

For products

supply (from the Supply Table)

equals

demand (from the Use Table).

309. That is, when the data from the income, expenditure and production approaches are used to fill the tables all produce the same estimate of current price GDP.

Annex 1

The balancing process

310. Initial estimates – once the initial data estimates have been gathered, estimates of the components of supply and demand for products are prepared, together with the estimates of industry outputs and inputs (thus value added). The resulting production-based estimates of current price value added are then compared with the expenditure and income measures and the checks and analysis which follow extend the validation checks which will already have been carried out on the initial data estimates. The investigations which follow often lead to the revision and redelivery of data.

311. In parallel with this work, alternative estimates of value added for each of the one hundred and twenty-three industries are prepared using income-based data.

312. The coherence of these initial estimates is then assessed by:

- comparisons of gross value added for each industry using the income and production-based approaches, and
- comparisons of the components of supply and demand for each type of product (which effectively compare the production and expenditure approaches).

313. In addition a variety of time series, for example, growth rates and the ratio of gross value added to total output, are compiled to aid the assessment. At this stage the resulting income, production and expenditure aggregates will typically show different profiles over time. To obtain the revised estimates an iterative process begins to reconcile income and production-based estimates of industry value added and the supply and demand for each product.

314. These estimates are scrutinised and validated and checked for their plausibility and coherence across all industries and products. Consistency and coherence over time are also important and the impact of revisions to earlier years and the quality of the relative data sources are also taken into account. When necessary other sources (for example ONS survey data and company reports and accounts), are used to inform the investigation of particular areas.

315. Final estimates – as final estimates are received from data compilers the steps of assessment and scrutiny, comparison and reconciliation continue. For the time series under consideration the quality of source data, revisions performance and any specific estimation problems are taken into account. Any changes to estimates are agreed and the inconsistencies between supply and demand, and between production and income-based gross value added, are continually reduced. This process continues until convergence between the aggregate totals is achieved.

316. The single best estimate of GDP which emerges will reflect the relative merits of the production, income and expenditure estimates at the aggregate level. It will also have been assessed after consideration of the effect on current and constant price expenditure growth rates, the impact on the expenditure deflator, and the relation between current and constant price gross value added.

317. Once this GDP estimate has been fine tuned and agreed by all concerned, the industry gross value added and the gross value added weights are fixed after a full reconciliation of the income-based components with the output-based estimate. Product supply and demand will still differ at this stage because of the lack of detailed source data on, for example, distributors' trading margins and the allocation of other services provided by manufacturers, but adjustments are made until a balance is achieved. The Use table is then fully balanced by adjusting the intermediate consumption within the predetermined column and row totals. The end result is a full Supply-Use tables balance where input equals output and supply equals demand for all one hundred and twenty-three product and industry groups.

318. The annual coherence adjustments required to achieve a balance are also published in the Blue Book and Input-Output Analysis publications.

319. The National Accounts are currently in the early stages of a re-engineering programme. Key aspirations of the review include:

- the introduction of automated balancing of the quarterly estimates to improve the transparency of the balancing process;
- maximising the use of data by balancing Expenditure, Input and Output quarterly data in a Supply-Use table;
- the balancing of the annual estimate of GDP in both the current year's and the previous year's prices in a Supply Use table framework.

320. More detail on the changes being considered can be found in Tuke and Aldin (2004).

ONS Annex 2.

The STOIR Review

321. The paragraphs below are taken from the report of the Short-Term Output Indicators Review report (STOIR). They aim to give an idea of the nature of the operation of these reviews as well as the recommendations produced. A full copy of the report can be found at the address below as can the ONS implementation plan and a report on progress of implementing the STOIR recommendations.

http://www.statistics.gov.uk/methods_quality/quality_review/economy.asp#stoir

ONS Annex 2.1 Introduction

322. This review was conducted by a team of ONS staff, under the guidance of a Project Board and a Steering Group. Outside users were involved in guiding the Review, and included representatives on the Steering Group from HM Treasury, the Bank of England, the Department of Trade and Industry and the Royal Statistical Society. The Review began in January 2000 and was completed by July 2000.

