

REVISIONS IN EURO AREA GDP AND RETAIL TRADE DATA: RELIABILITY, TIMELINESS AND INFRA-ANNUAL DISTRIBUTION ¹

**Contribution to the joint OECD / Eurostat Task Force on
“Performing Revisions Analysis for Sub-Annual Economic Statistics”**

Executive summary

The joint OECD/Eurostat Task Force develops a set of guidelines and best practices for performing and using the results of revision analyses and formulates a revisions analysis policy which effectively supports user needs in conjunction with the release of sub-annual economic statistics. The Task Force also provides a set of standard tools as a resource to both producers and users of official statistics to enable such analysis to be performed. The Task Force is co-chaired by the OECD and Eurostat and consists of representatives from statistical institutes and national central banks from European countries and the US. The ECB is a member of the Task Force and attaches high importance to the issue of revisions. A consistent and methodologically sound treatment of revisions by data providers will help data users like the ECB in their daily work with economic data.

As a contribution to the final output of the Task Force, the ECB provides a case study, focussing on the relationship between reliability and timeliness for selected euro area indicators as well as on the infra-annual distribution of revisions. However, euro area time series cover a relatively short period when compared with e.g. time series available for national European economies or for the US and, therefore, general conclusions are difficult to draw at this stage. The study reports on the reliability and the timeliness of the first (flash) estimates for quarter-on-quarter GDP volume growth (seasonally and working day adjusted) and for month-on-month growth of retail trade turnover (seasonally and working day adjusted and in constant prices) for the euro area. For the purpose of assessing the reliability of the first/flash estimates, a revisions analysis was carried out using suitable revision statistics with a view to providing key stylised facts about revisions to the first (flash) estimates.

¹ Prepared by Heinz Christian Dieden and Hans Olsson (ECB; Directorate General Statistics, General Economic Statistics Section) as a contribution to the OECD/Eurostat Task Force. The views expressed are those of the authors; useful comments and suggestions from the Task Force members as well as from Gabriel Quirós, Henning Ahnert and Wim Haine (all ECB) gratefully acknowledged.

Data sets were constructed for the euro area covering the period 2000Q1-2006Q4 for GDP (28 quarters) and January 2000 - April 2007 for retail trade turnover (88 months), i.e. almost the entire period since the inception of the euro area. Various aspects of revisions are distinguished with a particular emphasis on the reliability of the first estimate when compared with estimates typically available one year later ('annual update'). Furthermore, revisions between the first (flash) estimate and 'second estimate' and those between first (flash) estimate and the latest available vintage of data (the 'current estimate') have been investigated.

A range of revision statistics suitable to assess the reliability of the first estimates is considered. This involves a measure of the size of revisions (the average absolute revision), a measure of the direction or sign of the revisions, i.e. their 'bias' (the average revision) and a measure of the volatility of revisions (the standard deviation of revisions). These statistics are computed both for an average of the quarters/months as well as for the individual quarters/months to investigate if revision patterns may be period-specific. Timeliness is calculated as the number of calendar days between the end of the reference period and the day of data release.

The key findings from the revisions analysis are as follows.

For GDP volume growth

- *First, on average, all the revision indicators signal small amounts of revisions and euro area estimates can be considered as stable. For the size of revisions, results are small for the second estimate (0.06 percentage points (pp)) but increase to 0.09pp for the annual update and to 0.12pp for the current estimate. For the sign of revisions, negligible amounts of 0.01pp for second estimate, 0.0 for annual and 0.06pp for current estimate point to almost non-biased results; the volatility of revisions is also small (0.15 for the annual and the current estimate).*
- *Second, timeliness for euro area GDP volume growth has improved considerably since 2000 from around 70 days to around 44 days. Improved timeliness of the flash estimate did not lead to increased absolute revisions, quite contrary, since the euro area GDP flash estimate was introduced, the amount of revisions between the first release and the current estimate decreased from 0.14pp to 0.10pp on average.*
- *Third, the breakdown of revisions into different quarters shows a certain quarterly profile of revisions; somewhat higher revisions occur in the 1st half of the year, whereas quarters of the second half of the year tend to show somewhat more stable and less volatile estimates.*

For retail trade turnover:

- *There were periods of rather high revisions (early-2000, turn of the year 2001, mid-2002 until mid-2004) as well as periods with smaller, but still significant, revisions. Especially over the recent past, the ranges of revisions have narrowed, signalling some increase in the reliability of the euro area results.*

UNCLASSIFIED

- *The size of revisions is significant for all periods considered and reaches levels above 0.2pp (for the month-on-month growth rate).*
- *The sign of revisions or 'bias' tends to be small for both periods prior and after the flash introduction. However, there are changes in its direction: For periods after the introduction of the flash estimate, the bias is negative, indicating that earlier releases are generally overestimating the later results, whereas for periods before the flash estimate, the bias is positive, indicating that earlier releases are generally underestimating the later results.*
- *The volatility of revisions is relatively high, with increased values for pre-flash estimate periods. Since the introduction of the flash estimate, the standard deviation of the revisions decreased significantly, e.g. from 0.77 to 0.40 for the 'current' estimate.*
- *Timeliness for euro area retail trade turnover has improved considerably since 2000 from around 70 days to around 35 days. Significantly improved timeliness of the first estimate did not lead to increased absolute revisions and, since the introduction of the retail trade flash estimate, the amount of revisions between the flash and the estimate one-year-later decreased markedly from 0.55pp to 0.36pp on average.*
- *Revisions are not equally distributed across the months of the year although the overall picture provides no clear general rule for individual months. However, larger revisions are recorded in the first half of the year and the revisions in the Christmas-shopping period are not extraordinary.*

A few caveats nevertheless are worth pointing out. First, the samples considered are relatively small, covering the period starting since 2000. Since then, the statistics for the euro area have undergone drastic changes towards a more harmonised methodology and synchronised releases of national and European data. Implementing revised methodologies (e.g. ESA95) might have introduced one-off revisions in national data, with subsequent effects on euro area aggregates. Furthermore, economic statistics usually undergo a cycle of revisions which could span over several years (e.g. benchmark revision of National Accounts). Many of the data used for this study have not yet been fully and finally revised; this is especially true for more recent observations. Finally, the country coverage in euro area aggregates has changed over time, with more countries reporting data and which are subsequently included in euro area totals; this aspect has not been analysed.

Overall, the analysis presented in this note suggests that revisions to euro area aggregates for GDP volume growth and retail trade turnover have become smaller over time. The significant improvements in timeliness have not led subsequently to higher revisions, larger biases or higher volatility. The infra-annual distribution suggests that revisions tend to be higher in the first half of the year.

1. Introduction

Two key elements of economic statistics, namely their reliability and their timeliness, are often considered under the headline “trade-off”, indicating that improvements in one aspect are paid for with deteriorations in the other aspect.²

As a rule, most economic statistics are revised after the initial release and are necessary in order to improve the accuracy and level of detail of economic statistics³. Revisions are, in general, the result of new information becoming available. Another source for revisions is the introduction of conceptual changes, in order to cope with a changing environment or improvements (e.g. enhanced source statistics, the availability of better deflators for some product groups). As many infra-annual statistics are adjusted for seasonal and working day variations, changes in the concomitant adjustment factors can also cause revisions. An additional dimension of revisions exists when different geographical or institutional layers contribute to the production of aggregate statistics, e.g. country results are used to compile euro area aggregates. Finally, revisions can result from the correction of errors in source data or in computations. Generally, these reasons apply to both *primary* statistics (e.g. collected directly from a reporting entity) as well as to *derived* statistics (compiled using primary statistics, e.g. national accounts).

It should be borne in mind that low revisions are not necessarily proof of accurate measurement. Statistical offices may not, for example, recompile long back series after methodological revisions, because of resource constraints. Of course, the resulting relatively small average revisions for such series do not signal a best practice. The same applies if statistics are revised less because the first estimate becomes available much later or because late information is simply not incorporated at any point in time. Nevertheless, it is clear that information about revisions can help analysts and forecasters in interpreting new releases.

