



OECD SHORT-TERM ECONOMIC STATISTICS WORKING PARTY  
(STESWP)

**Revision Analysis for General Economic Statistics**

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Submitted to the Working Party under item 3 of the draft agenda

Meeting:  
26 – 28 June 2006

Franqueville Room  
OECD Headquarters, Paris  
Starting at 9:30 a.m. on the first day



EUROPEAN CENTRAL BANK

DIRECTORATE GENERAL STATISTICS

23 May 2006  
S/EAE/GES/2006/107

## REVISION ANALYSIS FOR GENERAL ECONOMIC STATISTICS<sup>1</sup>

### EXECUTIVE SUMMARY

*Following recent discussions regarding revisions and uncertainties in macroeconomic data, this note quantifies recent revisions to selected economic indicators, compares them with medium-term averages of revisions and links them with average growth rates. The analysis covers the euro area, its six largest member countries (Belgium, Germany, Spain, France, Italy and the Netherlands), the United Kingdom and, where data availability permits, the United States and Japan. The focus is on three aspects of revisions, namely 1) their average absolute size, 2) the potential bias of first estimates (measured by the average difference between the latest and first releases), and 3) the stability of first releases (measured by the ranges of revisions, and cumulated revisions since the first releases). In most cases, the analysis covers revisions for data from 1999 onwards and focuses on period-on-period growth rates.*

*The main results of the analysis are:*

*(1) Euro area first releases have been more stable than data for individual euro area countries, as revisions tend to cancel out at the euro area aggregate level. The first releases for the euro area aggregates show a very small or no bias. In particular, this is the case for revisions of data released from 2001 onwards, which underlines the role of euro area statistics for euro area analysis. Revisions of 1999 and 2000 data were more substantial, also due to the implementation of new legal requirements for statistics at that time (e.g. the ESA 95).*

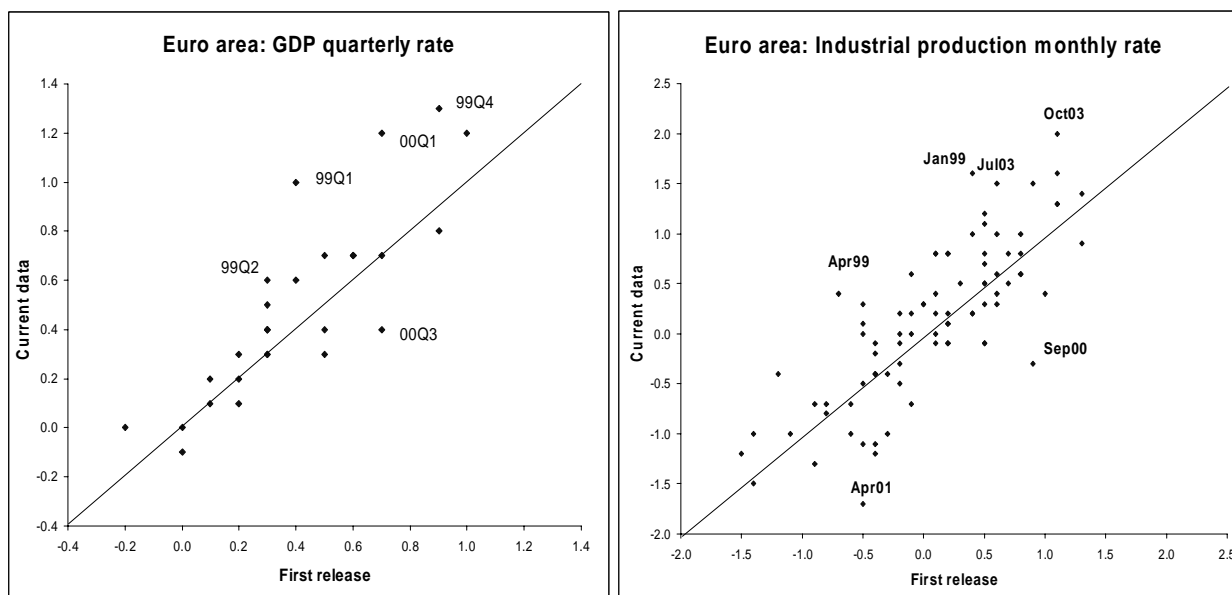
*(2) At the euro area level, revisions to date have not been higher for 2005 than for past periods. However, results released in 2005 will be subject to further revisions in 2006 and thereafter. Despite the relatively small revisions, their combination with the recent low growth of the euro area economy may have increased the perceived uncertainty concerning the releases of euro area economic indicators. In relative terms, average absolute revisions often exceeded average growth: in particular this applies to euro area retail trade and industrial production. There is no evidence of cyclicity in euro area revisions; however, as available historic vintages of revisions for the euro area cover only a few years, it is too early to draw*

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<sup>1</sup> The paper has been produced by H. Ahnert, M. Branchi, H. Dieden, W. Haine, C. Horvath, A. Kanutin and L. Kezber in the Euro Area Accounts and Economic Statistics Division (General Economic Statistics Section). Comments from S. Keuning and G. Quiros (DG Statistics), L. Reichlin (DG Research), L. Bilke, C. Bowles, N. Kennedy, G. Kenny and N. Vidalis (DG Economics) are gratefully acknowledged. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the European Central Bank.

The revision analysis for general economic statistics is independent of the multiple uses made of these statistics. The objective of this analysis is therefore different from the objective of the Euro Area Real Time Database (EA-RTDB), a Eurosystem project in the context of the Euro Area Business Cycle Network. Within the general objective of establishing facts and stimulating research on the broad topic of real-time analysis, the EA-RTDB can be particularly valuable, for instance, in assessing the impact of data revisions on monetary policy decisions.

definitive conclusions on this aspect. For GDP and industrial production, the relation between first and final estimates are shown in the following charts (points on the diagonal indicate zero revision).



(3) Euro area releases for quarterly GDP volume growth have been particularly stable since 2001/2002; the highest revisions equalled 0.2 percentage point. GDP expenditure components have been subject to larger revisions. In particular, this concerns the estimates for quarter-on-quarter growth of gross fixed capital formation, exports and imports. Revisions of the first release of euro area GDP volume growth for the first and fourth quarters have not been higher than revisions for other quarters.

(4) In general, monthly general economic statistics are more volatile and subject to higher revisions than lower frequency data. First releases for euro area quarterly employment and labour cost growth rates have been quite stable, with largest revisions equalling 0.2 percentage point. The first releases of monthly industrial production and unemployment statistics have been more volatile. The first results for compensation of employees data and, in particular, for retail trade turnover statistics have been revised quite substantially. The HICP flash estimate has been unbiased and revisions exceeded 0.1 percentage point only in exceptional cases.

(5) Euro area statistics published today differ substantially from the euro area statistics at the start of the Monetary Union. Most first releases are published with a higher country coverage, and, at the same time are significantly more timely than in 1999. At the same time, their reliability has certainly not deteriorated, and in several cases increased.

(6) The EU-wide revisions in national accounts data in 2005 had only a minor impact on GDP growth estimates. The main issue has been the lack of coordination across countries on the implementation (timing) of these changes, and not so much their magnitude; this situation will last until 2007. It is expected that the next series of major revisions will occur in 2011 and will be much better coordinated.

(7) Revisions in euro area employment level data mainly originated from new population census data for Spain and methodological improvements in Germany. While the improvements are welcome, it is a

concern that these sizeable changes were still necessary. Furthermore, late releases of employment data for some countries have caused revisions.

(8) For individual euro area countries the situation is less favourable than for the euro area as a whole and varies by indicator. In a few cases there is evidence of systematic upward or downward revisions; examples are the first releases for industrial production for Belgium, Germany and the Netherlands. Moreover, in many cases the range of the revisions and the volatility of the first estimates are high, and sometimes very high. This is the case for industrial production (BE, NL), retail trade (BE, DE, FR), employment (NL), and compensation per employee (DE).

(9) In principle, the euro area statistics should be revised each time any new or revised national statistic (of a larger country) becomes available. The volatility of euro area key indicators could thus be reduced significantly if release and revision calendars of these national statistics are (more) attuned. The recent progress in co-ordinating release calendars (e.g. for GDP and HICP flash estimates) is welcome and should continue without jeopardizing the timeliness of national releases. The co-ordination of revision policies across countries is in a very early stage and progress is crucial in order to further increase the stability of euro area aggregates

(10) By comparison, the United Kingdom generally shows revisions which are similar to those of the largest euro area countries, and larger than the euro area as a whole. The United States show higher revisions than the euro area for GDP and employment estimates, and similar revisions for the other indicators, albeit that these revisions often refer to series at a higher growth path. Available revision indicators for Japan signal very high revisions for first GDP releases.