323. The Review was initiated as part of a process of continuous improvement to assure the quality of the ONS's short-term output indicators, by assessing whether they meet users' needs, use best practices and are founded on good basic data. Where this isn't the case, the Review has recommended the measures needed to bring this about. National Statistics will be reviewing all its main statistics in a rolling programme to be conducted over the next five years.

324. The three short-term output indicators covered in this survey are the monthly Index of Production (IoP), the quarterly production measure of gross domestic product – GDP(O) – and the new monthly Index of Services. The latter is currently under development and has not yet been released as an official statistic. The use of price indices (the Corporate Services Price Indices and the Producer Price Indices) in their role as deflators was also covered within the Review.

325. The Review focused on the compilation of indicators used in economic analysis and assessment at the macro level rather than the micro level. A detailed assessment of the data-collection surveys is beyond the scope of this review (a separate review of the short-term inquiries is planned), although it does comment on whether the surveys are a suitable basis for compiling the indicators.

326. The Review examined a series of areas where ONS, or the users of the short-term output indicators, believed that improvements were possible. The Review has therefore focused on what were considered to be the most troublesome issues within the system of short-term output indicators.

ONS Annex 2.2 Main Findings and Recommendations for Change

327. Detailed studies conducted as part of the Review have confirmed the validity of much of the existing methodology and a number of recommendations for further work have been made. The investigations and recommendations also support and reinforce the existing programme for developing the short-term output indicators.

328. Some key strengths of the ONS's short-term output indicators are listed below.

- The indicators' scope, in particular the expanding coverage of the service industries. The development of the monthly Index of Services and the Corporate Services Price Indices means that they are both at the forefront of work on services statistics.
- The methods used to estimate output, which rely on information about turnover rather than typically second-best approaches based on volume indicators or other proxy indicators, such as labour inputs. The UK approach compares well with that used in many other EU countries.
- The inclusion of methodologies to deal with issues like inventory adjustments, differences between domestic and export prices, and time-lags between order and delivery. Moreover, these methods are well founded on basic data, rather than assumptions.
- The fact that the indicators cover all kinds of businesses – there are, for example, inquiry statistics for small enterprises within the service sector.
- The coverage of new forms of economic activity, such as e-commerce and mobile phones.

329. The main recommendations for changes to current practices are listed below.

R0.1 The integration of short-term output indicators and national accounts into a coherent system is a positive step and should be completed as soon as practicable.

R0.2 The short-term output indicators and, where appropriate, their sources should use consistent approaches and methods.

R0.3 The user requirement for short-term output indicators – particularly its focus on measuring movement – should be reflected in indicator and survey methodologies. In particular, there are alternative survey estimators that optimise estimation of movements.

Annex 2

R0.4 The ad hoc data-filtering interventions made by indicator statisticians should be applied within a more structured, consistent and formalised process. The application of data-filtering adjustments within the processing of the indicators can only be made consistent if there is greater consistency in the design and estimation methods of the inquiries that feed them.

R0.5 The development of important new statistics, such as the monthly Index of Services, requires that the introduction of new data collections, like the turnover and price collections in the service sector, should be better co-ordinated. A clear, written statement of the user need from the national accounts and other perspectives should be converted into a set of requirements, and from there into survey design.

ONS Annex 3. The Labour Force Survey Review

330. As with the summary of the STOI Review, the primary aim of this summary of the recommendations arising from the Labour Force Survey review is to give an idea of the sort of methodological issues that are considered during such a review. The full review documentation including progress against the implementation plan can be found here:

http://www.statistics.gov.uk/methods_quality/quality_review/labour.asp#nsqr12.

331. As a background, the recommendations should be considered against the considerable success of the survey both as a highly regarded UK source for labour market statistics, and as a source of demographic and other household statistics to a level of precision not matched by any other UK household survey. The recommendations aim to improve quality and value still further, where possible.

