

## Reliability and revision profile of selected German economic indicators

Economic analyses and forecasts are often based on provisional data, which are then revised at a later date when new information becomes available. The deviations between the data initially published and the final data enable conclusions to be drawn about the reliability of the economic indicators as well as the underlying analyses. Evaluations based on the Bundesbank's real-time database show that there are considerable differences in the revision profile of German economic indicators. Such differences stem from the particular collection, preparation and estimation methods used as well as from other characteristics of the time series in question. For instance, corrections to the industrial production index are minimal while the relatively high level of revision in the construction sector is due to specific weather conditions. Retail sales are characterised by a large proportion of estimates in the data initially published as well as by the methods used.

Revisions are often the greatest in the early stages. During the financial and economic crisis, revisions were not extraordinarily large. The cyclical turning points had already been shown correctly in the first publications.

As a rule, the results of the revision analysis undertaken show that economic observers should exercise caution when interpreting data at the current end. There is often a trade-off between the timeliness and the reliability of indicators. Official statisticians, together with reporting parties, are thus faced with the challenge of trying to issue as complete a data set as possible at the current end to keep revisions to a minimum from the outset. Official statisticians should therefore stand firm and not give in to the urgent call to make data available at an ever earlier date if this were to have too great an adverse impact on the reliability and accuracy of the information. The empirical information value of the statistics is the key quality criterion and should not be jeopardised. If in doubt, the reliability of the indicators is more important than the speed at which they are provided.

## Importance of revision analysis

*Need for revision*

Economic analyses and forecasts are often based on data that are provisional and incomplete. At the current end of a time series, it is rare for all relevant information to be available, meaning that statistics are often based on estimates and assumptions. In the revision process, estimates are substituted with figures from reports submitted at a later date and this gradually improves the quality of the statistics. In general terms, revisions can be seen as the price that has to be paid for very up-to-date statistics. Just how high this price can be, is shown in the following analysis.

*Broad use of real-time data and revision analysis*

Real-time data show the data currently available at certain points in time. For some time now, they have been used not just in economic analyses but also increasingly in macro-economic forecasts.<sup>1</sup> They can also be used to reconstruct the information underlying earlier decisions and to model decision-making processes.<sup>2</sup> Furthermore, the most recent information at the end of a time series can be used as a basis for projections. Perceptible revisions to these data can trigger a new forecast. Moreover, an evaluation of the forecast shows that the crucial factor is the period of time in which the revisions are made. For instance, the extent of the forecast error in the previous year's gross domestic product depends to a large degree on whether the quarterly values at the beginning of the forecast horizon are revised or those for a later quarter.<sup>3</sup> To ensure that forecasts are as reliable as possible, expected revisions therefore need to be taken into consideration. Statistics producers themselves ultimately also use the analysis of real-

time data. Such an analysis points to potential systematic errors in provisional figures that are to be corrected as well as to particularly problematic weaknesses in the process of collecting and estimating statistics.

## Reasons for revision

The reasons for revising statistics are manifold. Original values are chiefly revised as a result of data-driven or methodology-related changes.<sup>4</sup> The former largely arise from the substitution of estimates with figures obtained from reports submitted at a later date. In isolated cases, statistics may also be changed as a result of the incorporation of data corrections that went unnoticed in the initial plausibility checks of the results and were only later found to be incorrect by the reporting parties or the statistical institutions. Furthermore, monthly data is also adjusted, for instance, to take account of more comprehensive quarterly or annual information based on a larger group of reporting parties.

*Reasons for revision: data-driven and methodology-related changes*

Methodology-related changes are also possible. Refinements to estimation methods enable statistical results to better approximate the situation to be measured. In the case of indices, there are often new patterns as a re-

<sup>1</sup> See D Croushore (2011), *Frontiers of Real-Time Data Analysis*, *Journal of Economic Literature* 49, pp 72-100.

<sup>2</sup> See C Gerberding, F Seitz and A Worms (2005), *How the Bundesbank really conducted monetary policy*, *North American Journal of Economics and Finance* 16, pp 277-292.

<sup>3</sup> See Deutsche Bundesbank, *The impact of quarterly rates on the annual rate of change in gross domestic product in 2009*, *Monthly Report*, June 2010, pp 42-43.

<sup>4</sup> See C S Carson, S Khawaja and T K Morrison (2004), *Revisions Policy for Official Statistics: A Matter of Governance*, IMF Working Paper WP/04/87.

sult of updates to the overall trade weights for the aggregation of underlying index numbers when the base year is switched. The European harmonisation of recording methods also often results in revisions to past data.<sup>5</sup>

*Changes to definitions and classifications*

Occasionally the definition of an economic indicator itself may change, for example if new goods, services and production processes are to be included in updated product classifications or classifications of economic activities. It is debatable whether changes in data as a result of such circumstances are to be classed as “normal” revisions or as a new time series, which is to be treated in a fundamentally different way and is not intended for comparison with previous data sets. This decision depends on how the statistical findings are to be used. An economic analyst who wants to check his clarification model using historical information may treat larger conceptual changes in the statistics in the same way as any other data revision. By contrast, a statistician who wants to use empirical revision analyses to determine additional improvements for the process of producing statistics may closely examine any differences between the definitions and concepts in earlier and in current data.