(11) Revisions studies have a number of caveats; low revisions are not necessarily a proof of accurate measurement practices; cross-country differences in revision policies influence the results of revision studies; revision analyses depend on the selected time range; and definitive conclusions on the reliability and the absence of a bias of first estimates require a long revision history. Yet, the provision of information about the magnitude of revisions and their reasons may enhance both the assessment of back data and the interpretation of the most recent statistics.

## **1. Background**

In recent months concerns have been raised regarding uncertainties and revisions of key euro area indicators and corresponding national data. This note quantifies and analyses revisions for selected key macroeconomic variables used by the ECB.

As a rule, most economic statistics are revised after the initial release. Revisions are necessary in order to improve the accuracy and level of detail of economic statistics<sup>2</sup>, but entail costs for both producers and users. Producers of statistics aim to optimise both the provision of accurate, timely and comprehensive

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<sup>2</sup> Initial estimates are typically based on incomplete source information and can only be made at a rather aggregate level.

statistics and the stability of published data. Revision policies are interrelated with release practices, i.e. the ways in which revised statistics are made available to the public.<sup>3</sup> Despite some progress, national revision practices in European countries continue to differ considerably and this may lead to “noise” in the aggregated figures. The Ecofin Council requested, in its conclusions on the 2005 EFC Status Report, a “closer coordination of release, revision and dissemination practices”.<sup>4</sup>

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. In principle, the latter should be revised each time a new country figure is released, which would mean that euro area statistics are revised almost continuously. Obviously, this does not facilitate their interpretation and analysis. 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). Two major examples are explained in the Box overleaf.

Ideally, any revision analysis should distinguish standard revisions to first estimates due to improved information from other factors. Important other factors for euro area statistics are the implementation of harmonised statistical concepts, improvements to the timeliness of first estimates, and changes in the country coverage of the first estimates. However, for euro area statistics it is not possible to separate these effects, as the revision policies are currently not co-ordinated across Member States, and therefore many euro area revisions reflect both improved information and some changes in methods or concepts in one or more euro area countries.

The table below illustrates the improvements to timeliness and coverage for three of the euro area indicators.

**Table 1 Timeliness and country coverage rates for selected euro area indicators**

Indicator	Timeliness <sup>1)</sup>		Country coverage rate <sup>2)</sup>	
	Early-1999	End-2005	Early-1999	End-2005
GDP	75	45	77	94
Industrial production	104	47	85	97
Retail trade turnover	90	33-36	70	97

1) Number of calendar days after the end of the reference period; 1 month = 30 days.

2) In percent of the euro area.

Sources: Eurostat and ECB.

Revisions analyses as carried out in this paper<sup>5</sup> have a specific objective: they evaluate the reliability of the first estimate. However, low revisions are not necessarily a proof of accurate measurement. For

<sup>3</sup> The trade-off between reliability and timeliness, both integral parts of data quality, is not discussed in this note.

<sup>4</sup> See Ecofin Council Conclusions on the EFC Status Report and on EU Statistical Governance; 8 November 2005.

<sup>5</sup> More details and tabular results are provided in Annex 1.

example, some statistical offices do not recompile long back series after methodological revisions, because of resource constraints. Of course, the relatively small average revisions that can then be computed for those 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 (e.g. definitive accounts of local governments) is simply not incorporated at any point in time. Bearing these caveats in mind, informing users, both ex ante and ex post, about the magnitude of revisions and their reasons, may aid them in the interpretation of both back data and the most recent data. In addition, it allows for some cost-benefit analysis of compiling very timely, high-frequency statistics.

### **Box 1: Examples of recent one-off revisions: national accounts and employment statistics**

In recent months, two statistical domains have been enhanced by introducing important methodological changes, namely national accounts and employment statistics.

During 2005, euro area and Member States' GDP and national accounts data have been subject to revisions due to the implementation of (i) the introduction of chain-linking of annual and quarterly volume series, (ii) the new partial allocation to final demand of indirectly measured financial intermediation services (i.e. the interest margin, also called FISIM), and (iii) the benchmark revisions that must be implemented once every five to ten years. These changes reflect improvements in the accuracy and comparability of euro area and Member States' national accounts, and had been scheduled and agreed several years ago. Nevertheless, (the timing of) their introduction differed across countries. This caused some difficulties when interpreting euro area and national releases of these methodological changes. On the other hand, our analysis shows that the implementation of these statistical enhancements has implied relatively moderate revisions to euro area GDP volume growth. Revisions to annual growth rates ranged between 0.1 and 0.3 percentage points and the profile of seasonally adjusted GDP volume growth was only slightly revised. Nominal euro area GDP levels were revised upwards by 1.2% on average. Revisions to GDP growth and nominal GDP have been very pronounced for Spain and the Netherlands, mainly as a result of improved source data. The revision process has not yet been finalised, with, in particular, some further revisions of quarterly data for France and Italy to be expected in the next few months. A better coordination may be expected for the next benchmark revision (foreseen for 2011, although a common introduction date must still be agreed upon).

Euro area employment levels have been relatively unstable, in particular due to large revisions in Spanish and German data, while growth rates were less affected. Euro area levels were revised by on average +1.5%. Main reasons were new information from the population census in Spain, and improved sources in Germany. The revisions concerned in particular part-time employment. All forms of data collection for employment statistics are subject to some degree of uncertainty. Registers may be flawed due to the exclusion of unrecorded ('black' and illegal) employment or inaccurate recording, or they may not be available in time for the release of first employment estimates. Business or household surveys may be inaccurate due to surveying characteristics. Furthermore, also in this case, the lack of a co-ordinated revision timetable in the euro area Member States means that (relatively small) changes to euro area data occur at a very high frequency. Finally, at a country level, employment and unemployment (level and change) estimates are compiled in very different ways and are typically not consistent.

## 2. Quantitative revisions analysis for selected indicators

### 2.1 Framework of the analysis

The selection of indicators is determined by their relevance for business cycle analysis and, especially for labour market indicators, by their recent higher data uncertainty. The analysis focuses on revisions to these headline indicators for the euro area, its six largest countries (representing almost 90% of euro area GDP), the UK and, if data availability permits, the US and Japan. All calculations are done using published, rounded growth rates (and levels as in the case of the unemployment rate).

The following key economic indicators are included in this quantitative revisions analysis:

- **GDP volume growth** (seasonally adjusted (s.a.), quarter-on-quarter growth),
- **GDP expenditure components** (seasonally adjusted (s.a.), quarter-on-quarter growth),
- **Employment** (total civilian, s.a., quarter-on-quarter growth)
- **Unemployment** (total, ILO definition, s.a., rate)
- **Compensation per employee** (total, s.a., quarter-on-quarter growth)
- **Labour cost index** (total, s.a., quarter-on-quarter growth)
- **Industrial production** (excluding construction, s.a. month-on-month growth)
- **Retail trade turnover** (total, constant prices, s.a., month-on-month growth)
- **Consumer price index** (total, year-on-year growth).

At least two periods of revisions have been investigated: recent revisions, covering observations for 2005 (2005 Q1 until 2005 Q4 respectively) and earlier revisions, covering observations from January 2002 until December 2004 (2002 Q1 until 2004 Q4 respectively). The comparison of these two periods might indicate whether data uncertainty recently increased.<sup>6</sup> If data availability permits, a third, longer-term period has been included, covering observations from January 1999 onwards for the euro area, the US and Japan. The analysis covers releases available up to mid-March 2006.

Revision analyses require complete data archives containing all historic data vintages. From June 2001 onwards, all underlying data for the euro area and the EU countries are taken from the ECB/DG-S internal revisions database, in which all incoming vintages of data from Eurostat have been recorded.<sup>7</sup> For earlier periods, data have been taken from the published versions of the ECB's Monthly Bulletin. The latter, however, is a less suitable source as it does not reflect the intermediate revisions occurring between Monthly Bulletin cut-off dates, and as there may be cases where the Monthly Bulletin already contains a revised second release rather than the initial first release. Euro area data prior to 2002 exclude Greece. Vintages of data for the US, Japan and the first releases of the GDP before 2002 for the EU countries

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<sup>6</sup> As the most recent releases are subject to further revisions, revisions in these two periods are not yet fully comparable.