RO1: Primary Purpose: This should be recognised as being the prompt publication of key aggregates, for example whole economy indicators, for the integrated assessment of labour market conditions. Any changes to the LFS for other purposes, including regulatory obligations to provide LFS data to Eurostat, should be formulated with the primary purpose in mind.

RO2: Production of Monthly Estimates: The continuous nature of the LFS fieldwork means that the results have not been fully collated for processing until the end of the first week following the reference month. Many commentators commented that in order to be as relevant as those available in North America for example, the UK's monthly labour market statistics from the LFS need to be published in the month following the reference period.. The review recommends that the ONS should investigate methodologies for the production, and evaluation of the precision, of estimates based on a single month of LFS data as well as estimates of monthly change in the presently published series of rolling three month estimates. These investigations should include an assessment of the possible uses of LFS trend-based estimates.

RO5: Quality of Industry based data: Poor industry breakdowns from the LFS have prevented it being used by the National Accounts as often as it should be. Hence the review recommends that ONS should investigate ways to improve the quality of industry based information from the LFS. In particular it advises that consideration should be given to the use of the IDBR to code LFS industry and workplace data.

Annex 3

RO6: Classification of Employment Status: Previously ONS had a list of jobs which could not be classified as self-employed, which was used to edit responses. This list has now expired and raw responses are used. This created a discontinuity, and the review recommends creating a back series using respondents' own assessments of employment status instead of editing these responses.

RO7: Use of Administrative Data: For policy analysis there are a number of desirable variables (namely benefits) which would be desirable to have on the LFS, but which would be hard to collect. The review recommends that ONS should investigate the feasibility of linking administrative data, for example on receipt of working age benefits, to LFS survey data. Bearing in mind that the huge, potential benefits of such linkage could only be realised if the ethical, legal and technical basis for linkage was acceptable and it could be shown that its implementation would have no significant deleterious effects on the acceptability to respondents of participation in the LFS.

RO10: Calculation and Dissemination of sampling and non-sampling Quality Measures: That ONS should aim to make more measures of quality routinely available with LFS data including the impact of proxy responses and the imputation of missing responses. A particular focus should be to improve the information available about the extent of non-response bias in the LFS estimates using information about LFS non-response available from the 2001 Population Census.

ONS Annex 4. SPC Paper on Revisions

332. At its meeting on 27th November 2003, the ONS Statistical Policy Committee agreed a policy on the inclusion of revisions information in First Releases containing time series data. The following note will be placed on the ONS website when the policy is publicly launched.

ONS Annex 4.1. ONS to provide more information about revisions in its first releases

ONS Annex 4.1.1 Introduction

333. Starting today, 25 February 2004, with the UK Output, Income and Expenditure First Release, ONS will be providing users with more information in its First Releases about revisions to time series. This will help users interpret and use the latest estimates as they will know how estimates have been revised in the past. The new information will appear in a standard form in each First Release, accompanied by explanations of any special features if necessary.

334. These changes will contribute towards the implementation of the National Statistics Protocol on Revisions. Principle 3 of the Protocol says "A statement explaining the normal effect of revisions will accompany the release of all key outputs subject to regular revisions". The changes will put the revisions to key series in an historical context, will clearly identify revisions being made, will explain the status of the figures and identify any planned future revisions.

335. The main change will be a new table in the background notes to releases giving information about past revisions to key indicators. The table will usually be in this form for releases giving quarterly series. There will be a slightly different form for releases of monthly series.

Revisions between first publication and estimates three years later

	Value in latest period	Average revision over last 5 years (bias)	Average revision over last 5 years without regard to sign (average absolute revision)
Key indicator 'a'			
Key indicator 'b'			
Key indicator 'c'			

Annex 4

336. The second column shows the bias over the last five years – revisions are biased if they are consistently different from zero in either direction. The information in this column will be tested using a modified t-statistic to see whether there is statistical evidence that the bias is significantly different from zero for any of the indicators. (If the test is not significant this implies that the observed bias might have occurred by chance when there is no bias in the revisions.) The third column in the table shows the average absolute revision to the key variables over this period – this gives the average size of revisions over the last five years as an indication of the reliability of the latest figures.