*Revision as part of seasonal adjustment*

Revisions to original values can be seen in seasonally adjusted data. In addition, the process of seasonal adjustment itself entails revising seasonally adjusted figures. The procedures to filter data used in seasonal adjustment are sensitive to incorporating new information at the current end.<sup>6</sup> Estimating calendar effects also causes seasonally and calendar-

adjusted figures to change at a later point in time, especially in the case of short time series due to the low number of observation values. Thus in order to assess the reliability of the seasonally adjusted indicators used for the current economic observation, it is not sufficient to observe merely revisions caused by new original values but the effect of these revisions on seasonally adjusted data must also be taken into account. On the other hand, neglected revisions do not necessarily demonstrate the quality of statistics. Hence the easiest way to minimise revisions is to not conduct any at all. Statistical findings would thus remain provisional and new information would not be taken into consideration.

### Empirical revision profile

The Deutsche Bundesbank's real-time database provides the data basis on which to examine the revision profile of German economic indicators.<sup>7</sup> It contains historical results of some 280 economic indicators from the

*Comprehensive database*

<sup>5</sup> For instance, it is already evident that the EU-coordinated decision to include the measurement of prices of seasonal food, clothing and shoes in the next update of the national consumer price index (which is already included in the German Harmonised Index of Consumer Prices) will have an impact on its intra-annual profile. See G Elbel, *Behandlung saisonaler Erzeugnisse in der deutschen Verbraucherpreisstatistik*, *Wirtschaft und Statistik* 11/2010, pp 1022-1029.

<sup>6</sup> See Deutsche Bundesbank, *The changeover from the seasonal adjustment method Census X-11 to Census X-12-ARIMA*, *Monthly Report*, September 1999, pp 39-50.

<sup>7</sup> The real-time database contains the data currently available at certain points in time ([http://www.bundesbank.de/statistik/statistik\\_realtime.en.php](http://www.bundesbank.de/statistik/statistik_realtime.en.php)). See Deutsche Bundesbank, *Publication of a comprehensive real-time database for the German economy*, *Monthly Report*, August 2009, pp 50-51, as well as T A Knetsch (2010), *The Bundesbank's Macroeconomic Real-Time Database for the German Economy (Gerda)*, *Schmollers Jahrbuch* 130, 2, pp 241-252.

national accounts, monthly business and labour market reports as well as price statistics. Depending on availability, some figures are contained in both original and seasonally adjusted and/or calendar-adjusted form. From these figures, the total revision for a reporting period can be calculated as the difference between the final value and the initial, provisional figure. Unless otherwise marked, the data up to the end of 2009, which were available when the revision analysis was conducted (March 2011), are taken as being final. For the most part, these data are based on information that is available in full.<sup>8</sup>

In order to determine the reliability of the selected indicators, five different summary statistics are calculated. For this purpose, rates of change are used that are central to economic observation. The arithmetic mean of the revisions can be used to determine potential systematic distortions of the provisional data. The mean absolute revision (ie in terms of absolute value) provides additional information. When calculating this figure, the positive and negative corrections do not offset each other, thus giving rise to the impression of a "normal" amount of changes to the data. A further measure is the standard deviation. This demonstrates how far away the revisions spread from the mean. One answer to the question of how reliably the initial (provisional) publication maps the development trend at the current end is indicated by the relative frequency of cases in which the data from the initial estimate shows the same sign as the final results. As an indicator of quality, the ratio between the average absolute rates

of change of the final results (signal) and the mean absolute revisions (noise) is examined.

In the following analysis, these summary statistics are applied to real-time data of selected economic indicators that are of particular interest for the calculation and projection of gross domestic product (GDP).

The industrial production index calculated each month by the Federal Statistical Office has a prominent role in economic analysis. Since January 2007, the monthly values have been based on information supplied by entities with at least 50 employees; prior to this date, the reports were based on a smaller group of reporting parties.<sup>9</sup> Figures for late reports were estimated in order for the provisional monthly data initially published to be as precise as possible. Revisions to the data initially published for a month thus result, first, from substituting estimates with late reports. Second, after the close of each reporting quarter corrections arise due to the incorporation of reports from smaller entities. Third, as part of the annual correction process each spring, prior-year data are corrected by entering reports submitted at a later date. Hence, a complete revision cycle for primary statistical data takes, on average, almost one

*Selection of economic indicators*

*Revision cycle for industrial production index*

*Summary statistics*

<sup>8</sup> This applies particularly to the original values. Although the extent of revision for seasonally adjusted results generally decreases over time, due to technical reasons the correction process never ends.

<sup>9</sup> See C Bald-Herbel, Umstellung der Konjunkturindizes im Produzierenden Gewerbe auf Basis 2005, *Wirtschaft und Statistik* 3/2009, pp 223-231; C Bald-Herbel, Erste Erfahrungen mit dem neuen Konzept des Produktionsindex für das Produzierende Gewerbe, *Wirtschaft und Statistik* 6/2000, pp 413-419 as well as N Herbel and J Weisbrod, Auswirkungen des neuen Konzeptes der Produktionserhebungen auf die Berechnung der Produktionsindizes ab 1999, *Wirtschaft und Statistik* 4/1999, pp 293-298.