<sup>7</sup> The internal revisions database used as a main source for this note was implemented in 2001 for the purpose of data quality checking of daily data transmissions from Eurostat before onward dissemination of these data to users in the ECB and NCBs. While every effort has been made to ensure revisions due to incorrect data transmissions have been eliminated from the analysis the volume of data involved may mean that this validation process is not totally perfect. For previous uses of this source for revision analyses see also "*Improvements to euro area GDP and National Accounts*", Box 5, ECB Monthly Bulletin, December 2005, and "*2005 EFC Status Report on Information Requirements in EMU*", Annex III, November 2005.

have been received from the OECD, derived from databases used for the production of the (monthly) Main Economic Indicators publication (MEI).<sup>8</sup>

This paper assesses total revisions, i.e. the difference between the latest (current) value for an observation and the value of its first release, as well as successive revisions, defined as the sum of all revisions to observations since their first release. Successive revisions may be relevant, because a low total revision may hide a series of positive and negative revisions, which caused data uncertainty in the meantime.

## **Box 2: Revision indicators**

### **A) Total revisions**

Total revisions are calculated as the absolute difference between the current data and the first release of the statistic concerned. This measure excludes all intermediate revisions and is the most important measure of reliability as it provides information on the overall stability of the first release. For example, a low absolute average of total revisions points to an almost unrevised first release.

#### Average total revisions

Average of the difference between the latest available value and the first release for each observation period. This measure indicates a possible **bias of the first release**.

#### Average absolute revisions

Average of the absolute difference between the latest available value and the first release for each observation period, regardless of their sign. This measure indicates the **stability of the first release**. As a relative measure, the ratio of average absolute revisions and average growth rate is also provided.

#### Range of total revisions

Highest and lowest total revisions to the first release for all observation periods. This range indicates the **volatility of the first release**. The total range covers all the revisions and may include outliers; the 90% range discards the largest 10% of the revisions.

### **B) Successive revisions**

Successive revisions are calculated by accumulating all revisions to the first release, i.e. this measure includes all intermediate revisions and provides complementary information on the fluctuations of the first release caused by later revisions.

#### Average Cumulative Absolute Revisions

For each observation period, the sum of revisions, regardless of their sign, is accumulated. The average for all observation periods may then be a useful supplementary indicator for the **volatility of the first release** as some euro area statistics are revised several times a month and “latest to first” comparison may hide revisions carried out in the meantime.

### **C) Memorandum item: Average quarterly/monthly growth rate**

The average growth rates are helpful when assessing the impact of average revisions of the economic indicator, since the size of the acceptable revisions is likely to depend on the trend growth of the underlying series. It should, however, be borne in mind that there is no one-to-one relationship between revisions and growth rates.

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<sup>8</sup> A comprehensive Euro area Real Time database – currently including euro area aggregates as published in the ECB’s Monthly Bulletin from January 2001 to August 2005, as well as other financial and monetary statistics – has been constructed jointly by the ECB and the Euro Area Business Cycle Network (EABCN) and is available on the EABCN website. This is a first output of the EABCN-RTDB project, which aims at constructing a harmonised real-time database for the Euro area and EU countries. For further information on the project see <http://www.eabcn.org>

## 2.2 Results

Complete tables for the euro and country data can be found in Annex 1.

### 2.2.1 GDP volume growth (quarterly)

The first ‘flash’ estimate of the euro area quarter-on-quarter GDP volume growth rate is published within 45-48 days after the end of the reference quarter with a country coverage of around 96% of euro area GDP. Further breakdowns for the expenditure, production and income side are published in two subsequent releases, at around  $t+63$  and  $t+103$  days. GDP is estimated from various basic statistics and sources, including administrative data, censuses, surveys of businesses and households, and typically summarises billions of transactions in one single number. Regular revisions are the result of incorporating improved quarterly or annual source data, whereas five-yearly benchmark revisions reflect improved multi-annual source data or methodological improvements.

Despite some critical comments on GDP revisions in recent publications<sup>9</sup>, our revisions analysis leads to a rather favourable assessment of the reliability of the first estimates of euro area and Member States’ headline quarterly GDP growth. From 1999 to 2005, the first **euro area** estimate exhibits a small bias of 0.1pp (i.e. slightly more positive than negative revisions) and is relatively stable (i.e. an average absolute revision of less than 0.2 pp), but this should be seen in comparison with a long-term average GDP growth of 0.5%. The range of total revisions is rather wide (between -0.3pp and +0.6pp), suggesting some volatility. Chart 1 shows that relatively high GDP growth rates (period 1999 Q1 – 2001 Q1) have been revised significantly upwards, while revisions to around or below average growth rates have been smaller and also mostly upwards. It is, however, difficult to infer clear conclusions on the possible relation between the size of growth rates and revisions as the period under investigation is (inevitably) too short and because there may be specific reasons for the less reliable first estimates for 1999 Q1 to 2001 Q1. The revisions did not occur at one point in time, but are the result of successive upward revisions in the underlying country data. These estimates may have been surrounded by higher than usual uncertainty due to the implementation of the European System of Accounts 1995 which some statistical offices were finalising in that period. In addition, a lower country coverage of these first estimates (around 77% of euro area GDP) may also explain part of the revisions. This is suggested by upward revisions entailed by the second estimates with a country coverage of around 90%.<sup>10</sup> Disregarding the observations for 1999 Q1 to 2001 Q1 – as indicated in the second line<sup>11</sup> of table 1 - one finds that the first estimate exhibits no bias, is more stable (average absolute revision of 0.1) and has a low volatility.

The introduction of benchmark revisions and improved methods by countries and Eurostat in 2005 has not led to significant changes in quarterly GDP growth rates. On average, the quarterly results for 2005

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<sup>9</sup> See “Euro area GDP – Initial estimate may underestimate 4Q05 GDP growth”, JP Morgan Economic Research, 13 February 2006 and “GDP growth – A numbers racket”, The Economist, 18 February 2006.

<sup>10</sup> For more information on 1999/2000 revisions see also “Revisions to quarterly national accounts for the euro area”, Box 4, ECB Monthly Bulletin, August 2001.

<sup>11</sup> Similar reductions in bias and volatility (and increases in stability) are observed when the revision analysis is carried out from 2000 Q2 onwards (not shown in the table). In addition, taking the period from 2003 Q1 onwards shows that the release of flash estimates has not negatively affected the reliability of the first estimate.

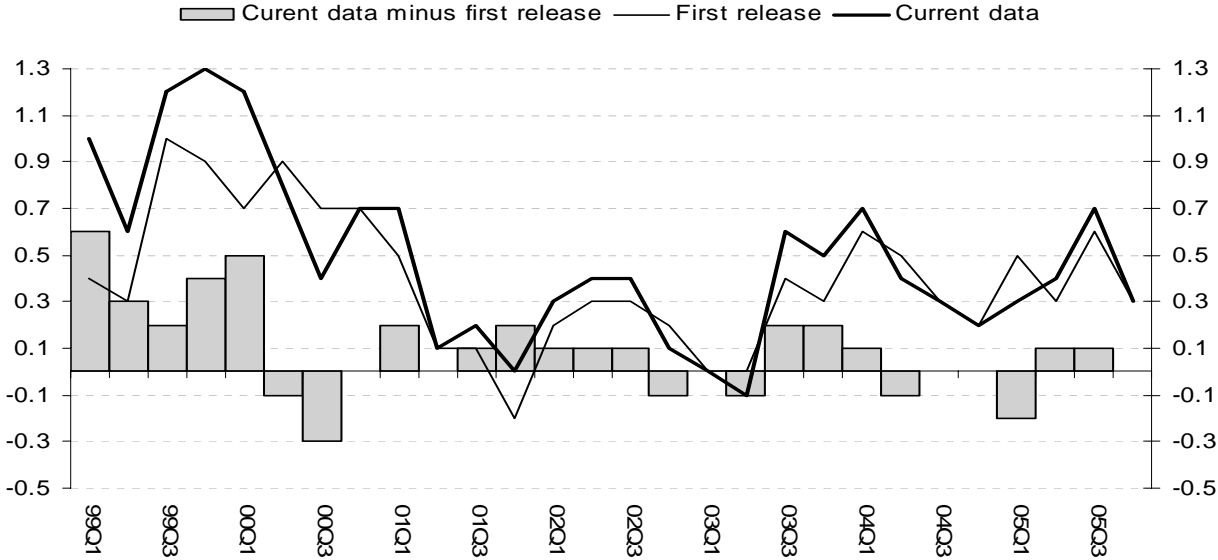
have not been revised more than earlier quarters or than before the benchmark revisions were introduced. In relative terms, the size of the growth rate published with the first estimate was on average revised by 24% for the latest four quarters, while it was on average revised by 36% for the entire period. The revision to the first estimate for 2005 Q1 has been slightly higher than usual (i.e. -0.2pp).