Timeliness is another key element of data quality and indicates the delay between the end of the reference period and the availability of these data to users. Users like the ECB had expressed timeliness requirements for reliable economic statistics.⁴ For this study, timeliness is defined as the number of calendar days between the end of the reference period and the public release of the euro area results by Eurostat; each calendar month is considered to have 30 days. Regarding the period 2000-2006, the

² Numerous papers on timeliness, proposals to improve it as well as on revisions are available. A comprehensive and systematic list of papers for short-term economic statistics is e.g. available from the OECD Timeliness Framework at: http://www.oecd.org/document/40/0,2340,en_2649_34257_30460520_1_1_1_1,00.html. For euro area aggregates as well as for selected national data, the ECB's Occasional Paper “Analysis of revisions to General Economic Statistics” from October 2007 by M. Branchi, H. C. Dieden et al. (available via: <http://www.ecb.europa.eu/pub/pdf/scpops/ecbocp74.pdf>) provides a range of revision indicators applied to key economic indicators. Specific GDP related indicators are described in “Joint ECB's DG-S/Eurostat Task Force on quality in quarterly national accounts – Final Report”, <http://www.cmfb.org/pdf/CMFB%2004-06-A.7.1%20FinalCMFBreport%20TF%20QNA.pdf>

³ Initial estimates are typically based on incomplete source information and can only be made at a rather aggregate level.

⁴ For example, the ECB published its requirements for general economic statistics in a report entitled “Review of the requirements in the field of general economic statistics”, December 2004, available via: <http://www.ecb.europa.eu/pub/pdf/other/reviewrequirementsgeneconomstat200412en.pdf>

European Statistical System (ESS) has made significant progress in the timeliness of several economic statistics for the euro area as a whole. For example, first estimates of GDP became available with a delay of around 70 days in 2000, whereas the flash GDP estimate is now published after around 45 days. Similar improvements were achieved for euro area retail trade turnover, which is now available after around 35 days, whereas timeliness was at around 67 days during 2000.

Finally, for infra-annual statistics, it is interesting to analyse how revisions are distributed across different quarters/months during a year. If infra-annual patterns of revisions can be identified, such distributions can help in assessing better the likely uncertainty around first estimates for specific observation periods.

This paper analyses the revisions to euro area aggregates for GDP volume growth and for retail trade turnover with the aim to assess whether or not improvements in timeliness of first releases have increased subsequent revisions and whether there are infra-annual patterns of revisions. In order to assess the reliability of the first estimates and of the data releases more generally, (real-time) data sets of GDP volume growth and retail trade turnover in the euro area have been set up. These data sets are described in Section 2, followed by a description of the revision indicators in Section 3. Findings from the revision analyses are presented in Section 4 and, finally, Section 5 concludes.

2. The ECB real-time data sets for the euro area GDP and retail trade

Quarterly national accounts (QNA) data for the euro are compiled and released by Eurostat, based on national data provided by national statistical institutes (NSIs). The revision analysis refers to quarter-on-quarter growth rates, derived from seasonally and working day adjusted data, expressed in constant prices and refers to the euro area-12 composition. At present, Eurostat publishes for GDP volume growth a first estimate (since 2003 referred to as the flash estimate) 45 days after the end of the reference quarter (in May for Q1, in August for Q2, in November for Q3 and in February of the next year for Q4), followed by a first full release within about two weeks later, i.e. 60 days after the end of the reference quarter. A second estimate with full details is provided between 100-103 days after the reference quarter. An estimate typically released in the third quarter of the year after the first estimate, which might incorporate important new information, is what will be called the ‘annual update’. Finally, there is also – at any point in time – a ‘current’ estimate available, reflecting the most recent vintage of data, released in our case in 2007Q1. These estimates will all be considered for our analysis, and referred to throughout this note consistently with the terminology of ‘first’ or ‘flash estimate’, ‘second estimate’, ‘annual update’ and ‘current estimate’. Regular revisions are the result of incorporating more accurate quarterly or annual information, including updated seasonal and working day adjustment parameters. Benchmark revisions undertaken at intervals of five years reflect improved multi-annual source data and methodological improvements. At present, awaiting a harmonisation of national revision policies at a European level, quarterly and annual euro area data are updated two times per quarter (i.e. with each new publication).

The choice of the specific estimates and revisions for our analysis aims at covering the regular and major revisions (intermediate revisions are not considered) and is motivated by the release and revision practices of the statistical offices which are subsequently included in euro area aggregates. Notably, at the occasion of the “annual update”, quarterly estimates are generally aligned with the latest available annual information. The current estimate provides an essential reference, as it generally reflects major benchmark revisions, including methodological improvements, and can be considered the best available estimate of GDP. However, it is important to keep in mind that the release and revision practices of the national statistical offices are currently not co-ordinated among them and this may affect the analysis of euro area revisions.

Retail trade turnover data for the euro area are available on a monthly basis from Eurostat, based on national data provided by NSIs. The revision analysis refers to month-on-month growth rates, derived from seasonally and working day adjusted data, expressed in constant prices and refers to euro area-12 composition. Since the reference period January 2004, Eurostat releases a ‘first estimate’ with limited detail (total, food and non-food) at around 35 days after the reference month; the full euro area details become available one month later (‘second estimate’). Similar to GDP data, the ‘current estimate’ might include data which were not yet subject to the full revision cycle; therefore, we also look at results as available one year after the initial release (‘one-year-later estimate’). For reference periods up to December 2003, only one estimate for the euro area was released by Eurostat at around 65 days after the reference month. The introduction of the first retail trade estimate with a considerable gain in timeliness was a major improvement for the European Statistical System (ESS). For the revision analysis, the whole period under consideration (January 2000 – April 2007) is therefore broken into two-subgroups (January 2000 – December 2003 and January 2004 –April 2007, respectively).

Retail trade turnover is mainly collected via enterprise sample surveys; in addition, some countries make use of administrative sources (VAT declarations). Regular revisions to retail trade data are due mainly to late responses of enterprises, aside from the update of seasonal factors. Occasional major revisions are usually caused by changes in the base year. There is also – at any point in time – a ‘current’ estimate available, reflecting the most recent vintage of data, released in our case in May 2007. The revision analysis will consider the two sub-periods before and after the availability of a “first” or “flash” estimate for retail trade separately. Retail trade estimates will be considered for our analysis, and referred to throughout this note consistently with the terminology of ‘first estimate’, ‘second estimate’, ‘one-year-later estimate’ and ‘current estimate’.

The revisions analysis is based on real time data sets for the euro area for the period 2000Q1-2006Q4 (GDP) and January 2000-April 2007 (retail trade), respectively. This entails a total of up to 28 releases of GDP growth and of 88 releases of retail trade for the euro area. The releases since May 2001 were taken from ECB’s internal revisions database, in which all incoming data vintages from Eurostat have been stored, whereas the releases for earlier periods were taken from the ‘Main Economic Indicators Original

Release Data and Revisions Data Base' of the OECD.⁵ or from data vintages included in the ECB's Monthly Bulletin. These revision data sets were used to compute quarter-on-quarter growth rates of GDP and month-on-month rates for the retail trade turnover, respectively. The analysis considers for the GDP volume growth three releases and for the retail trade two releases (since the Jan 2004 reference period).

3. Revision indicators

In order to analyse the reliability of the early estimates, revision indicators have been compiled which illustrate in which respect and to what extent the first and other estimates of GDP growth and retail trade can be considered as reliable. For the purpose of this note, three dimensions of revisions were selected, namely the size of revisions, the extent to which revisions are consistently positive or negative, and the overall 'normality' of the revisions.

In order to assess the **size of revisions**, we use the average absolute revision (AAR). This is computed as the absolute value of the revisions on average across all revisions, using the formula

$$r_j^{AAR} = \frac{1}{n} \sum_{i=1}^n |\eta_{i,j} - \eta_{i,1}| \quad (1)$$

where n is the number of time series values for which revisions are considered, and $\eta_{i,j}$ is the estimate of the indicator η in period i ($i = 1, 2, \dots, n$) as released in period j ($j = 1, 2, \dots, T$; for GDP growth the periods are quarters), so that the absolute revision between first and second estimate is $|\eta_{i,2} - \eta_{i,1}|$, between first estimate and annual update is $|\eta_{i,4} - \eta_{i,1}|$ (for GDP growth only), and the revision between first and current estimate is $|\eta_{i,T} - \eta_{i,1}|$. By using absolute values, this measure focuses on the size of the revisions, regardless of the sign. The size of revisions is probably the key question in relation to the reliability of first estimates. Furthermore, we report the range of revisions, i.e. the highest and lowest value of revisions.

