

Discussion

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1. Introductory Remarks

Every national statistical institute that publishes early estimates faces a dilemma regarding the balance between timeliness and reliability. As the UK National Statistician has commented in an article looking at the underlying causes of revisions, “revisions are an expected and inevitable consequence of the 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.” (Cook 2004). If we publish early, then the first estimates are prone to substantial revision. If we wait until all the information is in and methods agreed, then the statistics are published too late to inform important policy decisions such as setting interest rates.

It is important to distinguish carefully between the accuracy of statistical estimates and their reliability (under the IMF’s Data Quality Assessment Framework, revisions are considered to be a gauge of reliability; see IMF 2001). Reliability only says something about the extent to which the numbers will change over time. This in itself says nothing about how accurate the numbers are. It is entirely possible that the accuracy of past estimates could be improved, for example, by using better methodologies, but this would come at the expense of reliability, in the form of revisions.

Comparing the reliability of different time series is only appropriate if the timeliness of the estimates is comparable. The United Kingdom is first in the world with its estimate of economic growth (quarterly GDP released about 25 days after the period), and so it might be expected that the reliability of these estimates would be less than in the case of a country which chose to wait longer and incorporate more information before releasing the first estimate. Many international comparisons omit this factor in presenting the results, and so give a false impression of low quality in a series which can actually meet user needs better than a series released later but with improved reliability.

It is sometimes more important to ensure that the first estimates are a reliable unbiased estimate of the eventual estimate. For example, when economic growth is smooth and stable, then it is more likely that early estimates are good indicators of the final estimate. But when a turning point in the economy is reached, the robustness of the underlying statistical methods is more important and more subject to scrutiny. For example, in times of smooth growth, the previous estimate of growth is a reasonable first estimate of the subsequent period growth. But at a turning point, such an estimate is significantly misleading. And it is at turning points that decisions on interest rates, for example, are

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most critical in terms of determining the future economic growth. This argues that when assessing the performance of a statistics office, greater weight should be given to the reliability of its estimates during periods of change.

In February 2004 the United Kingdom introduced measures of reliability of quarterly growth estimates in the first release of GDP estimates. These measures were extended to cover all market-sensitive economic statistics by the middle of 2004, so that users could judge the reliability of all the major measures of the UK economy. The reliability measures are of bias and spread, and cover a recent period of the relevant economic indicator. These measures are intended to allow users to judge for themselves the extent to which they can make policy decisions on the measures, knowing that they are liable to change to a measured amount. It is intended that these measures shall not only help users understand the reliability of the series, but also educate them into treating revisions as an expected feature of early estimates, rather than a revelation of unexpected “errors” in these estimates.

2. How the GDP Estimates Are Produced

In the UK, revisions to GDP are caused by a number of factors – new data, improvements in methodology etc. To illustrate this, the following section considers how the UK GDP data evolves over its life-span. This is of particular relevance to the discussion of whether final estimates follow the Efficient Forecast Hypothesis (EFH) or the Measurement Error Hypothesis (MEH). In the first case, revisions are uncorrelated with the initial estimates, whereas in the MEH case they are uncorrelated with the final estimates. ONS studies (see for example Richardson 2003b) have suggested that while total revisions to UK GDP quarterly growth rates are correlated with the initial estimates (suggesting that revisions arise in a predictable manner), this result is partly explained by studying the stages of the production process at which the revisions (and the predictability) arise.

There are three successive monthly releases after the end of each quarter in the UK: 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).

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 the 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. The missing data is forecasted, usually using univariate time-series models. 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.

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. On the expenditure and income sides, we start to get data on business investment, household consumption, earnings, quarterly profits etc.

As with the annual GDP estimate, the production of a single quarterly estimate requires the balancing of the information from the three approaches. However, because the detailed information which feeds into the Supply-Use process is not available at this stage, a different approach has to be taken. Consequently, the ONS uses an informal balancing process, where the output measure of GDP is given a larger weight.