**Table 2 Euro area - GDP volume growth (s.a., q-o-q)**

Observations	Total revisions <i>(latest minus first release)</i>				Successive revisions	Memo item: Average quarterly growth
	Average revision	Average absolute revision (relative to average growth)	Range of revisions		Average cumulative absolute revision	
			Total	90%		
05Q1 – 05Q4	0.00	0.10 (24%)	-0.2 to 0.1	-0.2 to 0.1	0.10	0.41
02Q1 – 04Q4	0.04	0.09 (29%)	-0.1 to 0.2	-0.1 to 0.2	0.41	0.31
99Q1 – 05Q4	0.09	0.16 (36%)	-0.3 to 0.6	-0.2 to 0.5	-	0.45

Source: ECB calculations based on Eurostat data.

**Chart 1 Euro area – GDP volume growth (s.a., q-o-q)**



A revisions analysis of first estimates for **expenditure components** may provide further useful information for the analysis of GDP volume growth (see table 2 and Annex 2). While the first estimates for consumption and foreign trade variables are on average revised by +0.1pp, a high bias of 0.4pp is observed for gross fixed capital formation. The first estimates of expenditure components are less stable and much more volatile than those of GDP. This is most pronounced for gross fixed capital formation (e.g. an average absolute revision of 0.6pp, in comparison with an average growth of 0.5, exports and imports). These high revisions have to be seen against the background of their high quarterly growth rates. The higher uncertainty that surrounds the expenditure components cancels out at the aggregate GDP level. Similarly as for aggregate GDP growth, one notices significant upward revisions to initially already relatively high growth rates of expenditure components in the period 1999 Q1 - 2001 Q1.

**Table 3 Euro area - GDP expenditure components (s.a., q-o-q; 1999 Q1 until 2005 Q4)**

Observations 99Q1 - 05Q4	Total revisions (latest minus first release)				Memo item:  Average quarterly growth
	Average revision	Average absolute revision (relative to average growth)	Range of revisions		
			Total	90%	
Private consumption	0.09	0.21 (49%)	-0.3 to 0.8	-0.2 to 0.6	0.43
Government consumption	0.10	0.24 (50%)	-0.4 to 0.6	-0.3 to 0.5	0.48
Gross fixed capital formation	0.36	0.56 (104%)	-0.5 to 1.7	-0.4 to 1.2	0.54
Changes in inventories <sup>1</sup>	-0.03	0.17	-0.4 to 0.5	-0.4 to 0.4	-
Exports	0.11	0.65 (52%)	-1.4 to 2.4	-1.2 to 1.8	1.26
Imports	0.09	0.71 (57%)	-1.7 to 2.5	-1.4 to 1.3	1.24

<sup>1</sup> Revisions to contribution of changes in inventories to quarterly GDP growth. Changes in inventories excluding acquisitions of valuables.

Source: ECB calculations based on Eurostat data.

Also at the **national level** (see tables in Annex 3), the analysis does not provide evidence for a significant bias in the first estimate of headline GDP volume growth in the six largest euro countries. Since 1999, average revisions have not exceeded +/-0.1pp, with the exception of ES (0.2pp) and this includes the effect of the 2005 benchmark revisions. However, apart from IT (for which the benchmark revision of quarterly data was delayed and count not yet been taken into account for this analysis), the volatility of first estimates is significantly higher than for euro area data. As regards the possible relation between the size of GDP growth and revisions, one notices that for DE and FR high initial estimates have been revised significantly upwards. As for euro area aggregate GDP growth, these above average revisions mainly relate to the period 1999 Q1 - 2001 Q1. The average revision to the quarters of 2005 is broadly in line with the long-term average revision; noticeable exceptions are 2005 Q1 and 2005 Q2 for DE (-0.4pp and +0.3pp), as well as 2005 Q1 and 2005 Q3 for NL (-0.7pp and +0.4pp respectively).

First releases of both the **UK** and the **US**<sup>12</sup> have been slightly biased and their volatility has been higher than that of the euro area results, although the average growth rates in these countries have been higher as well. GDP growth for **JP** is on average revised by -0.2pp and is quite volatile with a very high range of revisions (between -1.9pp and +0.8pp).

### 2.2.2 Employment (quarterly)

First estimates of euro area employment data (national accounts definition, expressed in persons) are compiled by the ECB's DG Statistics at around 100 days after the reference quarter, with an underlying country coverage of 80%. At a country level the national accounts data are compiled by amalgamating administrative, household and business survey estimates of employment, as well as incorporating

<sup>12</sup> The average and range of revisions are smaller than those published by the BEA (e.g. bias of 0.1 pp) in its press releases. This is because the BEA's published information on revisions is based on a longer time horizon and, excludes the most recent years (i.e. it relates to the years 1982-2002). For a further discussion of US GDP revisions see also B. Aruoba, "Data revisions are not well behaved", CEPR/EABCN Discussion paper No 5271, October 2005. The author uses US GDP vintages from 1965 and finds that GDP first estimates are biased, and that the revisions are predictable. For a discussion of UK GDP revisions see also H. Robinson, "Revisions to quarterly GDP growth and its production (output), expenditure and income components", Economic Trends, Office for National Statistics, December 2005.

information from censuses - revisions to this data set can therefore come from many sources. The revision analysis begins in 2002 because appropriate source data for earlier periods are not available.

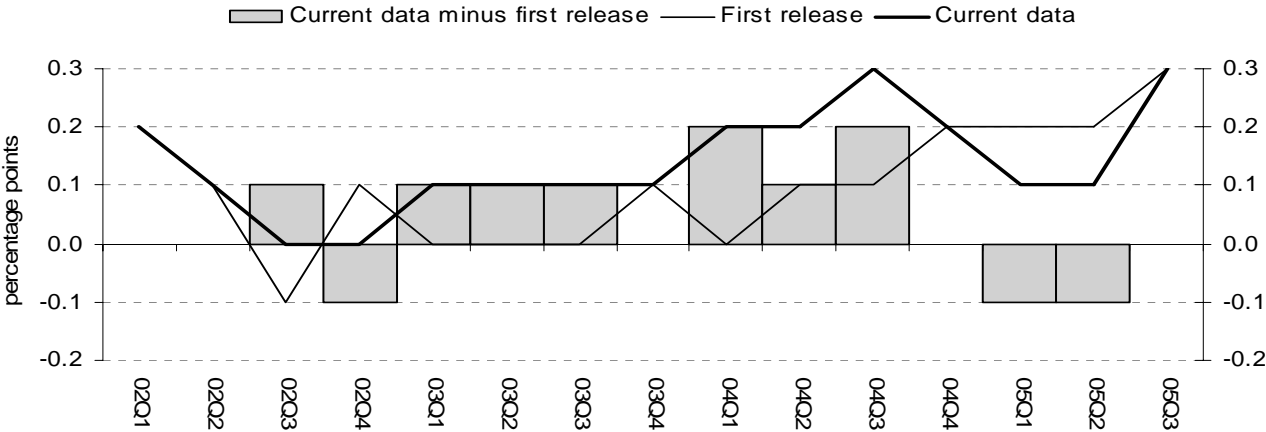
The average revision of the quarter-on-quarter growth rate of total **euro area** employment data in 2005 was small (-0.1pp). This average is of the same magnitude, albeit of a different sign, as for earlier revisions (0.1pp). The highest single revisions equal 0.2pp. The average absolute revisions were only 0.1pp; this concerns both earlier and recent revisions. The absolute cumulative amount of revisions is relatively high, suggesting some volatility in the euro area results. The fact that the euro area aggregate is recalculated each time new data become available for any of the countries is likely to have an effect on this measure. Overall, the euro area growth figures are considered to be rather stable and unbiased, but the small revisions must also be seen against the background of the small average growth rate of the quarterly series. Changes in the *level* data are examined in more detail in Annex 2.