In order to assess the direction or **sign of revisions**, we use the average revision (AR). This is computed using the formula for the arithmetic average

$$r_j^{AR} = \frac{1}{n} \sum_{i=1}^n (\eta_{i,j} - \eta_{i,1}) \quad (2)$$

where (as above) n is the number of time series values for which revisions are considered, and $\eta_{i,j}$ is the estimate of the indicator η in period i as released in period j , so that $\eta_{i,1}$ is the first estimate, $\eta_{i,2}$ is the second estimate, and $\eta_{i,T}$ is the current estimate. The formula is similar to that of the average absolute

⁵ See 'Performing Revisions and Real-time Analysis. Introducing the Main Economic Indicators Original Release Data and Revisions Data Base' by Richard McKenzie, OECD Statistics Briefs no. 12, 2006.

revision, but takes into account the sign of the individual revisions. This has the effect that if revisions are consistently positive or negative, the average revision would be positive or negative, respectively. The direction or sign of revisions provides evidence whether or not the first estimate is consistently revised up or down, i.e. in which direction the first estimate is ‘biased’. This is important as it may be exploited directly for the anticipation of future revisions. For instance, if the first estimate on average has been revised up in the past, then it may be expected that future first estimates are going to be revised up as well. Furthermore, we count the number of upward and downward revisions.

In order to assess the **volatility of revisions**, we use as a measure the standard deviation of the revisions. This is computed in the usual way using the formula

$$\sigma_j = +\sqrt{\frac{1}{n} \sum_{i=1}^n (\eta_{i,j} - \eta_{i,1} - r_j^{AR})^2} \quad (3)$$

where $\eta_{i,1}$, $\eta_{i,2}$ and $\eta_{i,T}$ are denoted as above, and r_j^{AR} denotes the average revision between the first estimate $\eta_{i,1}$ and the j -th estimate $\eta_{i,j}$ - as defined in (2). The standard deviation is a measure of how different the revisions are from the average revision, i.e. how dispersed they are. Whether revisions are volatile is another important question regarding future releases: if the first estimate is revised sometimes a lot and sometimes a little, it is much more difficult to predict what size a revision will have in future.

The pattern across periods i.e. the infra-annual distribution of revisions provides evidence whether revisions depend on the quarter/month during a year. It is important to understand whether revisions may be larger in some periods than others, whether revisions tend to be consistently positive or negative in some periods but not in others, and whether volatile behaviour may be characteristic of revisions in some periods but not others. Having discussed the size, sign and volatility of revisions on average over the year, this aspect of the analysis links revisions to a specific period during a year. For example, it is not excluded that retail trade turnover data for the observation period December exhibits different revisions as for other months; one reason could be that December is anyway the month with the highest turnover for many retailers (Christmas shopping) and therefore per se more error-prone; furthermore, specific end-year activities (physical stock-taking, end-year company accounts) might have an impact to the reporting behaviour of retailers, leading to an increased number of late respondents with subsequently more revisions.

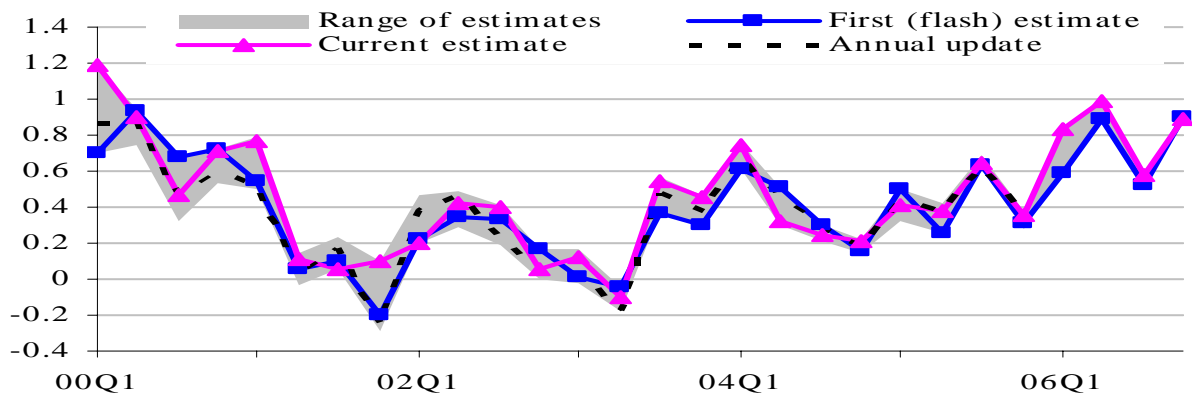
4. Revision analyses for GDP volume growth and retail trade turnover for the euro area

4.1 GDP volume growth

4.1.1 Total revisions

Chart 1 provides information on revisions to first estimates of GDP growth for the euro area aggregate and shows the range of estimates published for a given reference quarter. It thus highlights (as reflected by the range depicted in grey) by how much the estimates for a given quarter may vary over time. As can be seen from this chart, those fluctuations have been relatively limited in the recent past, although prior to that they have on occasions amounted to more than 0.5 percentage points, as was the case in particular in the early part of the sample (notably for 2000Q1).

Chart 1 Evolution of estimates of GDP volume growth for the euro area



Source: ECB calculations based on Eurostat data.

Table 1 summarises the findings from the revision analysis. It should, however, be borne in mind that especially for most recent observations, the ‘current estimates’ have not been subject to the full cycle of revisions. Therefore, the summary results are partially based on observations with incomplete revision cycles and are to be considered as preliminary.

First, the size of revisions is relatively small and euro area estimates can be considered as stable. Between the first and second estimate, euro area GDP estimates are on average not more revised than 0.06 percentage points (pp). However, this comparison is influenced by the fact that several NSIs follow a revision policy that almost by definition excludes revisions between first and second estimates. The assessment shall therefore have a stronger focus on revisions measured between first and annual as well as between first and current estimate.

Between the first and the annual update (i.e. the estimate which is available in the third quarter of the following year) the average absolute revision amounts to 0.09 pp, slightly higher than the amount seen between first and second estimate. Between the first and the current estimate, the average absolute

revision amounts to 0.12pp but the range between +0.5 and -0.2pp points to some larger revisions. This is a non-negligible amount, taking into account that it refers to quarter-on-quarter growth rates which, if annualized, would almost reach 0.5pp. However, this outcome is influenced by one-off effects in benchmark revisions and it is therefore not possible to derive general conclusions. Comparing the size of revisions, those between first and second estimate tend to be smallest and those between first and current estimate tend to be largest, whereas revisions between first estimate and annual update are somewhere in between. This finding is not surprising as more and more data become available over time and the current estimate entails the bulk of revisions, including recent benchmark revisions.

Table 1 Revisions in euro area GDP volume growth (2000Q1 – 2006Q4)
(percentages, if not otherwise indicated)

	First estimate versus second estimate	First estimate versus annual update	First value versus current estimate *)
	<i>Size of revisions</i>		
Average absolute revision	0.06	0.09	0.12
Range of revision	[-0.1 , 0.2]	[-0.2 , 0.2]	[-0.2 , 0.5]
	<i>Sign of revision</i>		
Average revision	0.01	0.00	0.06
Changes in sign	0 out of 28	0 out of 24	1 out of 28
Upward/downward revisions (number of cases)	16/12	11/13	17/11
	<i>Volatility of revision</i>		
Dispersion (standard deviation)	0.08	0.15	0.15

Source: ECB calculations based on Eurostat data.

*) Most recent observations have not been subject to the full cycle of revisions. However, alternative calculations with end-periods of 2005Q4 and 2004Q4 have not changed the overall findings; for example, the average absolute revision was 0.13 (2004Q4) and 0.12 (2005Q4), the average revision was 0.06 and 0.05 and the standard deviation was 0.17 and 0.15 respectively.