## Revision of German economic indicators\*

Indicator	Period of analysis	Number of observations	Mean revision, in percentage points	Mean absolute revision, in percentage points	Standard deviation of revision, in percentage points	Reliability of sign, <sup>1</sup> as a percentage	Signal-to-noise ratio <sup>2</sup>
Change in seasonally adjusted figures compared with previous period, as a percentage							
Production index Industry <sup>3</sup>	06.1995–12.2009	173	0.1	0.9	1.2	86	1.4
	06.1995–12.2004	113	0.1	1.0	1.3	81	1.1
	01.2005–12.2009	60	0.2	0.7	0.8	95	2.2
Construction	06.1995–12.2009	173	-0.2	2.5	3.3	79	1.1
	06.1995–02.2005	115	-0.3	2.7	3.6	74	1.0
	03.2005–12.2009	58	0.0	2.0	2.7	88	1.4
Energy	06.1995–12.2009	173	0.5	2.3	3.0	64	0.8
Retail sales	10.1996–12.2009	146	0.3	1.4	1.8	71	0.8
External trade							
Export	02.1995–12.2009	173	-0.3	1.5	2.0	84	1.6
Import	02.1995–12.2009	173	-0.2	1.6	2.0	88	1.9
Employees	02.1995–12.2009	167	0.0	0.1	0.1	95	1.2
Gross domestic product, real <sup>4</sup>	1995 Q2 – 2009 Q4	57	0.0	0.2	0.3	96	2.6
Change in original values compared with previous year, as a percentage							
Production index Industry <sup>3</sup>	06.1995–12.2009	173	0.1	0.9	1.2	90	6.2
	06.1995–12.2004	113	0.0	1.0	1.3	86	4.1
	01.2005–12.2009	60	0.3	0.7	0.8	98	12.4
Construction	06.1995–12.2009	173	1.4	2.2	2.7	91	3.2
	06.1995–02.2005	115	1.8	2.9	3.1	88	2.5
	03.2005–12.2009	58	0.6	1.0	1.2	98	7.4
Energy	06.1995–12.2009	173	1.1	2.4	2.9	73	1.3
Retail sales	10.1996–12.2009	159	0.5	1.1	1.5	84	2.1
External trade							
Export	02.1995–12.2009	179	0.1	0.7	1.4	98	12.6
Import	02.1995–12.2009	179	0.1	1.3	1.6	97	7.6
Employees	09.1999–12.2009	123	0.2	0.4	0.5	83	2.4
Gross domestic product, real <sup>4</sup>	1995 Q2 – 2009 Q4	57	0.0	0.3	0.4	100	6.6

\* Comparison of provisional values initially published with final figures (data as of March 2011). — <sup>1</sup> Share of cases where figures from the initial estimate have the same sign as the final results. — <sup>2</sup> Ratio of average absolute rates of change in final results (signal) to mean absolute revisions (noise). — <sup>3</sup> Up to June 2001, output from manufactur-

ing. — <sup>4</sup> Prior to 2005 Q1, the most recently published values for the respective price base are taken as the final figures; that is 1998 Q4 for the base 1991=100 and 2004 Q4 for the base 1995=100. These changeovers coincide with the introduction of ESA 95 and of chain indices, respectively.

and a half years. The underlying aggregates can still change, even after this cycle has been completed. Additional revisions are made at roughly 5-year intervals as a result of changes to the methodology, the base year as well as to the classification of economic activities and goods.

*Extent of revision ...*

A look at the above-mentioned summary statistics shows the following for industrial output: with an average revision of 0.1 percentage points over the entire period examined, the month-on-month seasonally adjusted rate of change shows virtually no bias. The mean absolute revision amounts to 0.9 percentage points. The distribution of the corrections is virtually symmetrical. In over four-fifths of the cases, the provisional month-on-month change has the same sign as the final results.

*... reduced by changing the estimation method*

However, such long-term averages do not reflect the typical revision profile in every period. Taking industrial output as a case in point, it can be illustrated to what extent the revision structure can be dependent on which conventions, measurement concepts and collection procedures are used. For instance, up to the end of 2004, missing results from local units were substituted with the values reported for the previous month.<sup>10</sup> This meant larger revisions if special effects, such as the timing of school holidays, had a major impact on the previous month's value. Since 2005, these transitional gaps in information have been filled by estimated figures based on changes on the previous month derived from reports submitted on time. This has demonstrably improved the provisional data on in-

dustrial output published. In the period from 2005 onwards, both mean absolute revision and dispersion are lower than in the previous period. The reliability of the initially published tendency of the findings has also increased. The information value of data for the summer months August and September, which are affected by school holidays and plant shut-downs, increased in particular. Prior to the change in the estimation method, the mean absolute revision for these months stood at 1.3 percentage points and afterwards it returned to the average for all months.

Revisions to construction output – which comprises both general building and civil engineering – are less evenly distributed than in the industrial sector. Coupled with pronounced irregular effects, in terms of value, the level of revision to seasonally and calendar-adjusted figures observed is comparatively high. In the case of construction, these effects are extraordinary weather conditions.

*Construction output ...*

This indicator, too, shows a decline in the amount of revision in response to improvements in the method for calculating and publishing provisional data. Since 2005, when the method was first changed for the period from March to October, construction output has been adjusted in advance to anticipate the expected correction in the total annual survey on the construction industry. This put an end to the overestimation of the month-on-month provisional rate of change, which had been observed until that time. The extent of abso-

*... with declining data corrections*

---

<sup>10</sup> See Federal Statistical Office, Kurznachrichten, Methodische Änderungen bei den Konjunkturindizes, Wirtschaft und Statistik 3/2005, p 179.

lute revision declined notably and the reliability of the sign at the current end increased.