337. The ONS recognises that revisions are only one indicator of statistical quality and revisions do not capture the complete picture. The revised data may itself, be subject to sampling or other sources of error. Other aspects of quality in statistics are set out in the Eurostat framework and include accuracy, timeliness, and robustness.

338. Other developments to implement the protocol on revisions include:

- A table, or tables, of revisions to the main series published in the release with an explanation of the reasons for them. These tables appear after the other tables and are designated with an **R** in their numbering.
- In most cases, identification of the periods subject to revision in the current edition of the release.
- An extra note to explain the status of the figures and planned future revisions.
- In some cases a periodic article about the revisions performance of the indicators. For example an article about GDP revisions appeared in Economic Trends December 2003.

ONS Annex 4.1.2 Questions and Answers

When will the new material appear?

339. It is being introduced over the next four months and should be in all releases published after the end of June 2004.

Which releases will carry the new information?

340. All those which carry long runs of time series information.

Will the information be in other ONS publications?

341. The immediate priority will be its inclusion in First Releases. But other publications giving long run time series will follow where appropriate.

What is the modified t-statistic?

342. Revisions are considered to be biased if the mean revision is statistically significantly different from zero. A t-test compares the calculated bias in the series (i.e. the mean revision) with the variability of the revisions to test whether the bias is significant. However, the standard t-test is based on the assumption that the revisions are independent of each other. This is not true for a time series as revisions made for one period may be associated with revisions made to previous periods. The modified t-test corrects for this lack of independence by adjusting the estimate of the variability of the revisions to take into account the serial correlation, that is the extent of the association between successive revisions. A technical description of the modified t-statistic and its calculation is given in the link.

ONS Annex 4.1.3 The modified t-statistic

343. For the purpose of the revisions information contained in the First Releases, the revision to a economic series, r_t , is defined as the difference between the initial estimate of that series and the updated estimate, made twelve months later (for monthly series) or 3 years later (for a quarterly series). The revisions to a series are considered to be biased if the mean revision is statistically different from zero. A modified t-test is used to test the significance of the mean revisions. The rationale for using a modified t-test is that successive revisions in a series may not be independent. If they are not independent (i.e there is serial (or auto-) correlation in the revisions) the standard t-test would overstate the significance of the results.

344. We assume that the revisions fit a regression model of the form:

$$r_t = \mu + \varepsilon_t \quad \text{for } t=1 \text{ to } n \quad \text{i.e. with no explanatory variable.}$$

If the errors are thought to be serially correlated, they follow an autoregressive model of order one, AR(1):

$$\varepsilon_t = \alpha \varepsilon_{t-1} + u_t$$

where the u_t are independent and the auto-correlation coefficient, α , is between -1 and 1.

345. The standard t-statistic is:

$$t = \frac{\bar{r} - \mu}{\sqrt{\sigma^2/n}}$$

where \bar{r} is our sample mean revision, μ is the population mean revision (which we will assume is zero and test for as our null hypothesis), σ^2 is the variance and n is the number of observations.

Annex 4

346. Priestly (1981) has suggested that, where auto-correlation is present, the equivalent number of independent observations for estimating the mean should be reduced to:

$$n \frac{(1-\alpha)}{(1+\alpha)}$$

and thus the variance of the mean should be adjusted by increasing it to:

$$\frac{\sigma^2}{n} \frac{(1-\alpha)}{(1+\alpha)}$$

347. Under these circumstances, our modified t-adjusted statistic will be:

$$t - \text{adj} = \frac{\bar{r}}{\sqrt{\text{adjusted variance}}} \quad [\text{using } n^* \text{ degrees of freedom}]$$

with the null hypothesis that the population mean is zero and n^* , the equivalent number of independent observations for estimating the variance, is.