With regard to the sign of revisions, average revision or ‘bias’ tends to be negligible: 0.01pp for first versus second estimate, 0.0 for first versus annual and 0.06pp for first versus current estimate. Although very small, these values are positive, indicating that earlier releases are generally underestimating the later results. The existence of such a small positive bias suggests that on the basis of past experience, one might expect first estimates to be revised up by almost 0.1 percentage point for the euro area. When counting the cases of upward and downward revisions, an almost balanced picture points to almost equal cases of upward and downward revisions of the various estimates. With regard to changes in the sign of the estimate, no change was identified in the first versus second estimate and in the first versus annual and only one case for first versus current estimate.

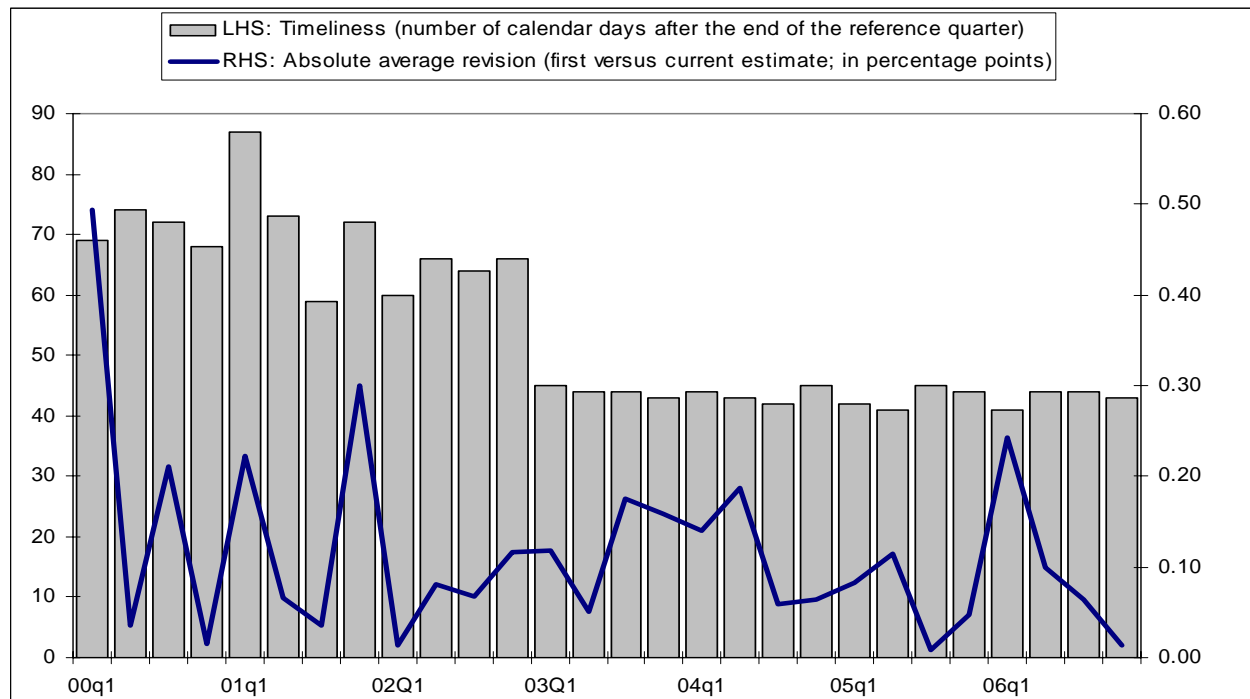
The volatility of GDP revisions is small and, similar to the other revision indicators, volatility also increases over time. The least volatile revision (standard deviation of 0.08) are those between first and second estimate, somewhat higher volatility (0.15) has been recorded for revisions between first and second as well as for first versus current estimate.

4.1.2 Timeliness

Timeliness for euro area GDP volume growth has improved considerably since 2000, namely from around 70 days to around 44 days. The whole period can be sub-divided into 2000q1 until 2002q4 and 2003q1 until 2006q4; caused by the introduction of a euro area flash estimate (with less details but available already at around 45 days after the end of the reference quarter). The average timeliness for the earlier sub-period is 69 days and the average for the second sub-period is 43 days. With regard to a possible trade-off between timeliness and revisions, findings are based on incomplete revision cycles for recent data and might therefore be subject to future updates.

With regard to the size of revisions, the average absolute revision over the whole period was 0.12pp, whereas for the earlier period it was 0.14pp and for the later period it was 0.10pp. Improved timeliness of the flash estimate (admittedly with less information and no further details provided by the time of the public release) did not lead to increased absolute revisions, quite contrary, since the euro area GDP flash estimate was introduced, the amount of revisions between the first release and the current estimate decreased markedly to 0.10pp on average (see chart 2). Similar results for the ‘annual update’ confirm these findings.

Chart 2: Timeliness and average absolute revisions for euro area GDP volume growth

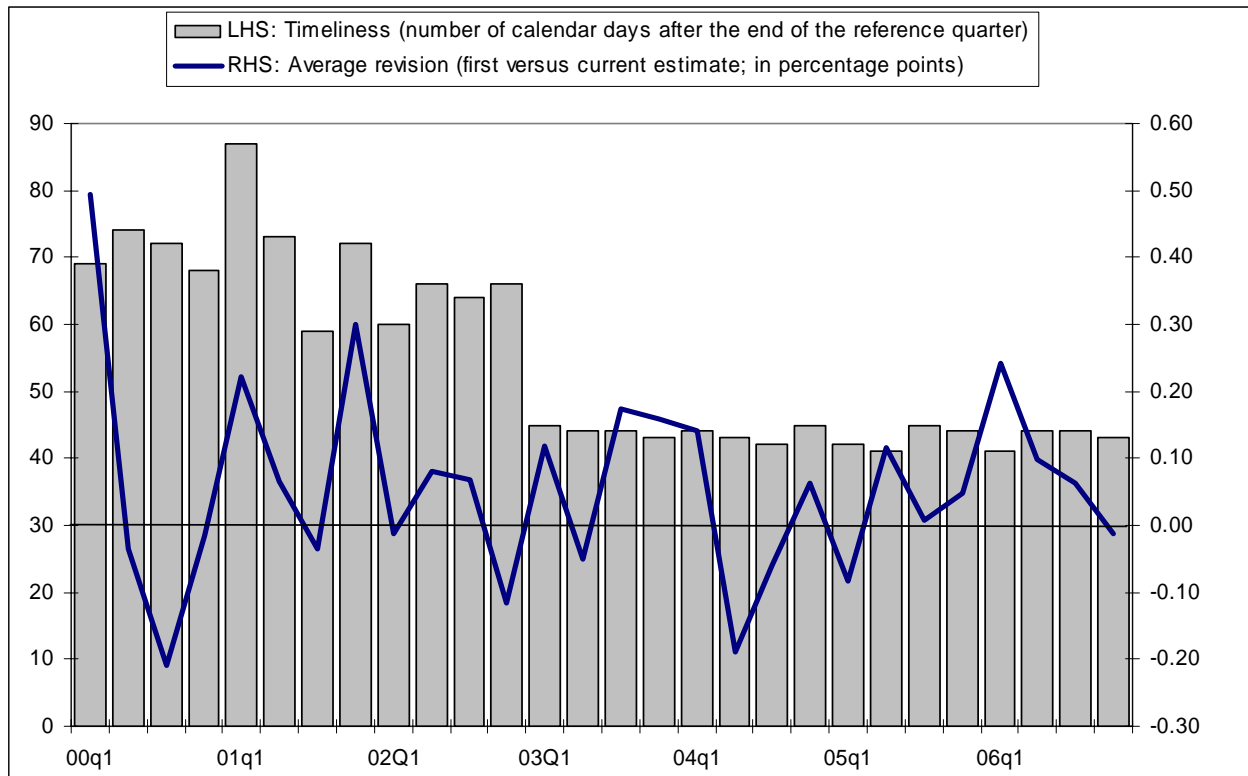


Source: ECB calculations based on Eurostat data.

With regard to average revisions, they amounted for the ‘current estimates’ to +0.07pp for the earlier period and to +0.05pp for the later period; over the whole period 2000-2006, the average revision was +0.06. When calculated for the ‘annual update’, average revisions were even closer to zero-values,

confirming that improved timeliness of the flash estimate did not lead to increased average revisions (see chart 3).