*Energy output ...*

Energy output is determined on the basis of official statistics on amounts of energy produced. Data is collected from a maximum of 1,600 energy supply companies with 20 or more employees. This does not include single renewable energy systems or parts thereof distantly connected to this source of energy. The data initially published for this indicator show a comparatively high proportion of estimated values.

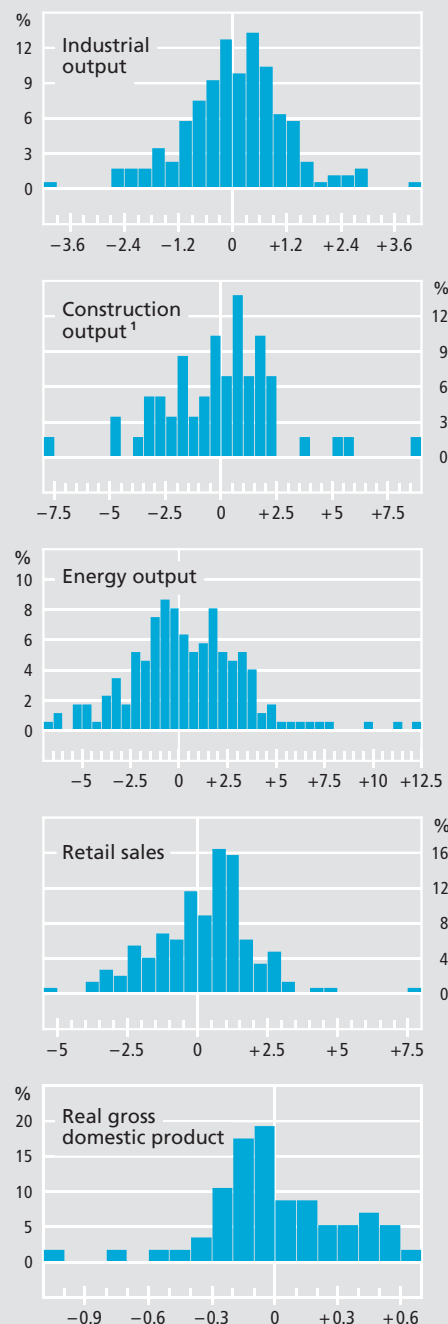
*... problematic at the end of the time series*

In the case of energy output, the initial, provisional, seasonally adjusted rates of change are, on average, half a percentage point below the final figures. Moreover, the mean absolute revision amounts to 2.3 percentage points. The revisions are not distributed symmetrically. The uncertainty of the initial estimate can also be seen in the fact that just over one-third of all cases does not have the same sign as the final results. All in all, initial data show more statistical coincidences than sound findings, which is also indicated by a signal-to-noise ratio of less than one. Hence provisional monthly flows of this indicator should not be interpreted in economic terms. While the reliability improves over a longer comparison period, it still remains limited, even when conducting a year-on-year comparison of original values. At 1.3, the signal-to-noise ratio is the lowest of all statistics considered here.

*Index of retail sales revised once a month ...*

The index of retail sales measures the development of sales of retail enterprises that have a minimum annual turnover of €250,000. It is

Frequency distribution of revision of selected economic indicators\*



\* Relative frequency of revision of seasonally adjusted rates of change (in percentage points) compared with previous period. — 1 Period of analysis from March 2005 onwards.

Deutsche Bundesbank

estimated on the basis of a sample of around 8% of retail enterprises domiciled in Germany. Retail sales figures are initially published approximately 30 days after the end of the month under review. Generally speaking, these results are compiled from data from the seven largest German federal states. The state results also contain estimates for enterprises that did not submit their reports on time or reported only extrapolated values. Roughly two weeks later, results supplemented with data from all German federal states are available. Incorporating late reports and rotating the enterprises included in the sample results in a revision cycle of up to 24 months.

*... and is initially not very reliable*

Since October 1996, the seasonally adjusted month-on-month rates of change initially published have been, on average, 0.3 percentage points below the final value.<sup>11</sup> The value of initial figures was corrected by an average of 1.4 percentage points. The revisions are not distributed symmetrically in this case either. The two largest distribution classes are those with revisions of between ½ and 1½ percentage points. According to the signal-to-noise ratio, statistical noise exceeds the news value. To improve the quality of these data, the estimation method was changed, most recently in 2003.<sup>12</sup> As no particular consideration was given to features affecting the number of working days, such as the date on which Easter falls, which is particularly important for retail trade, or the number of selling days, this has resulted in higher revisions to date, predominantly in March and April. For instance, the seasonally and calendar-adjusted month-on-month change in March 2010 which, at -1.8% in the initial publica-

tion, indicated an unusually sharp slump for retail, was revised to a positive rate of change of 1.0% (data as of June 2011) chiefly due to the substitution of estimates with late reports.