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 estimates, as well as revising estimates for earlier quarters in the current year and normally the previous year.

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).

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.

Akritidis (2003) uses UK quarterly growth rates published between 1993 and 2000, and suggests that revisions between the M1 and M3 estimates of quarterly growth are not statistically significant. Richardson (2003b) suggests that the revisions to the quarterly growth rate between these two publications are effectively noise, and not predictable from the initial estimates.

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 in the evolution of the annual estimate, based around the publication of the Blue Book, the ONS's annual national accounts publication. This is generally when methodological changes are introduced into the accounts, as well as new data sources and balancing processes.

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 published 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.

Akritidis (2003) shows that the second-largest mean revision to the quarterly growth rate (0.06 percentage points out of a total mean revision of 0.19) occurs between the M3

and BB1 stages, when annual data starts to become available. However, Richardson (2003b) finds these revisions to be unpredictable on the basis of the initial estimate.

Blue Book Two (BB2) – typically around 16-19 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 for revisions in the third month of each 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, 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*.

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 into the 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 BB 1998. Finally, data and methodology revisions in “closed years” (when long-run revisions are not allowed) are often delayed and fed into the *Blue Book* revisions in open years.

This stage is the largest source of revisions. Akritidis (2003) shows that it contributes over half of the total mean revision to quarterly growth of 0.19 percentage points. Richardson (2003b) also finds that revisions at this stage are also significantly predictable at the 10 per cent significance level, suggesting that there is a degree of news in the system at this stage, i.e., information entering in a predictable fashion. Total revisions are also predictable.

Overall, the pattern of revisions suggests that attempting to classify revisions as being driven either by the EFH or by the MEH is an over-simplification. Arguably, estimates made at early stages of the production process are efficient forecasts of the estimates produced by the annual estimates derived from the current-price supply use balancing process. However, the longer-run revisions are mainly driven by methodology changes, rebasings etc. While these imply that the initial estimates are inefficient forecasts of the latest estimates, it is questionable whether the effect of these methodological changes could have been predicted at the time when the initial estimates were made.

3. Revisions as a Diagnostic Tool in a Statistics Office

The UK National Accounts is currently undergoing a reengineering programme and associated methods change. Given their importance both domestically and internationally, the National Accounts are one of ONS's most important and most prominent products. However, the systems, methods, and processes that support their production have evolved over time in a nonsystematic, often nonstandard way.

Through a reengineering 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 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.

Revisions analysis has two key roles in the new National Accounts system. Firstly, the ONS is moving towards an automated balancing procedure (see Tuke and Aldin 2004) and information is required on aspects of the quality of the underlying components that feed into the balance. Revisions information on both a formal and informal basis will feed into the process.

Secondly, there is the issue of using revisions in a management feedback structure. Richardson (2003a) suggests a number of ways in which a statistics office could use revisions information to improve the quality of their outputs. The key point is that revisions are an indicator of a deeper problem, and revisions can only be dealt with by dealing with this deeper problem.

Consider, for example, if a simple forecast efficiency testing methodology (such as Richardson 2003b) was applied not only to total GDP, but also to the components of expenditure. If we found growing evidence of predictability for revisions to a particular component between Month 3 and the first *Blue Book* which were feeding through to become revisions to aggregate GDP, then we could use this information in the longer term to identify weak areas of basic survey data for that component which could be addressed.

Revisions information on the Production measure might indicate that a certain sector was particularly prone to revisions, and we could also return to the data source. It might be that surveys from a particular sector are prone to consistently low levels of returns, or that early returns are not typical of the sector as a whole. This could affect the overall early estimates, and when later responses arrive they could cause revisions in the accounts.

The ONS, like other national statistics offices, uses imputation methods to fill gaps in data (see, for example, Reed 2002). Revisions information is vital to assessing the reliability of the forecasts, not just against early survey results but also against final or annual survey results which arrive later in the production process. A forecast efficiency methodology could be used to ensure that the forecasts or imputations are not developing a systematic bias over time (e.g., caused by a gradual structural shift in the economy) which would lead to revisions when data replaced the imputations/forecasts.