Chart 3: Timeliness and average revisions for euro area GDP volume growth



Source: ECB calculations based on Eurostat data.

4.1.3 Quarter-by-quarter revisions

Revisions quarter by quarter provide details on the infra-annual distribution of revisions. Splitting the whole sample of 28 observations over 4 quarters reduces the sample sizes for each quarter drastically and, therefore, conclusions are even less broadly based. Table 2 uses the same statistics as computed so far, but on a quarter-by-quarter basis; blue shaded cells indicate highest values among the quarters.

Interestingly, the size of revisions differs across quarters; although, in general, these differences remain small in particular for first versus second estimate but gain some grounds when first estimates are compared with the annual update and the current estimate. In summary, higher values for the various revision indicators are mostly recorded during the first half of the year (see blue shaded cells in Table 2). Looking at their quarterly profile, average absolute revisions vary rather significantly. For first and current estimates, highest revisions are recorded for 1st quarters (0.08pp and 0.19pp respectively); lowest revisions are recorded for 3rd quarters (0.05pp and 0.09pp, respectively). Similar as for the average of all quarters, there is an increasing path in the size of revisions from first, to annual and to current estimate. Similar to this profile, largest ranges of revisions are identified for 1st and/or 3rd quarters, whereas smaller ranges are identified for the other quarters of the year.

Table 2 Quarter-by quarter revisions in euro area GDP volume growth
(percentages, if not otherwise indicated)

	First estimate versus second estimate	First estimate versus annual update	First value versus current estimate
	<i>Average absolute revision</i>		
First quarters	0.08	0.08	0.19
Second quarters	0.04	0.09	0.09
Third quarters	0.05	0.09	0.09
Fourth quarters	0.06	0.08	0.10
All quarters	0.06	0.09	0.12
	<i>Range of revisions</i>		
First quarters	[0 , 0.2]	[-0.1 , 0.2]	[-0.1 , 0.5]
Second quarters	[-0.1 , 0]	[-0.1 , 0.1]	[-0.2 , 0.1]
Third quarters	[-0.1 , 0.1]	[-0.2 , 0.1]	[-0.2 , 0.2]
Fourth quarters	[-0.1 , 0.1]	[-0.1 , 0.1]	[-0.1 , 0.3]
All quarters	[-0.1 , 0.2]	[-0.2 , 0.2]	[-0.2 , 0.5]
	<i>Average of revisions</i>		
First quarters	0.06	0.05	0.16
Second quarters	-0.01	0.00	0.01
Third quarters	0.01	-0.03	0.00
Fourth quarters	-0.04	-0.03	0.06
All quarters	0.01	0.00	0.06
	<i>Volatility of revisions (standard deviation)</i>		
First quarters	0.09	0.10	0.19
Second quarters	0.06	0.11	0.11
Third quarters	0.00	0.00	0.00
Fourth quarters	0.07	0.10	0.13
All quarters	0.08	0.15	0.15

Source: ECB calculations based on Eurostat data.

The sign of revisions alters between quarters but highest, positive values occur for the 1st quarter., especially for the current estimate (0.16pp); corresponding values for 2nd (0.01), 3rd (0.0) or 4th quarters (0.06) are significantly lower, but remain positive. The underestimation of 1st quarters might be due to increased uncertainty on the amount of the carry-over effect of GDP⁶ or due to other beginning-of-the-year circumstances (e.g. legal acts often enter into force at the start of the year).

The volatility of revisions confirms a pattern of increased standard deviation in the first half of the year as well as an increase from first, to annual and to current estimates. The exception being the 3rd quarter, which shows no volatility.

⁶ A carry-over effect occurs if the level of an economic variable during the fourth quarter of the year differs from its average level during the whole year. Assuming, for example, that the level of a certain variable during the fourth quarter exceeds its average yearly level by x%. In that case, an unchanged level of this variable during the next year (compared to the last quarter of the previous year) will result in an average level in that year which is x% higher than the average level in the preceding year. Taking account of carry-over effects improves the quality of forecasts of the growth rates of economic variables on an annual basis. The ECB refers occasionally to this effect in its staff macroeconomic forecasts (see <http://www.ecb.int/pub/pdf/other/ecbstaffprojections200503en.pdf>).

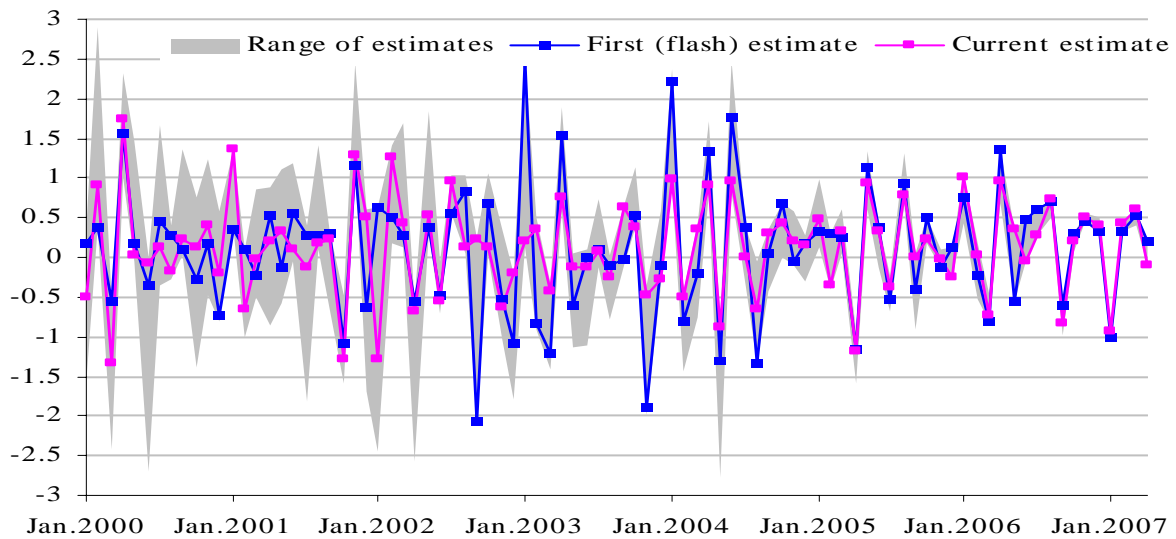
In conclusion, the breakdown of revisions into different quarters shows that there is a quarterly profile of revisions and that somewhat higher revisions occur in the 1st half of the year, whereas quarters of the second half of the year tend to show somewhat more stable and less volatile estimates.

4.2 Retail trade turnover

4.2.1 Total revisions

Chart 4 plots revisions between first releases and current estimates of euro area retail trade turnover and shows the range of estimates for a given reference month. It thus highlights (as reflected by the range depicted in grey) by how much the first estimate for a given month varied over time. As can be seen from this chart, there were periods of rather high revisions (early-2000, turn of the year 2001, mid-2002 until mid-2004) as well as periods with smaller fluctuations of the revisions. The flash estimate for euro area retail trade turnover (with only limited detail, providing breakdowns for total food and total non-food retail) is available since the reference period January 2004. Especially over the recent few years, the ranges of estimates have considerably narrowed, signalling some stabilisation of the euro area results.

Chart 4 Evolution of estimates of retail trade turnover growth for the euro area



Source: ECB calculations based on Eurostat and OECD data.

Table 3 summarises the findings from the revision analysis, respectively for the periods one month later, two months later, one year later and compared to the current estimate. Each category is broken down for before and after the introduction of retail trade flash estimates in Jan2004.

With regard to the size of revisions, they are significant for all periods and reach levels above 0.2pp (for the month-on-month growth rate). For results before and after the introduction of the flash estimate, there is almost no difference for revisions ‘one-month later’ or ‘two-months later’. However, the size of revisions differs considerably between the two sub-periods for the ‘one-year later’ (0.55pp versus 0.36pp)

and the 'current' estimate (0.54pp versus 0.30pp). Comparing the absolute average revisions for the different categories, the first estimate is significantly revised within the month following its release, less so during the month thereafter, but further significant revisions were recorded up to one year later. Comparing results before/after the flash introduction, the absolute revisions have been significantly reduced for the 'one-year later' and the 'current' estimate, but remain at elevated levels. The range of revisions confirm this positive development; for example, the range of revisions for the one-year later estimate decreased from (-1.9 to +1.5) to (-0.8 to +0.9); similar improvements are observed for almost all other categories.