A further particularity of retail sales can be seen in the period from June 2010 onwards. This corresponds with the time when a new automated sample rotation was introduced.<sup>13</sup> Since then, revision has increased and, at below 50%, the proportion of cases where the provisional data in the initial estimate has the same sign as the revised results is particularly low. Given this situation, the information value of the initially published data on retail sales for private consumption is currently particularly low.

*Data initially published for retail sales currently requires considerable correction*

For external trade, information about cross-border goods trade outside of Germany is collected by the customs authorities; for EU intra-trade, this information is reported directly by companies. To ease the reporting burden on companies, minimum thresholds have been set for which no statistical reports are necessary. Up until the end of 2010, there was a two-stage revision procedure. The first revision of external trade figures initially published came about two to three weeks later once the results broken down into goods and

*New approach to revision for external trade ...*

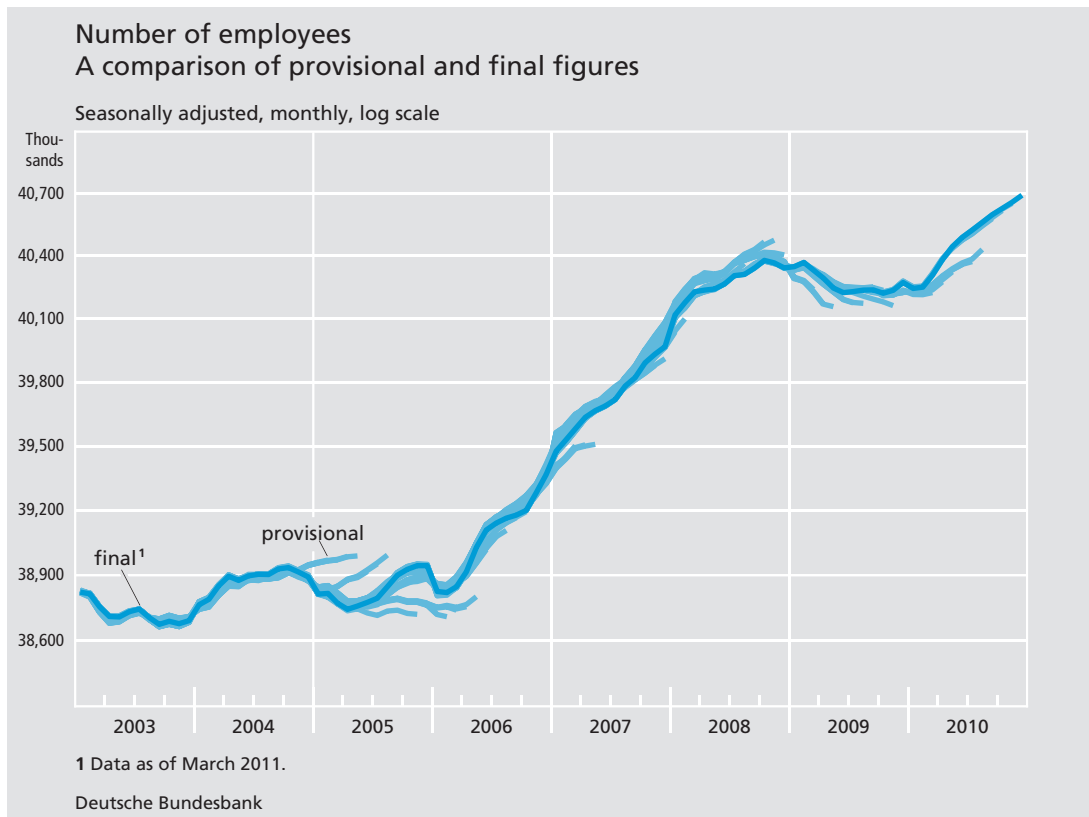
---

<sup>11</sup> The starting point for the examination corresponds with the time that normal reporting on the development of retail sales started again following the changeover from the national to an EU-harmonised classification of economic activities.

<sup>12</sup> See I Fischer, Neues Schätzverfahren im Handel und Gastgewerbe, *Wirtschaft und Statistik* 7/2004, p 750f.

<sup>13</sup> See E Wein and K Lorentz, Die neue automatisierte Stichprobenrotation bei den Handels- und Gastgewerbestatistiken, *Wirtschaft und Statistik* 11/2010, pp 979-989.





country groups had been released. The annual correction was made in the autumn of the following year. As of the start of the 2011 reporting year, there are plans – in line with European harmonisation requirements – to revise monthly external trade results six times, starting two months after initial publication, to ensure that late reports are incorporated sooner than has been the case to date. In addition, the usual annual correction is also scheduled to take place.

*... and, in the past, similar changes for import and export values*

The summary statistics provide rather similar results for import and export. They show a slight overestimation of the initial month-on-month seasonally adjusted rate of change. The absolute correction amounted to approximately 1½ percentage points. In more than four-fifths of the cases, the initial esti-

mate had the same sign as the later figures. The signal-to-noise ratio of these indicators is also relatively high. For exports, it amounts to 1.6 and, for imports, 1.9. Thus the external trade balance – calculated from these two indicators – initially published is comparatively reliable.