**Table 4 Euro area – employment**

Observations	Total revisions <i>(latest minus first release)</i>				Successive revisions  Average cumulative absolute revision	Memo item:  Average monthly rate
	Average revision	Average absolute revision (relative to average growth)	Range of revisions			
			Total	90%		
05Q1 - 05Q3	-0.07	0.07 (44%)	-0.1 to 0.0	-0.1 to 0.0	0.40	0.16
02Q1 - 04Q4	0.07	0.08 (57%)	-0.1 to 0.2	-0.1 to 0.2	0.50	0.14

Source: ECB calculations based on Eurostat data.

**Chart 2 Euro area – employment**



The euro area revisions of the employment measure aggregate some more significant but counter-balancing patterns at a the **national level**. In particular data for ES (average revision between 2002 and 2004 equals 0.2pp) have shown sizeable revisions since 2002, which is mainly due to the incorporation of updated population data. These reflect changes recorded in the latest census which was undertaken in 2001 (there are similar but smaller effects for BE and IT). The revisions in 2005 have become significantly smaller suggesting that the effects of the census update are coming to an end. DE has seen several administrative changes in the methods to count employed persons (Hartz reforms / “one euro jobs”). This has led to some ongoing volatility in the data (see also Annex 2). The revisions of quarter-on-

quarter percentage changes of employment data (calculated on non-seasonally adjusted data) in NL are quite high.

The employment data for the **UK** show a small bias, and the data for the **US** display no bias. According to the available data vintages from the OECD, employment data for **JP** are not revised.

### 2.2.3 Unemployment rates (monthly)

First estimates of euro area harmonised unemployment rate data are released by Eurostat at around 30 days after the reference quarter, normally with above 90% coverage of the euro area<sup>13</sup>. They are compiled by extrapolating harmonised European Labour Force Survey (LFS) data with available monthly indicators for each Member State. Revisions in the most recent months have mostly been due to changes in the German unemployment system (e.g. a change in the eligibility criteria for the unemployment benefit). Similar to employment data, new data coming from population censuses can also have a marked effect on revisions. In 2002 a Regulation<sup>14</sup> was established that defined unemployment at the EU level. The implementation of this Regulation led to an increase in revisions for data prior to 2002.

In 2005, the average revision of the month-on-month change of total **euro area** unemployment data was small (-0.1pp) and in a narrow range, that is between -0.2 and +0.1pp. The average is similar to the revisions from 2002 to 2004. Relatively high revisions were reported for the period before 2002, for which current unemployment rates are about 1 p.p. below the initial estimates. As mentioned previously, this is due to a new Regulation that came into force in 2002. The average absolute revisions were at similar low levels (0.1pp) for more recent periods. From the beginning of 2005 all EU Member States should conduct a continuous LFS, yielding quarterly average data. Eurostat has therefore started to change its calculation methods, with the aim to use quarterly instead of annual benchmarks. This may lead to more frequent but smaller data revisions in the future. Overall, the euro area unemployment rate data are considered to be fairly stable and unbiased for the periods after 2001.

**Table 5 Euro area – unemployment**

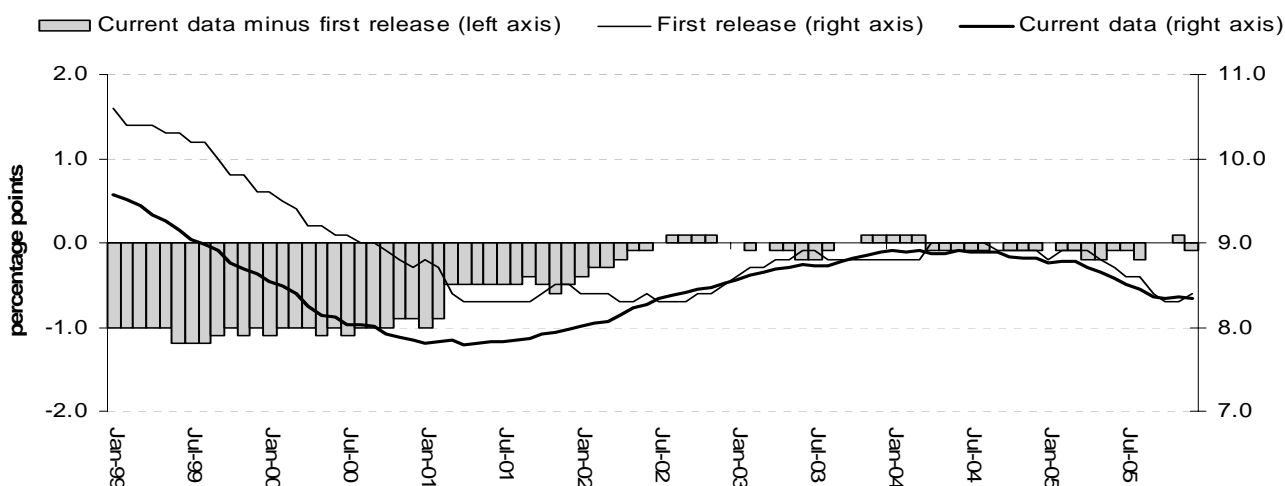
Observations	Total revisions <i>(latest minus first release)</i>				Successive revisions	Memo item:  Average monthly rate
	Average revision	Average absolute revision (relative to average rate)	Range of revisions		Average cumulative absolute revision	
			Total	90%		
Jan05 - Dec05	-0.08	0.10 (1%)	-0.2 to 0.1	-0.2 to 0.0	0.13	8.55
Jan02 - Dec04	-0.06	0.11 (1%)	-0.4 to 0.1	-0.4 to 0.1	0.53	8.63
Jan99 - Dec05	-0.42	0.44 (5%)	-1.2 to 0.1	-1.1 to 0.1	-	8.50

Source: ECB calculations based on Eurostat data.

<sup>13</sup> This 90% coverage includes extrapolations of Greek and Italian data which are, at present, only available at a quarterly frequency.

<sup>14</sup> Commission Regulation (EC) No 1897/2000 of 7.9.2000 implementing Council Regulation (EC) No 577/98 on the organisation of a labour force sample survey in the Community concerning the operational definition of unemployment, OJ L 228, 8.9.2000, p.18.

**Chart 3 Euro area - unemployment**



Data on the **euro area countries revisions** are available only from 2002. The spread of the revisions for 2002 to 2004 was above 0.5 percentage points and, in the case of BE and ES, was closer to 2 percentage points. This may be partly explained by the once per year re-benchmarking of the data. BE and ES have incorporated changes to their data as a result of information from the latest census and adjusted the scaling factors of survey data.

The unemployment figures in the **UK** are more stable than in the euro area. The UK has already used a continuous LFS for some time and as a result there has been no need to re-benchmark the monthly results to annual LFS data. Furthermore, monthly results are calculated as three-month averages, which limits the effect of revisions. The **US** and **JP** data are rarely revised.

#### **2.2.4 Compensation per employee (quarterly)**

First estimates of the euro area compensation per employee data are usually compiled around 100 days after the reference quarter. The euro area country coverage is mostly around 80%. Both components are estimated as part of the quarterly national accounts, which integrate statistics from many sources. Therefore, the revisions may have various causes. Revisions of the compensation data tend to be higher than the revisions of the employment data. The revision analysis only begins in 2002 because appropriate data for earlier periods are not available.