Table 3 Revisions in euro area retail trade turnover growth (Jan2000 – Apr2007)
(percentages, if not otherwise indicated)

	First release versus 1 month later		First release versus 2 months later		First release versus 1 year later		First release versus current final *)	
	Before flash	After flash	Before flash	After flash	Before flash	After flash	Before flash	After flash
	<i>Size of revisions</i>							
Average absolute revision	0.21	0.22	0.26	0.24	0.55	0.36	0.54	0.30
Range of revisions	[-1.1 , 1.2]	[-0.9 , 0.6]	[-1.0 , 1.0]	[-1.3 , 0.7]	[-1.9 , 1.5]	[-0.8 , 0.9]	[-2.3 , 2.3]	[-1.2 , 0.9]
	<i>Sign of revisions</i>							
Average revision	0.02	-0.12	0.05	-0.09	0.05	-0.08	0.05	-0.04
Changes in sign	5 out of 48	4 out of 40	25 out of 48	18 out of 39	12 out of 48	7 out of 29	11 out of 48	9 out of 40
Upward/downward revisions (cases)	28/18	13/27	30/18	19/20	29/19	12/17	23/25	21/19
	<i>Volatility of revisions</i>							
Dispersion (standard dev.)	0.31	0.26	0.34	0.33	0.71	0.43	0.77	0.40

Source: ECB calculations based on Eurostat and OECD data.

*) For most recent observations, current estimates have not been subject to the full cycle of revisions. However, alternative calculations with end-period Dec2005 have not changed the overall findings; for example, the average absolute revision was 0.34, the average revision was -0.07 and the standard deviation was 0.45.

With regard to the sign of revisions, average revision or 'bias' tends to be rather small for both periods prior or after the flash introduction but with somewhat larger values for the period 'after flash'. Furthermore, there are changes in the direction of the bias. For periods after the introduction of the flash estimate, the bias is always negative, indicating that earlier releases are generally overestimating the later results, whereas for periods before the flash estimate, the bias is always positive, indicating that earlier releases are generally underestimating the later results. The existence of such a small negative bias for 'after flash' periods suggests that probably those enterprises included in the flash estimate are not fully representative for the whole sample. Despite the small bias, the relatively high number of changes in sign as well as the high number of upward and downward revisions underlines the uncertainty of results included in the first estimate. This holds for periods before and after the introduction of the flash estimate.

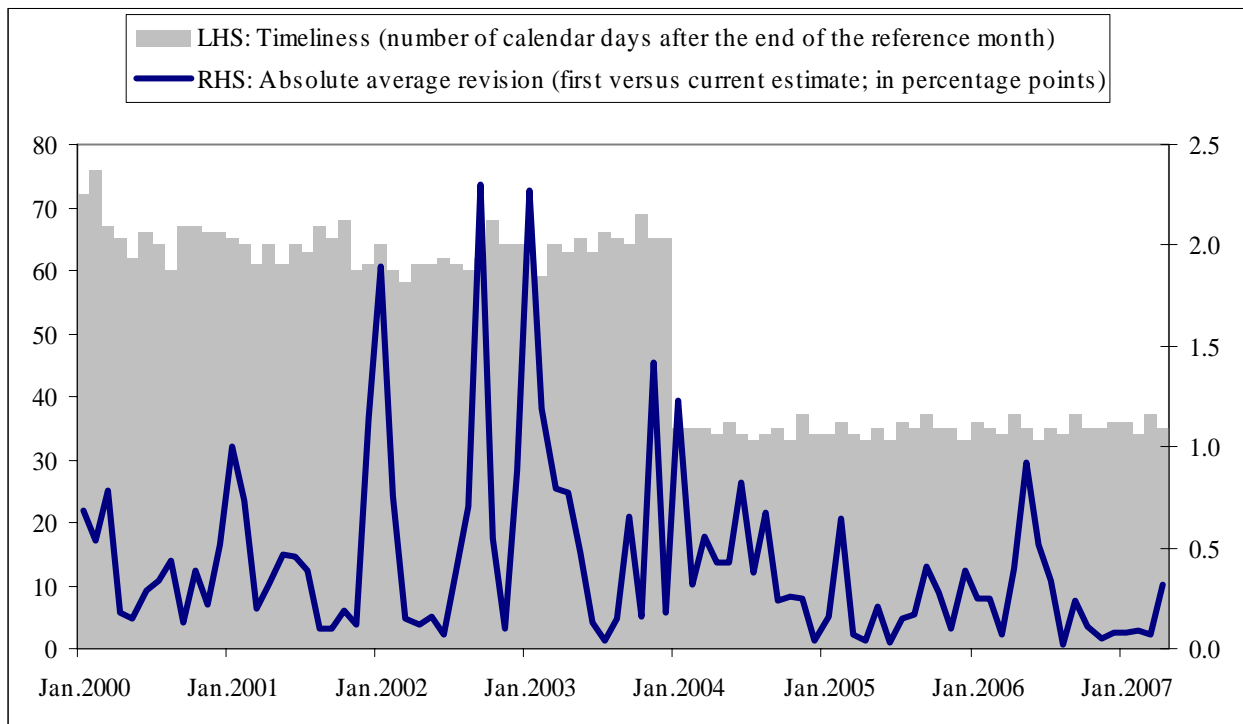
The volatility of retail trade turnover revisions is relatively high, with increased values for pre-flash estimate periods. Since the introduction of the flash estimate, the standard deviation of the revisions decreased, e.g. from 0.77 to 0.40 for the current estimate and from 0.71 to 0.43 for the ‘one-year later’ estimate.

4.2.2 Timeliness

Timeliness for euro area retail trade turnover has improved considerably since 2000 from almost 70 days to around 35 days in 2007. This major improvement in timeliness was achieved in January 2004 with the introduction of euro area flash estimate at around 35 days after the end of the reference month, improving the timeliness by around 30 days. The period under consideration for the revision analysis has therefore been sub-divided into January 2000 until December 2003 and January 2004 until April 2007. The average timeliness for the earlier sub-period was 64 days, for the second sub-period 35 days and for the whole period, the average timeliness was 51 days.

With regard to the size of revisions, the average absolute revision over the whole period was 0.43pp, whereas for the period before flash it was 0.54pp and for the later period it was 0.30pp for the current estimate; similar improvements were recorded for the ‘one-year-later’ release (0.55pp down to 0.36pp). The introduction of the flash estimate with significantly improved timeliness of the first retail trade turnover estimate did lead to decreased absolute revisions.

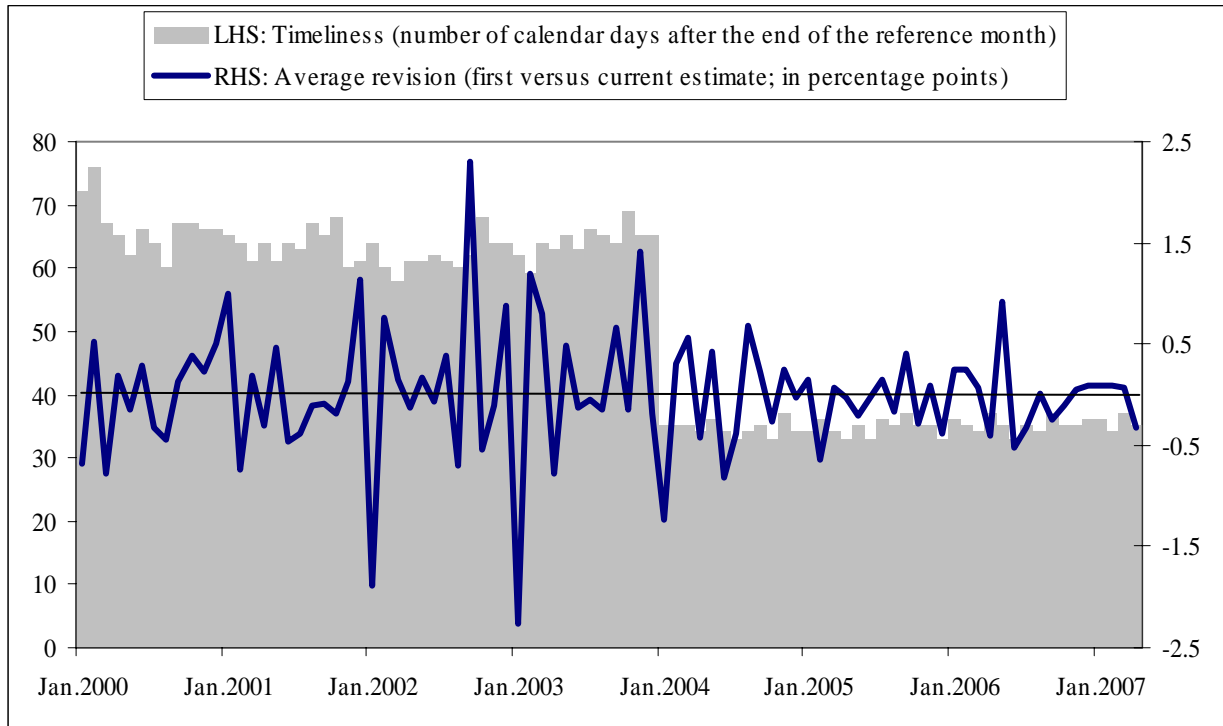
Chart 5: Timeliness and average absolute revisions for euro area retail trade turnover