$$n \frac{(1-\alpha^2)}{(1+\alpha^2)}$$

348. The calculation follows the steps below:

1. Calculate the sample mean

$$\bar{r} = \frac{\sum_{t=1}^n r_t}{n}$$

2. The coefficient α is estimated by $\hat{\alpha}$ where

$$\begin{aligned} \hat{\alpha} &= \frac{\text{Cov}(r_{t-1}, r_t)}{\sqrt{\text{Var}(r_{t-1}) \text{Var}(r_t)}} \\ &= \frac{\sum_{i=2}^n (r_{i-1} - \bar{r}_{t-1})^2 (r_i - \bar{r}_t)}{\sqrt{\sum_{i=1}^{n-1} (r_i - \bar{r}_{t-1})^2 \sum_{i=2}^n (r_i - \bar{r}_t)^2}} \end{aligned}$$

$$\text{where } \bar{r}_{t-1} = \frac{\sum_{i=1}^{n-1} r_i}{n-1} \quad \text{and } \bar{r}_t = \frac{\sum_{i=2}^n r_i}{n-1}$$

3. The estimate for the variance of the sample mean is s where

$$s^2 = \frac{\sum_{t=1}^n (r_t - \bar{r})^2}{n}$$

4. The estimate of the adjusted sample variance is s^* where

$$s^{*2} = \frac{s^2 (1 + \hat{\alpha})}{n (1 - \hat{\alpha})}$$

5. The adjusted degrees of freedom is n^* where:

$$n^* = n \frac{(1 - \hat{\alpha})^2}{(1 + \hat{\alpha})^2}$$

6. Calculate modified t-statistic, t-adj

$$t - adj = \frac{\bar{r}}{s^*} \quad \text{[using } n^* \text{ degrees of freedom]}$$

7. Compare the t-adjusted value with the critical t-value

Compare the absolute t-adjusted value against the critical t value at 95% significance (2-tailed) and reject the null hypothesis if $|t-adj| > t\text{-critical}$ i.e. if rejected the test statistic is statistically significant.

Index to Charts and Tables

Table 1: Mean revision to GDP by stage of production process	25
Table 2: Estimates of Quarterly GDP Growth (%)	27
Table 3: Revisions to Estimates of Quarterly GDP Growth (percentage points)	27
Table 4: DTI Construction Estimates provided to ONS	33
Table 5: Construction – change between Q4 2002 and Q1 2003 by component, current prices	36
Table 6: Weights for composite orders in DTI Construction model	36
Table 7: Regression Coefficients for DTI Construction model	36
Table 8: Response Rates for DTI Construction survey at M2 and M3 in Q1 and Q2 2003 by Strata	39
Table 9: Annual Blue Book GDP growth rates	46
Table 10: Revisions to annual GDP growth in Blue Books	46
Table 11: Gross domestic product by category of expenditure at current market prices: revisions	47
Table 12: Revisions to 3 month on 3 month loP Estimates	57
Table 13: Revisions to month on month loP Estimates	58
Table 14: Revisions Policy for the RSI	60
Table 15: Impact of the revisions on the headline RSI growth rates (latest 3 months on previous 3 months)	61
Table 16: Summary of RSI revisions for the period Jan 2000 to August 2002	62
Table 17: 3-month on 3-month % change to RSI	64
Table 18: month on month % change to RSI	65
Table 19: Key augmented regression results from Faust et al	73
Table 20: Reduced sample period results from Faust et al, 88Q1-97Q4	74
Table 21: Various Regression samples – Faust et al model	76
Table 22: Öller and Hansson (2002) – Key results for Absolute Revisions	77

Chart 1. Revisions to construction output as published by ONS, Month 2 to Month 3 estimates of GDP	41
Chart 2. Level of construction activity (index, 2000 = 100)	41
Chart 3. Construction growth as published by ONS in M2 and M3 estimates of GDP	42
Chart 4: Headline growth in the RSI	61
Chart 5: Total Revisions to GDP – 1985 – 1997	76