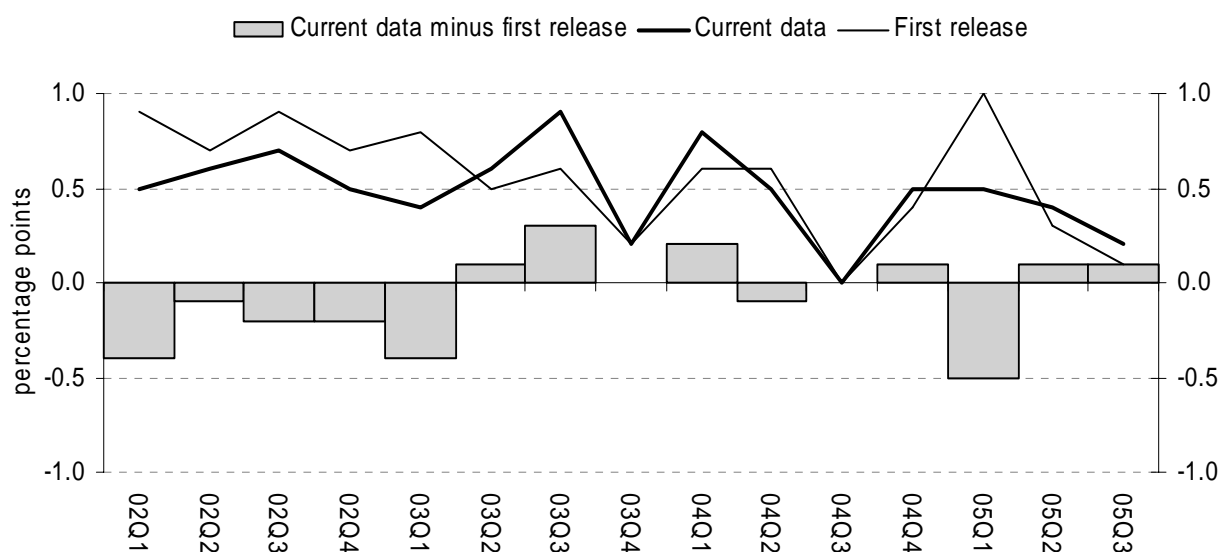
Data for 2005 on quarterly **euro area** compensation per employee were revised by -0.1pp on average (a value that is only marginally higher than for earlier observations), signalling a minor upward bias in the first release. Stability (average absolute revision) has remained broadly satisfactory. However, the 90% range of total revisions shows a noticeable volatility in the first release, especially taking into account the relatively low average growth rate of the indicator. The seemingly sizeable relative absolute revisions (64% for recent data and 35% for past data) are attributable to the low growth rate of the indicator. The first quarters of the year tend to be revised more: the three highest (downward) revisions occurred in the first quarters of the recent four years.

**Table 6 Euro area – compensation per employee**

Observations	Total revisions <i>(latest minus first release)</i>				Successive revisions	Memo item:  Average quarterly growth rate
	Average revision	Average absolute revision (relative to average growth)	Range of revisions		Average cumulative absolute revision	
			Total	90%		
05Q1 - 05Q3	-0.10	0.23 (64%)	-0.5 to 0.1	-0.5 to 0.1	0.43	0.36
02Q1 - 04Q4	-0.06	0.18 (35%)	-0.4 to 0.3	-0.4 to 0.2	1.24	0.52

Source: ECB calculations based on Eurostat data.

**Chart 4 Euro area – compensation per employee**



Turning to the major **euro area countries**, the bias and volatility have been highest for DE, ES, IT and NL. The range of the revisions is sizeable in all countries, especially for back data and particularly for DE (this can mainly be attributed to the introduction of changes in the national accounts that affected both the compensation and the employment estimates). Relative absolute revisions for country data are sometimes very high (especially for DE and NL), but primarily due to the low growth rates.

Historic data vintages for revision analyses for the **UK, US and JP** were not available for this study.

### 2.2.5 Labour cost index (quarterly)

First estimates of the euro area labour cost index (LCI) are released at around 80 days after the reference quarter, with full breakdowns (by industry and by labour cost components) and with a country coverage of around 80%. The revision analysis begins in 2002 only because appropriate source data are not available for earlier periods. Data sources used for the compilation vary from country to country and include sample surveys and administrative sources (e.g. tax records). Regular quarterly revisions of the LCI have typically been the result of improved source data. With the phasing-in of the new Council

Regulation<sup>15</sup> several Member States introduced methodological improvements (e.g. in June and September 2005 for FR, IT, NL and UK), resulting in noticeable revisions to ES and NL backdata.

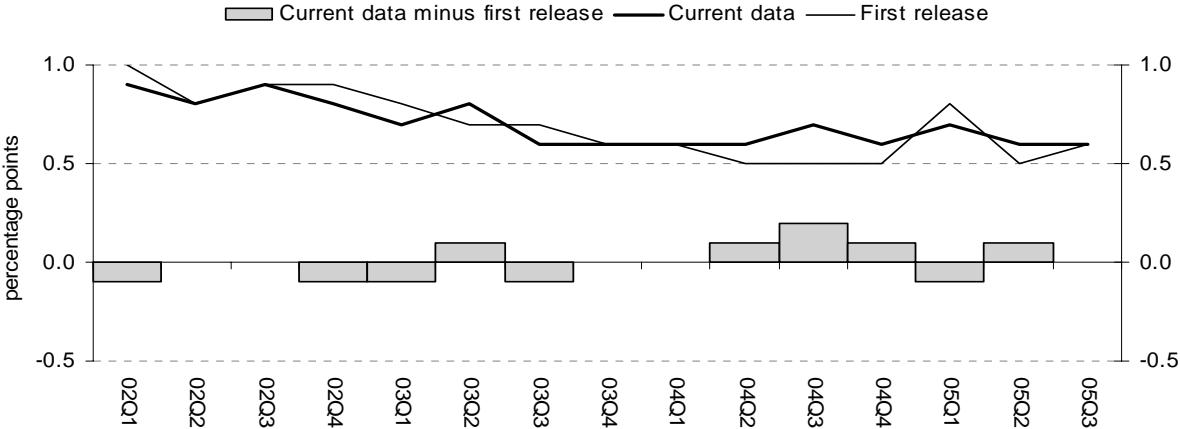
Despite these changes, the average revision of the quarterly **euro area** labour cost index suggests no bias in the first release both for recent and for earlier observations. The instability of the first release has been relatively modest, with around 0.1pp average absolute revisions. Relative absolute revisions have also been limited (around 11%). In terms of volatility, the range of revisions remained practically the same for recent observations. Overall, the revision indicators show a very similar picture for earlier and more recent observations in all three dimensions examined. A cyclical pattern could not be identified.

**Table 7 Euro area – labour cost index**

Observations	Total revisions <i>(latest minus first release)</i>				Successive revisions	Memo item:  Average quarterly growth rate
	Average revision	Average absolute revision (relative to average growth)	Range of revisions		Average cumulative absolute revision	
			Total	90%		
05Q1 - 05Q3	0.00	0.07 (12%)	-0.1 to 0.1	-0.1 to 0.1	0.07	0.60
02Q1 - 04Q4	0.01	0.08 (11%)	-0.1 to 0.2	-0.1 to 0.1	0.86	0.72

Source: ECB calculations based on Eurostat data.

**Chart 5 Euro area - labour cost index**



Looking at the larger **euro area countries** for which data are published, there is no significant bias in the first estimates, but on the other hand a relatively wide range of revisions can be observed for back data (especially for ES and NL, where it is explained by the introduction of a new data source). The stability of the first release improved for all countries examined. Data for BE are lacking, while data for IT are confidential.

<sup>15</sup> Since 2003 the LCI is based on a European Regulation (No 450/2003) whereas formerly it was collected under a gentlemen’s agreement. See also Box 4 in ECB Monthly Bulletin of July 2005, “New Series of Hourly Labour Costs in the Euro Area”.

**UK** revisions indicate unbiased first releases, but a volatility that exceeds that of the euro area data revisions. Corresponding data on revisions of similar labour cost measures for the **US** and **JP** are not available in the ECB databases.

## 2.2.6 Industrial production (monthly)

Euro area monthly industrial production data are released approximately 48 days after the reference month with a country coverage of almost 97%. In addition to the headline figure, further breakdowns, e.g. by Main Industrial Groupings, are provided. The main method to collect information on industrial production is by means of a business sample survey. Regular revisions are due to late responses of enterprises and the update of seasonal factors. Occasional revisions are caused by 5-yearly changes in the base year of the index (in some countries), or the benchmarking to annual statistics.