Source: ECB calculations based on Eurostat and OECD data.

With regard to average revisions, they amounted to +0.05pp for the earlier period and to -0.04pp for the later period; over the whole period January 2000 - April 2007, the average revision was +0.01. Although the improved timeliness of the flash estimate did not lead to increased average revisions, the sign of the average revisions changed from positive for the earlier period to negative for the later period (see chart 6).

Chart 6: Timeliness and average revisions for euro area retail trade turnover



Source: ECB calculations based on Eurostat and OECD data.

4.2.3 Month-by-month revisions

Revisions month-by-month provide details on the infra-annual distribution of revisions. Splitting the whole sample of 88 observations over 12 months reduces the sample sizes drastically; therefore, conclusions call for even higher caution, also taking into account that recent observations were not yet subject to the complete revision cycle. Table 4 uses the same statistics as computed so far, but on a month-by-month basis; blue shaded cells indicate highest values among the different months.

UNCLASSIFIED

Table 4 Month-by month revisions in euro area retail trade turnover
(percentages, if not otherwise indicated)

	First release versus 1 month later		First release versus 2 months later		First release versus 1 year later		First release versus current final	
	Before flash	After flash	Before flash	After flash	Before flash	After flash	Before flash	After flash
	<i>Average absolute revision</i>							
January	0.38	0.14	0.34	0.12	0.88	0.42	1.46	0.43
February	0.11	0.16	0.17	0.16	0.61	0.41	0.80	0.33
March	0.17	0.10	0.22	0.13	0.37	0.19	0.48	0.19
April	0.12	0.28	0.27	0.22	0.53	0.32	0.35	0.29
May	0.18	0.38	0.23	0.60	0.47	0.54	0.31	0.52
June	0.23	0.28	0.27	0.44	0.70	0.34	0.24	0.46
July	0.14	0.21	0.13	0.34	0.65	0.23	0.29	0.29
August	0.15	0.35	0.15	0.20	0.33	0.49	0.35	0.29
September	0.49	0.35	0.46	0.22	0.53	0.22	0.80	0.29
October	0.14	0.29	0.28	0.29	0.43	0.49	0.32	0.22
November	0.19	0.05	0.22	0.08	0.61	0.34	0.47	0.13
December	0.17	0.16	0.35	0.19	0.47	0.34	0.68	0.17
All months	0.21	0.22	0.26	0.24	0.55	0.36	0.54	0.30
	<i>Range of revisions</i>							
January	-1.1 , 0.2	-0.3 , 0.2	-1.0 , 0.1	-0.3 , 0.1	-1.9 , 0.2	-0.8 , 0.3	-2.3 , 1.0	-1.2 , 0.2
February	-0.3 , 0.1	-0.3 , 0.1	-0.1 , 0.3	-0.3 , 0.1	-0.7 , 1.1	-0.4 , 0.4	-0.7 , 1.2	-0.6 , 0.3
March	-0.3 , 0.1	-0.1 , 0.1	-0.3 , 0.4	-0.2 , 0.2	-0.5 , 0.8	-0.1 , 0.4	-0.8 , 0.8	0.1 , 0.6
April	-0.3 , 0.0	-0.4 , 0.1	-0.6 , 0.0	-0.4 , 0.1	-1.2 , 0.4	-0.5 , 0.0	-0.8 , 0.2	-0.4 , 0.0
May	-0.2 , 0.4	-0.9 , 0.3	-0.3 , 0.5	-1.3 , 0.5	0.2 , 0.6	-0.5 , 0.9	-0.2 , 0.5	-0.2 , 0.9
June	-0.5 , 0.1	-0.3 , 0.3	-0.5 , 0.0	-0.4 , 0.7	-1.2 , 0.5	-0.5 , -0.2	-0.5 , 0.3	-0.8 , 0.0
July	0.0 , 0.3	-0.4 , 0.0	0.0 , 0.3	-0.6 , -0.2	-1.8 , 0.4	-0.4 , -0.1	-0.4 , 0.4	-0.4 , 0.1
August	-0.3 , 0.2	-0.3 , 0.6	-0.3 , -0.1	0.0 , 0.6	-0.3 , 0.8	-0.2 , 0.8	-0.7 , -0.1	-0.2 , 0.7
September	-0.3 , 1.2	-0.5 , -0.2	-0.1 , 1.0	-0.3 , -0.1	-0.4 , 1.5	-0.2 , 0.2	-0.1 , 2.3	-0.2 , 0.4
October	0.1 , 0.2	-0.3 , -0.2	0.1 , 0.5	-0.4 , -0.2	-0.4 , 1.0	-0.7 , -0.3	-0.5 , 0.4	-0.3 , -0.1
November	-0.1 , 0.5	0.0 , 0.1	-0.2 , 0.5	0.1 , 0.1	-0.3 , 0.8	0.1 , 0.6	-0.1 , 1.4	0.1 , 0.2
December	-0.1 , 0.4	-0.2 , -0.1	0.1 , 0.5	-0.3 , 0.2	0.0 , 1.0	-0.4 , -0.3	-0.2 , 1.1	-0.4 , 0.1
All months	-1.1 , 1.2	-0.9 , 0.6	-1.0 , 1.0	-1.3 , 0.7	-1.9 , 1.5	-0.8 , 0.9	-2.3 , 2.3	-1.2 , 0.9
	<i>Sign of revisions</i>							
January	-0.24	0.00	-0.25	-0.02	-0.76	-0.12	-0.96	-0.19
February	-0.05	-0.06	0.11	-0.10	0.26	-0.14	0.43	0.00
March	-0.04	-0.02	0.08	0.01	0.08	0.11	0.09	0.19
April	-0.12	-0.24	-0.26	-0.08	-0.35	-0.31	-0.26	-0.29
May	0.01	-0.21	0.04	-0.25	0.47	0.19	0.24	0.38
June	-0.15	-0.07	-0.26	0.02	-0.39	-0.34	-0.09	-0.46
July	0.14	-0.21	0.13	-0.34	-0.27	-0.23	-0.09	-0.19
August	-0.04	0.04	-0.15	0.20	0.05	0.34	-0.35	0.18
September	0.35	-0.35	0.39	-0.22	0.32	0.00	0.75	0.13
October	0.14	-0.29	0.28	-0.29	0.24	-0.49	-0.13	-0.22
November	0.13	0.02	0.11	0.08	0.45	0.34	0.41	0.13
December	0.13	-0.16	0.35	-0.08	0.47	-0.34	0.59	-0.11
All months	0.02	-0.12	0.05	-0.09	0.05	-0.08	0.05	-0.04

Source: ECB calculations based on Eurostat and OECD data.