Employment figures in the national accounts do not only provide comprehensive information on labour market developments at an early stage, they also have an important role to play in extrapolating GDP with regard to estimating value added in various economic sectors, especially in the services sector. The monthly aggregates comprise employees (wage earners, salaried staff, civil servants, persons in low-paid employment and soldiers) as well as the self-employed and family work-

*Employment figures ...*

## Quality requirements for statistics from a national and European perspective

When observing the economy, it is only possible to answer questions concerning the dynamics and direction of economic activity in its different facets with the aid of short-term statistics. In this regard, it is of key importance to identify cyclical turning points at an early juncture. Most economists share this fundamental view. Nevertheless, there is a fair chance that the judgement made when weighing up the timeliness and reliability of statistics will differ depending on whether the analysis is based on European or national data. This also impacts on the matter of the preferred initial publication date for statistics.

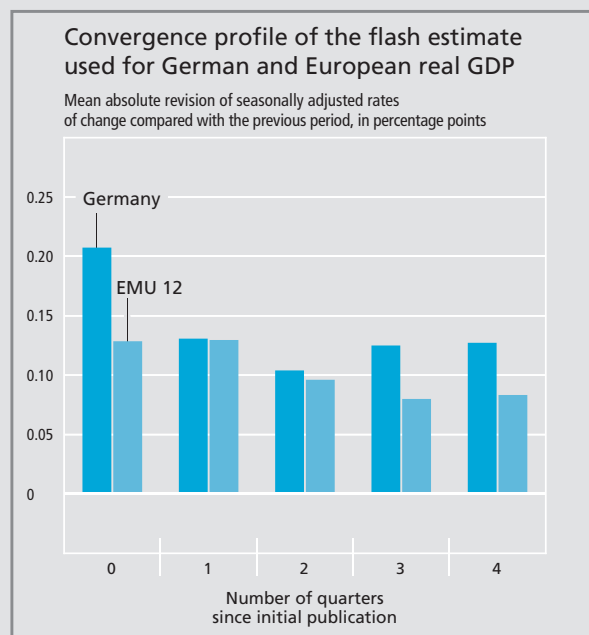
Considerations relating to sample theory and time series analysis are of key relevance to this argument. The former considerations presuppose that, in the case of a small random sample taken from a large population, the reliability of the sample mean is mainly predicated on its absolute size, and less so on the proportion of observed cases in the population.<sup>1</sup> Hence, it is safe to assume that smaller samples taken at the national level, which deliver unreliable figures with high sampling errors, can be aggregated at the European level to form a large sample that allows sufficiently sound conclusions to be drawn about the aggregate. Following this idea, the European figures could, with the same degree of reliability, be published at an earlier date than national data, provided a sufficiently large number of cases have been observed in Europe but not at the national level.

A similar line of argument is pursued in terms of time series analysis. In this case, use is made of the seasonally adjusted figures that represent a key area of interest with regard to current economic developments. These are based on models and comprise the components of the (long-term) growth trend, cyclical fluctuations and irregular movements (including special factors that can be explained in economic terms, such as large orders or strikes, but also random factors and statistical measurement errors). Where such randomly occurring irregular fluctuations recorded at the national level have no strong positive correlation with one another, they tend to be cancelled out when forming larger aggregates. Conse-

<sup>1</sup> The variance of the sample mean can thus be calculated as the ratio of the variance of sample values to the number of individual observations. The size of the population is virtually negligible. — <sup>2</sup> Austria,

quently, more highly aggregated time series generally follow a calmer and smoother path than their individual components. Accordingly, as long as they are equally timely, European seasonally adjusted data are, *ceteris paribus*, more reliable for the purpose of observing current economic developments than the corresponding figures for individual member countries. In other words, seasonally adjusted data for Europe could be published ahead of those pertaining to individual countries while providing the same degree of reliability.

These arguments are shown to be correct if the revisions to the seasonally adjusted rates of change for German GDP vis-à-vis the previous quarter are compared with those of the 12 countries of the former European Monetary Union<sup>2</sup> (EMU 12) for the period from the first quarter of 2003 to the fourth quarter of 2009.<sup>3</sup> What becomes clear is that the extent of mean absolute corrections at EMU-12 level on both the first and the later calculation dates is consistently below or equivalent to that for Germany. At 0.2 percentage points, the standard deviation of the revisions to the initially released data among the



Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. — <sup>3</sup> The recently published values using the price base 1995 = 100 for the fourth quarter of 2004 are

EMU 12 is likewise somewhat below the result measured for Germany (0.3 percentage points).

Moreover, none of the investigated cases indicated a reverse pattern in developments from one quarter to the next when switching from the provisional figures to the final data. Last but not least, in Germany and the EMU 12 alike, the ratio between the average absolute rate of change and the mean absolute revision stands at a value of around five. These combined factors demonstrate a high quality of data, especially as flash estimates do not, on average, show any distortions.

In the recent past, the high degree of data reliability has prompted a Europe-wide debate as to whether the flash estimate should be published in advance of its current release date, namely after a period of just 30 days as opposed to the present 42-day interval. In this context, announcing the initial European results on their own is considered inadequate as, in the interest of transparency, there is a wish to identify the manner and force with which each country has contributed to shifts in the European aggregate. At this point, however, the line of reasoning becomes circular, for these same theoretical considerations support an accelerated announcement of purely European statistics, with national data published at a later date. If national and European data are to be announced simultaneously then it is necessary to wait for qualitatively sound data for the last national figure before going ahead with publication. This is especially pertinent given that national data are not used by national policy-makers alone. Among other things, they also serve as a starting point for international discussions about the varying dynamics and heterogeneity of different country groups and nations within areas operating a monetary union. The van Rompuy initiative and the scoreboard approach at the European level recently stressed this very perspective.<sup>4</sup> National statistics relating to the excessive deficit procedure are also of great importance for economic policy.