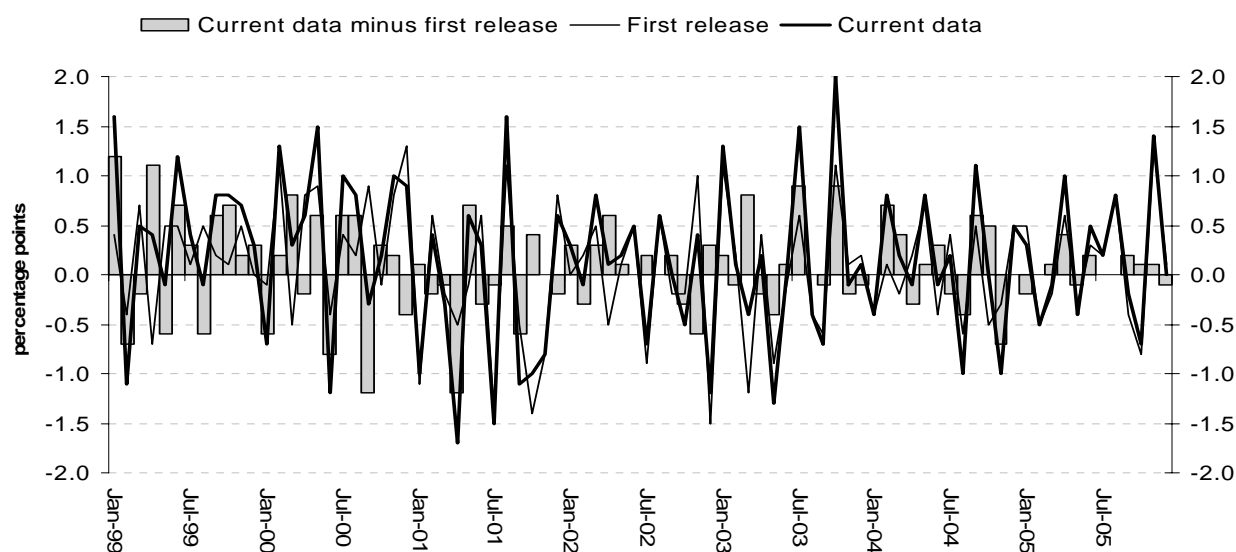
**Euro area** industrial production has a bias of 0.1pp, but is subject to quite some uncertainty with an average absolute revision of 0.4pp, and 90% of all revisions between -0.7pp and 0.8pp for the periods from 1999. These revisions are sizeable in comparison with an average monthly growth rate of around 0.1%. Contrary to national results, which are usually revised only once in between successive releases, the euro area industrial production estimate is updated whenever new or revised national data are published, leading to, in general, many successive revisions. This is due to the lack of coordination of national release calendars. Revisions to recent months have on average been somewhat lower than for earlier periods. Revisions to December data have not been higher than the average. Given the high volatility and relatively short length of the series, it is difficult to infer a clear conclusion on the possible cyclicity of revisions of euro area industrial production statistics.

**Table 8 Euro area - industrial production**

Observations	Total revisions (latest minus first release)				Successive revisions	Memo item:  Average monthly growth rate
	Average revision	Average absolute revision (relative to average growth)	Range of revisions		Average cumulative absolute revision	
			Total	90%		
Jan05 - Dec05	0.06	0.13 (68%)	-0.2 to 0.4	-0.2 to 0.2	0.54	0.19
Jan02 - Dec04	0.10	0.32 (320%)	-0.7 to 0.9	-0.7 to 0.6	2.98	0.10
Jan99 - Dec05	0.08	0.37 (247%)	-1.2 to 1.2	-0.7 to 0.8	-	0.15

Source: ECB calculations based on Eurostat data

**Chart 6 Euro area - industrial production**



With regard to **euro area countries**, the industrial production index series for FR, IT and ES have not shown significant revisions on average. However, the range of total revisions is rather large (e.g. for FR, where 90% of revisions are between -1.9pp and +1.4pp). The average revision is more pronounced for DE (+0.2pp). The highest average revisions are observed for BE (+0.4pp) and NL (+0.3pp). The series for these two countries are also very volatile. The very high range of successive revisions for BE industrial production is striking; there are many successive revisions with differing signs for each observation. The high revisions for NL are partly caused by the fact that only in this country these series are made consistent with the quarterly national accounts when they become available, or are revised. The 2005 revisions at the country level have so far been below the long-term average, with the exception of BE.

Average revisions and volatility for both the **UK** and **JP** are similar to the results for the largest euro area countries, while the results for the **US** are unbiased and relatively stable<sup>16</sup>.

### **2.2.7 Retail trade turnover (monthly)**

First estimates of euro area retail trade turnover are released at around 35 days after the reference month with limited detail (total, food and non-food) and almost complete euro area country coverage (97%); the full euro area detail becomes available one month later. Retail trade turnover is mainly collected via enterprise sample surveys; some countries make additional use of administrative sources (VAT declarations). Regular revisions in retail trade data are mainly due to late responses of enterprises, besides the update of seasonal factors. Occasional major revisions are usually caused by changes in the base year.

In 2005, the average revision of **euro area** retail trade turnover statistics was -0.1pp, while the average monthly growth rate was 0.04pp. For earlier periods, the average revisions were close to zero. The

<sup>16</sup> For further analysis of revisions to the US industrial production index see also N.R. Swanson and D. van Dijk, "Are statistical reporting agencies getting it right? Data rationality and business cycle asymmetry", *Journal of Business and Economic Statistics*, January 2006.

average absolute revisions were very substantial over the whole period 1999-2005 (0.5) and over the period 2002-2004 (0.6pp). Between 2002 and 2004, the 90%-range (-2.4 and +0.8pp) indicates a high volatility of the first estimates. Increased absolute revisions have been recorded around the turn of a year, with high downward revisions for the January observations. Furthermore, the absolute cumulative revisions have been high (9.6pp). This is due to the uncoordinated release calendars of countries, which necessitates many revisions at the euro area level. Another reason for this high volatility may be the introduction of the euro area flash estimate in April 2004, which helped to considerably bring forward the release of euro area results (from  $t+60$  to  $t+35$ ), but perhaps at the cost of initially decreasing the reliability. In 2005, the average of absolute cumulative revisions is considerably lower (at 1.0pp). There is no evidence that the size of the revisions depends on the phase of the business cycle. All in all, the overall reliability and stability of euro area retail trade turnover statistics leaves room for further improvement.

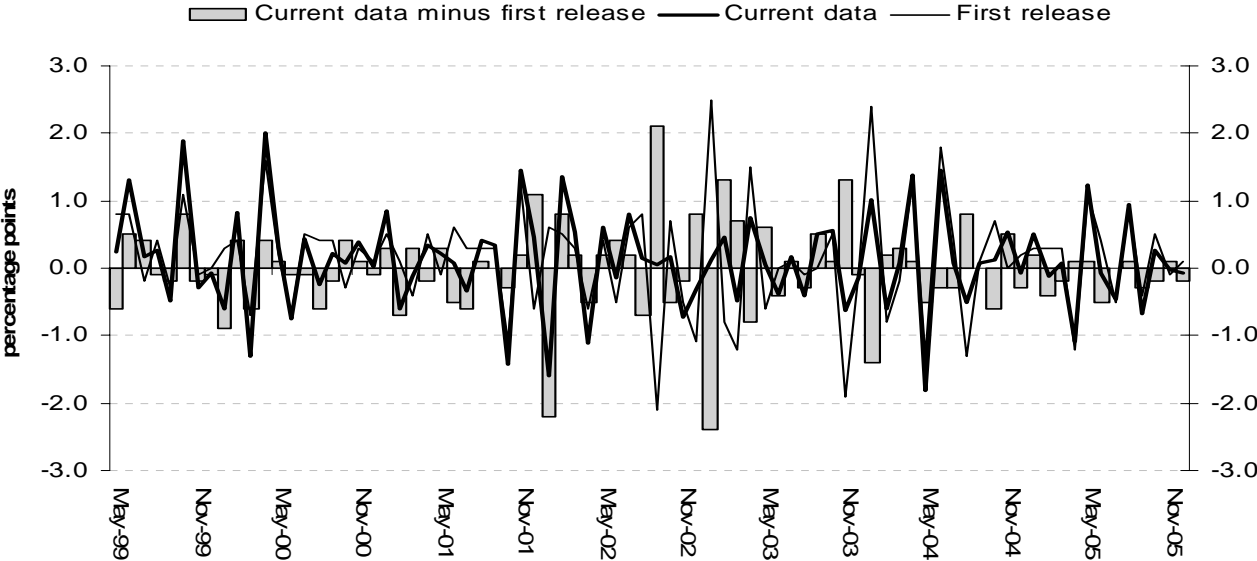
In relative terms, revisions exceeded by far the average monthly growth rate. For the entire period (1999-2005), the average absolute revision was more than four times higher than the average growth rate.

**Table 9 Euro area - retail trade turnover**

Observations	Total revisions <i>(latest minus first release)</i>				Successive revisions	Memo item:  Average monthly growth rate
	Average revision	Average absolute revision (relative to average growth)	Range of revisions			
			Total	90%	Average cumulative absolute revision	
Jan05 - Dec05	-0.10	0.20 (500%)	-0.5 to 0.2	-0.5 to 0.1	1.07	0.04
Jan02 - Dec04	-0.01	0.63 (1260%)	-2.4 to 2.1	-2.4 to 0.8	9.63	0.05
May99 - Dec05	-0.03	0.46 (418%)	-2.4 to 2.1	-0.8 to 0.8	-	0.11

Source: ECB calculations based on Eurostat data.