Table 4 (cont'd) Month-by month revisions in euro area retail trade turnover
(percentages, if not otherwise indicated)

	First release versus 1 month later		First release versus 2 months later		First release versus 1 year later		First release versus current final	
	Before flash	After flash	Before flash	After flash	Before flash	After flash	Before flash	After flash
	<i>Volatility of revisions (standard deviation)</i>							
January	0.57	0.20	0.52	0.18	0.89	0.59	1.47	0.70
February	0.17	0.20	0.17	0.18	0.74	0.47	0.83	0.44
March	0.20	0.12	0.29	0.17	0.52	0.24	0.65	0.25
April	0.15	0.21	0.27	0.32	0.64	0.29	0.31	0.22
May	0.24	0.59	0.32	0.91	0.21	0.73	0.30	0.57
June	0.29	0.33	0.24	0.59	0.83	0.18	0.30	0.40
July	0.14	0.18	0.15	0.24	1.06	0.18	0.35	0.29
August	0.22	0.48	0.08	0.31	0.48	0.70	0.28	0.44
September	0.63	0.18	0.48	0.11	0.82	0.31	1.08	0.34
October	0.04	0.06	0.16	0.11	0.59	0.25	0.39	0.09
November	0.29	0.06	0.32	0.02	0.53	0.38	0.68	0.10
December	0.20	0.09	0.19	0.22	0.43	0.07	0.57	0.24
All months	0.31	0.26	0.34	0.33	0.71	0.43	0.77	0.40

Source: ECB calculations based on Eurostat and OECD data.

Similar to the infra-annual distribution of revisions for GDP volume growth, revisions to retail trade turnover are not equally distributed across the months of the year. In summary, highest values for the various revision indicators are recorded mostly during the first half of the year and almost no highest values were observed for the 4th quarter of the year (see blue shaded cells in Table 4). Regarding the size of revisions, for the pre-flash period, highest values were recorded for January observations (with the exception of the 2-month later estimate), whereas for all after-flash periods, highest values were recorded for May observations. For the months before the end of the year, which usually contribute most to annual retail trade turnover, average absolute revisions are generally below the average for all months, however, the December values are mostly above those recorded for November. For the range of revisions, there is a significantly smaller range for after-flash revisions than those recorded for the period before the flash estimate was introduced, in particular for the one-year-later period.

The sign of revisions alters between positive and negative and it is difficult to derive a general pattern from this non-regular behaviour. However, for the Christmas-shopping month December, the sign of revisions is negative for all periods after the introduction of the flash, signalling an overestimation of first results. In total, there are more negative than positive biases and there is a higher concentration of larger biases in the first half of the year.

The volatility of revisions varies quite considerably across months. Comparing the volatility for the periods before and after the introduction of the flash, in the majority of cases, the variability in size of revisions was smaller after the flash estimate was introduced than it was before the flash. The general pattern of increased standard deviation in the first half of the year is equally confirmed.

In conclusion, the breakdown of revisions into different months shows a diverse picture with no clear general rule for individual months. However, larger revisions are recorded in the first half of the year and the revisions for the Christmas-shopping period are not extraordinary. These preliminary findings are based on a small number of observations per month and shall be interpreted with considerable caution,

5. Conclusions

In this note, the reliability of estimates for GDP volume growth and retail trade turnover in the euro area has been examined. In the first instance, statistics suitable to capture the key properties of revisions between the first and subsequent estimates have been computed in order to assess whether revisions are large, positive or negative (i.e. are 'biased') or volatile. Secondly, developments in timeliness have been compared with the developments of revisions. Finally, the infra-annual distribution of revisions has been examined with the aim to identify whether revisions differ across quarters (for GDP) or months (for retail trade) during a year.

A few *caveats* nevertheless are worth pointing out. First, the samples considered are relatively small, covering the period starting since 2000. Since the start of EMU, the statistics for the euro area have undergone drastic changes towards a more harmonised methodology and synchronised releases of national and European data. Implementing revised methodologies (e.g. ESA95) might have introduced one-off revisions in national data, with subsequent effects on euro area aggregates. However, experiences show that revisions in national data often tend to offset each other in euro area aggregates, at least to certain extent. However, possible implications of such methodological changes or changes in data collection, sampling or data processing have not been separated from total revisions in this paper. Next, there is no explicit distinction between different sources of revisions; e.g. for GDP, there have been revisions that solely reflect new data but also major (benchmark) revisions reflecting a change in statistical methodology, notably the introduction of chain-linking in the context of ESA95. Furthermore, economic statistics usually undergo a cycle of revisions which could span over several years (e.g. benchmark revision of National Accounts). Many of the data used for this study have not yet been fully and finally revised; this is especially true for more recent observations. Finally, the country coverage in euro area aggregates has changed over time, with more countries reporting data and which are subsequently included in euro area totals. In particular for flash estimates, it is assumed that increased country coverage rates have increased the reliability of these early estimates with a subsequent decrease in revisions. The aspect of changes in country coverage has not been analysed in this paper.

The *key findings* from the revisions analysis are as follows.

For **GDP volume growth**, on average, all the revision indicators signal small amounts of revisions and euro area estimates can be considered as stable. This holds for the size of revisions (0.06pp for first versus second estimate, 0.09pp for first versus the annual update and 0.12pp for first versus the current estimate), the sign of revisions (negligible amounts of 0.01pp, 0.0 for annual and 0.06pp, respectively) and for the volatility of revisions (0.15 for the current estimate). Second, timeliness for euro area GDP volume

growth has improved considerably since 2000 from around 70 days to around 44 days. Overall, the improved timeliness of the GDP flash estimate did not lead to increased revisions. Thirdly, the breakdown of revisions into different quarters shows different profiles for quarters. In summary, higher values for the various revision indicators are mostly recorded during the first half of the year.

For **retail trade turnover**, two distinct periods were analysed namely the period before the introduction of the euro area flash estimate (Jan 2000 – Dec 2003) and the period thereafter (Jan 2004 – April 2007). There were periods of rather high revisions (early-2000, turn of the year 2001, mid-2002 until mid-2004) as well as periods with smaller revisions. Especially over the recent past, the ranges of revisions have narrowed, signalling some increase in the reliability of euro area results. However, the size of revisions is significant for all periods considered and reached levels above 0.2pp (for the month-on-month growth rate). The sign of revisions or ‘bias’ tends to be relatively small for both periods prior and after the flash introduction. However, there are changes in its direction: For periods after the introduction of the flash estimate, the bias is negative, indicating that earlier releases are generally overestimating the later results, whereas for periods before the flash estimate, the bias is positive, indicating that earlier releases were generally underestimating the later results. The volatility of revisions is relatively high, with increased values for pre-flash estimate periods. Since the introduction of the flash estimate, the standard deviation of the revisions decreased significantly, e.g. from 0.77 to 0.40 for the current estimate. Timeliness for euro area retail trade turnover has improved considerably since 2000 from almost 70 days to around 35 days. Significantly improved timeliness of the first estimate did not lead to increased absolute revisions and, since the introduction of the retail trade flash estimate in January 2004, the amount of revisions between the flash and the estimate one-year-later decreased markedly from 0.55pp to 0.36pp on average. Revisions are not equally distributed across the months of the year although the overall picture provides no clear general rule for individual months. However, larger revisions are recorded in the first half of the year and the revisions in the Christmas-shopping period are not extraordinary.

Overall, the analysis presented in this note suggests that revisions to euro area aggregates for GDP volume growth and retail trade turnover have become smaller over time. The significant improvements in timeliness have not led to subsequently higher revisions, larger biases or higher volatility. The infra-annual distribution suggests that revisions tend to be higher in the first half of the year.

References

Branchi, M., Dieden, H. C., Haine, W., Horváth, C., Kanutin, A. and Kezber, L. “Analysis of revisions to general economic statistics”; ECB Occasional Paper no 74, October 2007.

Di Fonzo, T. (2005) “The OECD Project on Revisions Analysis: First Elements for Discussion”, *Review of Economics and Statistics*, vol. 60, pp. 193-200.

ECB Monthly Bulletin “The reliability of estimates of euro area GDP growth and its components”, June 2006; Box 8, pp. 62-64.

McKenzie, R. “Performing Revisions and Real-time Analysis. Introducing the Main Economic Indicators Original Release Data and Revisions Data Base”, OECD Statistics Briefs no. 12, 2006.