4. How a Statistics Office Could Use the Results of This Study

From the point of view of a statistics office, the findings that various vintages are cointegrated and that the final vintage is weakly exogenous are positive ones. More and more, statistics offices are being judged by their key users and stakeholders. Revisions are one of the few potential indicators of reliability in a series, and hence they are often used to judge a statistics office's performance.

While for a number of users, such as the financial sector, the key figures are the latest estimates of the growth rate, for policy-makers the long-term trend is often as important as the short-term growth rates. For example, in the UK, HM Treasury looks at the trend rate of growth as a key element of their economic and budgetary forecasts. Long-term revisions to GDP undoubtedly concern them, as they may mean that the dates or amplitudes of the cycles have moved, and that trend growth over the cycle has changed. Similarly, the Bank of England uses trend estimates in its output gap analysis. If it could be shown that the previous and latest vintages are both derived from a well-behaved data

generating process, i.e., are cointegrated, and that the latest series is weakly endogenous, it might remove some of the problems caused for policy-makers by revisions.

The question then becomes, what would a statistics office do if it found that different vintages were not cointegrated? One suggestion might be that the statistics office should carry out these tests before the publication of the revised data, and use the results to inform users of the possible effect of the changes on their models etc.

How important is it that different vintages tell the same short-term story? From a journalistic point of view, revisions to recent estimates can often be made into a story by linking them to policies. For example, the Financial Times commented in September 2003 that “The ONS, however, has discovered 1.3 percentage points of additional GDP growth between 1998 and 2000. Other things being equal, the output gap that supposedly exists at the moment would be wiped away at a stroke.” But the extent to which major policy users are concerned by revisions is questionable. These users tend to be highly aware of the potential for revisions, and are careful not to base policy on a lone indicator. For example, the Bank of England commented when giving evidence to the Lords Select Committee into Economic Affairs “because we are aware of the imprecise nature of the measurement and the fact that data is subject to revision, we take on board a whole range of other information when we are coming to our judgement, so we should not really be thrown by one large data revision.” Papers such as that of Castle and Ellis (2003) further illustrate how much importance key users such as the Bank of England place on understanding the issue of revisions.

It is important that the statistics office makes public enough information to enable all users to judge the likelihood of revisions, and so become aware of the possible effects on models, forecasts etc. In the UK this has tended to be in the form of annual articles. More recently, revisions information has been included in our regular data releases.

5. References

- Akritidis, L. (2003). Revisions to Quarterly GDP Growth and Expenditure Components. *Economic Trends*, December, TSO.
- Castle, J. and Ellis, C. (2003). Building a Real-time Database for GDP. *Bank of England Quarterly Bulletin*, Spring.
- Cook, L. (2004). Revisions to Statistics: Their Role in Measuring Economic Progress. *Economic Trends*, January, TSO.
- IMF Statistics Department (2001). The Fourth Review of the Fund’s Data Standards Initiatives – Supplement on the Data Quality Assessment Framework. International Monetary Fund, Washington, DC, 10 July.
- Reed, G. (2002). How Much Information Is in the UK Preliminary Estimate of GDP? *Economic Trends*, August, TSO.
- Richardson, C. (2002). Revisions to GDP: A Time Profile. *Economic Trends*, July, TSO.
- Richardson, C. (2003a). Measuring Aspects of Quality Performance of Important Data Series published by National Statistics Office: Illustrated by the Case of Revisions to Gross Domestic Product Estimates in the UK. Paper presented to the International Statistics Institute Annual Conference.

Richardson, C. (2003b). Revisions Analysis: A Time Series Approach. *Economic Trends*, December, TSO.

Tuke, A. and Aldin, V. (2004). Reviewing the Methods and Approaches of the UK National Accounts. *Economic Trends*, January, TSO.

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