What is more, the notion of bringing forward the release date for GDP statistics, to just 30 days after the end of

regarded as the final figures prior to the first quarter of 2005. — 4 See Task Force to the European Council (2010), Strengthening Economic

the reporting period (GDP in  $t+30$ ) instead of the current 42-day wait, could push statistics to their limits. For instance, at such an early calculation date, no reliable data are yet available from the individual statistical fields for the third month of any given quarter. Hence, most of this information would have to be estimated. There would then be a danger that special effects or cyclical turning points, whose future occurrence is particularly hard to pinpoint, would not be included in the calculation of GDP in the last month of the quarter. Had the GDP calculation date been set 30 days after the end of the reporting period, the crisis-induced sharp decline in industrial output in September 2008 could not have been taken into account when initially determining the figure for the third quarter of 2008. Such a scenario would have harboured the risk of sending a wrong signal at first, namely of “no significant events” having occurred thus far. An assertion of this kind would have necessitated painful adjustment of the statistics at a later date.

Two additional demands that play a role in the debate surrounding timeliness and reliability are consistency and coherence. Up-to-date and reliable figures calculated on the basis of all available information should not only be consistent within individual statistical fields but also, and more importantly, the statistics should create a coherent, interlinked and consistent overall system. Arguably, it is at best possible in theory to meet all these demands at the same time. This would necessitate the quasi-continuous incorporation of all new reports into the primary statistics and the ongoing adjustment of the aggregated accounts up to and including the European system of national accounts. Such activity, however, would generate high statistical production costs and entail substantial adjustments on the part of the user, for example in terms of the timeliness of their analyses and forecasts. It is, therefore, impossible to totally avoid inconsistencies between figures taken from available reports and the latest published statistical results or between these data and those contained in the national accounts, and due account should be taken of such inconsistencies when making analyses and evaluations.

Governance in the EU ([http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/en/ec/117236.pdf](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/117236.pdf)).

ers that are economically active. They are available as early as 30 days after the end of the month under review and therefore much earlier than the results of many specialist statistics or the initial estimates for employees subject to social security contributions. Due to this tight timeframe, employment data that are initially published are based largely on estimates.<sup>14</sup>

*... with low revisions ...*

Over a longer period, the month-on-month rates of change in employment initially reported show, on average, no positive or negative bias. At only 0.1 percentage points, the mean absolute revision is the lowest of all economic indicators examined in this article. This shows that the generally expected development of these stock statistics can be successfully anticipated by means of the estimation algorithms used. However, in the area of cyclical turning points, the need for revision is much higher. Precisely in those times that are of particular interest for economic analysis, initial figures released for this indicator are to be interpreted with great caution. This is clearly evident when considering data from the summer and autumn of 2005. Provisional data at this time initially indicated a continuation of the trend hitherto, which had since been reversed, towards a decline in employment. It was not until months later when the primary statistics for employment were complete that it could be seen that the decline in employment had come to an end and employment was actually on the rise.

*... but problems at turning points*

*Gross domestic product ...*

The indicators discussed so far are required to extrapolate the data in the national accounts up to the current end of the time series. They

are ultimately reflected in the aggregate measure of an economy's performance, namely the GDP. Since the revision of the national accounts in 2005, the figures have been calculated in previous-year prices on the basis of a Laspeyres chain index.<sup>15</sup> Due to the high number of provisional and revised figures contained in the calculation of the GDP, the original values are considered provisional – not just within the calendar year. Once a year in August, the annual statistics and corrections to monthly indicators stretching back for some time are incorporated into the calculation.

In the underlying observation period (1995 Q2 to 2009 Q4), the seasonally adjusted real GDP does not show any systematic over or underestimation of the initial, provisional rate of change compared to the previous period. Similarly, the mean absolute revision amounts to only two-tenths of a percentage point. Just under two-thirds of the revisions are in the correction range of  $\pm 0.2$  percentage points. This is reflected in the reliability of the sign for the rate of change in the provisional data. In the period under review, only two (out of 57) cases had a different sign to the final results. The comparisons were conducted in line with the version of the national or European system of national accounts valid at that time to ensure that the variables compared were defined in the same way.

*... has a comparatively low level of revision*

<sup>14</sup> See S Fritsch, Die Erwerbstätigkeit in Deutschland (Teil 1), *Wirtschaft und Statistik* 9/2006, pp 934-946.

<sup>15</sup> See Deutsche Bundesbank, Revision of Germany's national accounts, *Monthly Report*, May 2005, pp 36-37.

*Revision low during financial and economic crisis*

To examine the possible impact of the financial and economic crisis on the revision profile, revisions for the months from September 2008 to April 2009 were closely analysed. They show that the initial indications of a sharp slump in industrial output became established rather quickly and did not require notable revision. The provisional figures overestimated the decline by 0.4 percentage points on average. However, this is put into perspective when considering the extent of the downturn. For instance, at 4.8, the signal-to-noise ratio in the period from September 2008 to April 2009 is much higher than in the overall period under review (1.4). Most of the other indicators present a similar picture. During the financial and economic crisis, the economic indicators were able to show the cyclical turning points very accurately.