**Chart 7 Euro area - retail trade turnover**



In most **euro area countries**, revisions in 2005 have been quite pronounced. The range of revisions for 2002-2004 was also high, often reaching several percentage points, e.g. in DE (-6.5 to 3.6). Only the data for IT (-1.0 to 1.0) have shown a somewhat lower volatility and no significant average revision. Particularly unreliable have been the first releases for BE, DE and FR. High absolute cumulative revisions for the historic averages in BE (7.7pp), DE (8.8pp) and NL (7.9pp) confirm a significant volatility in their first estimates. DE and FR showed particular high downward revisions to January observations.

In the **UK**, absolute average revisions were at similar levels as in the euro area. The bias of the first estimate and the average absolute revisions for the **US** and **JP** have been relatively small and comparable with euro area results. Higher revisions for the periods around the turn of the year were observed for JP.

### 2.2.8 Consumer price index (monthly)

The flash estimate of the HICP for the euro area is generally released on the last day of the reference month, with a 65% coverage of national data<sup>17</sup>. The full euro area breakdown, compiled from the complete set of national data, becomes available at around  $t+17$ . Most consumer prices are collected by sample surveys in outlets. Regular revisions only occur for the HICP flash estimate (published for the first time in October 2001) and have different causes. First, a revision of the national data underlying the estimate; second, a different inflation development in the countries that did not provide an input in the flash estimate; third, the volatility of the seasonal pattern and some atypical developments in the HICP sub-components. Finally, rounding effects can have an effect. Occasional and co-ordinated revisions can be caused by improvements in the coverage and compilation methodology of the national indices.

The average total revisions of the **euro area** data are zero. This indicates that there is currently no bias in the HICP flash estimate. The range of revisions exceeded 0.1pp only in exceptional cases. Of the 50 flash estimate releases to date, it was exact in 22 cases, 0.1pp different from the final estimate in 25 cases and 0.2pp off the mark in only 3 cases.<sup>18</sup> In relative terms, the revisions are also minor. This is confirmed by the similar results in the first and second part of the table below. Slightly higher average absolute revisions occurred in the years 2000 and 2001, due to the successive extensions of the geographical, population and product coverage of the HICP. Furthermore, specific national revisions due to improved quality adjustment procedures and a new weighting scheme in DE and the inclusion of sales prices in ES and IT also affected the euro area HICP in these earlier periods.

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<sup>17</sup> The euro area flash estimate coverage increased to around 86% in January 2006 due to the addition of French provisional data to the already available national figures for Belgium, Germany, Greece, Spain and Italy.

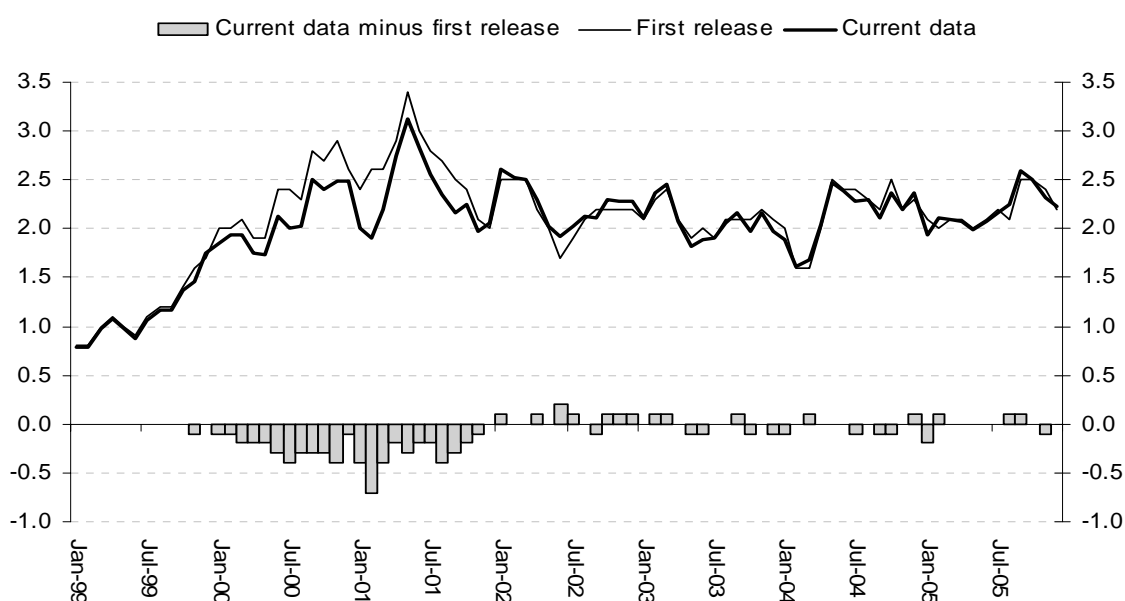
<sup>18</sup> See further details in the Box entitled "Assessing the reliability of Eurostat's euro area HICP flash estimate" in the January 2006 edition of the Monthly Bulletin.

**Table 10 Euro area - HICP**

Observations	Total revisions <i>(latest minus first release)</i>				Successive revisions	Memo item:
	Average revision	Average absolute revision (relative to average growth)	Range of revisions		Average cumulative absolute revision	Average annual growth rate
			Total	90%		
Jan05 - Dec05	0.00	0.05 (2%)	-0.2 to 0.1	-0.2 to 0.1	0.07	2.19
Jan02 - Dec04	0.01	0.06 (3%)	-0.1 to 0.2	-0.1 to 0.1	0.09	2.16
Jan99 - Dec05	-0.07	0.11 (5%)	-0.7 to 0.2	-0.4 to 0.1	-	2.03

Source: ECB calculations based on Eurostat data.

**Chart 8 Euro area - HICP**



As regards the **euro area countries** examined, the average overall revisions are also close to zero. The ranges of overall and successive revisions are slightly higher for DE, ES and IT. In the last twelve months the DE HICP data were revised 9 times, of which twice by 0.2pp. A similar situation applies to the IT estimate; this was revised 8 times, of which once by 0.2pp. The ES provisional HICP was revised 3 times, of which once by 0.2pp. The ranges of revisions are higher for ES and NL in the periods before 2005. However, they were mainly the result of one-off improvements in the compilation of the indices.

The **US CPI** index is revisable in principle, but only few revisions have ever occurred and these mainly concerned the corrections of mistakes.<sup>19</sup> In **JP** the CPI is not revisable in principle, which not necessarily points to a more accurate final estimate. However, some small revisions occurred in the period 1999/2002, due to the 5-yearly change in weights and the switch to the new base year 2000.

<sup>19</sup> A different situation would apply when considering the Chained US CPI, which is used for cost-of-living purposes. That index uses a superlative formula including current period weights and only first estimates of these weights are available at the time of the first compilation of the index. The index is therefore revised twice, on average by around 0.2 percentage points.

### 3. Conclusions

In summary, the first releases of euro area headline indicators have only a very small or no bias. The first estimates of GDP expenditure components are less stable and more volatile than those of GDP itself, in particular gross fixed capital formation and foreign trade components. Overall, there is no evidence that revisions in 2005 have been systematically higher than earlier revisions. Monthly retail sales and industrial production indicators show, as expected, higher revisions than quarterly data. There is no evidence of cyclicity in euro area revisions; however, as available historic vintages of revisions cover only a few years, any relationship between the size of the revisions and the phase of the business cycle cannot be excluded *a priori*.

At the euro area country level revisions are often somewhat higher, but they often cancel out in the euro area aggregation. From a euro area perspective, it is important that national releases and revisions are synchronised to the extent possible and without jeopardizing the timeliness of national data, in order to further increase the stability of euro area aggregates. In particular, progress towards co-ordinated revision policy, both for regular and for occasional major revisions, is therefore desirable.

Large revisions have occurred for euro area retail trade indicators and for compensation per employee statistics, due to sometimes high revisions in national data. In particular for euro area retail trade the timeliness of the first release was recently advanced from 65 to 35 days and this might have contributed to the currently still high revisions of early estimates. For GDP and unemployment, revisions have been higher in 1999 and 2000, mainly as a result of new statistical concepts that were introduced at that time.

Finally, it is important for users that in the communication of economic statistics (e.g. in press releases) sufficient background information on revisions is provided as this is important for the analysis of the results, and would facilitate the use of these statistics.