### Convergence of revisions

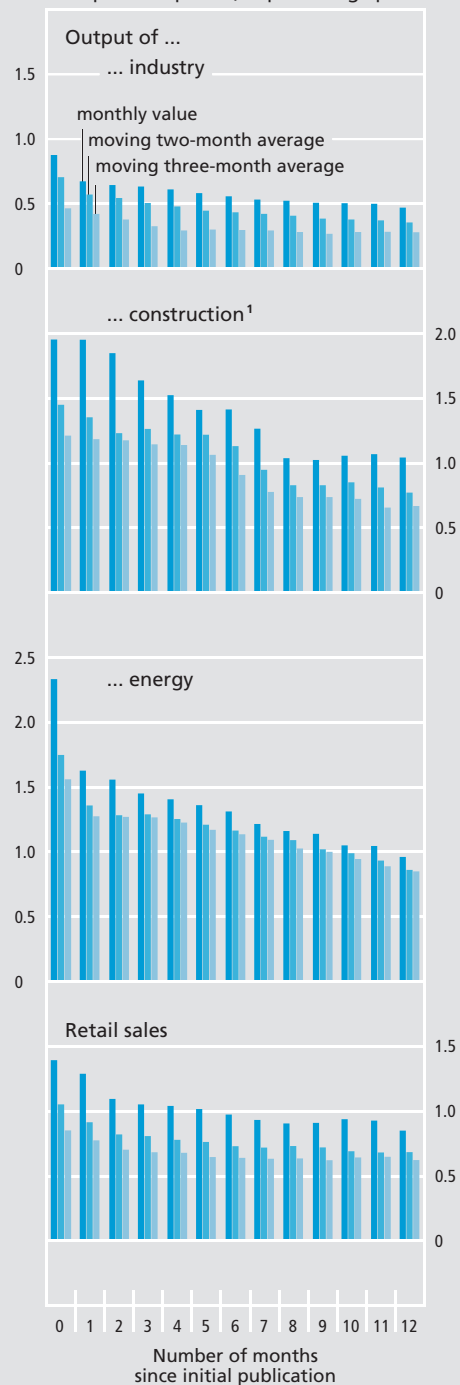
*Convergence profile ...*

*... of industrial output, ...*

The way in which provisional figures converge to final results shows that the path to the final data and, with it, the tailing off of revisions is different for each indicator. For instance, in the case of industrial output, revisions to the month-on-month rate of change as a result of incorporating late reports declines notably just one month after publication of the provisional results. The second publication then provides a fairly reliable picture of the trend in development at the current end. After that, the mean absolute revision declines at only a slow pace. Even after one year, it has not vanished entirely. On the one hand, the annual correction of the original values has not yet been included in full. On the other hand,

### Convergence of revision of selected economic indicators

Mean absolute revision of seasonally adjusted rates of change compared with previous period, in percentage points



1 Period of analysis from March 2005 onwards.

Deutsche Bundesbank

changes in seasonal and working-day factors ease over time but never completely disappear as additional values contain new information for estimating the seasonal component. Aggregate rates of change for two or three consecutive months vis-à-vis their corresponding previous period are less prone to revision than the month-on-month rates of change. Looking at a moving three-month average, the mean absolute revision is below half a percentage point, even for the initial publication.

*... construction output, ...*

At the start, revisions to construction output amount to just under 2 percentage points. It takes roughly eight months for this to be halved. When using three-month averages, the amount of revisions falls from 1.2 percentage points in the data initially published to 0.9 percentage points after six months. At in excess of 2 percentage points on average, revisions to the data initially published for energy are higher still. For these data, one year is needed before the mean absolute revision falls below 1 percentage point.

*... energy output ...*

*... and of retail sales*

From an initial level of 1.4 percentage points, revisions to retail sales decrease to less than 1 percentage point after six months. There is little change in the mean absolute revision to the rates of change vis-à-vis the previous period on the basis of three-month averages. It amounts to 0.9 percentage points for the first publication date and 0.6 percentage points one year later. Thus, depending on the observation method, it takes about six months, and in some cases longer, before the amount of revision declines notably.

## Conclusion

---

Overall, there are considerable differences in the revision profile of the economic indicators examined. In addition to GDP, a range of indicators (for example, for industrial output and the number of employees) generally proves to be sufficiently reliable with regard to the data initially published. However, a greater amount of caution should be exercised when examining others (for instance, energy output and retail sales) and it is advisable to wait for a more complete data basis before drawing conclusions about economic developments.

*Information value of statistics as key quality criterion*

However, merely providing information about the uncertainty of current statistical results from revision analyses – as demonstrated in this article – is not sufficient for practical use in economic policy. Instead, it is the responsibility of statisticians, together with reporting parties, to ensure that current data are always a sufficiently reliable basis for economic analyses. Given the urgent call to make data available at an ever earlier date, a decision must be reached as to whether it is worth investing additional resources to increase the speed at which sufficiently accurate data are provided or whether it is more appropriate to release figures at a later date when more information is available. The ultimate task of economic statistics is to achieve a realistic as possible picture of economic activity and economic structures using well-prepared primary data as well as user-friendly information and communication systems that provide the greatest possible support in the opinion-forming and decision-making process.