**Reporting on Accuracy for the National Accounts**

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**Abstract**

*Quality reporting, particularly regarding the Accuracy component, for macro-aggregate compilations such as the National Accounts, has historically posed a challenge to National Statistical Offices (NSO). Usually it is agreed that the traditional structure used for statistical products based on surveys utilizing sources of uncertainty, is not applicable. Tailored guidelines for discussing accuracy regarding macro-aggregate compilations have applied instead.*

*In 2016 Statistics Sweden launched a nationally regulated quality concept for official statistics of Sweden which is to apply for all statistical products, regardless of the design. The breakdown of the main component Accuracy follows the ESS structure quite closely i.e. Overall accuracy, Sources of uncertainty (Sampling, Frame coverage, Measurement, Non-response, Data processing, Model assumptions), as well as Preliminary statistics compared to final statistics. With all statistical products following this standard structure, there are large benefits to both users and producers alike who will clearly recognize the presentation format and more readily understand the information provided for their respective purposes.*

*A discussion of accuracy that follows Statistics Sweden’s standard approach for all statistical products has proven to be possible regarding the National Accounts. In 2018, Statistics Sweden invested concerted effort into adapting the national quality report for Gross Domestic Product (GDP) to the national standard, emphasizing the issues that are considered relevant and important for users.*

*In this paper, we will report the results of the work to adapt the quality report for GDP to this structure and share the lessons learned.*

**Keywords:** Quality concept, quality report, quality communication, accuracy, National Accounts

**1. Introduction**

*1.1 Quality reporting of the National Accounts*

The National Accounts build upon a large number of primary statistical sources which are then harmonized and compiled and according to an extensive set of internationally agreed rules and recommendations. Due to the complexity of the different sources and methods used in the National Accounts, quality reporting has generally posed a challenge to National Statistical Offices (NSO), Eurostat, and other international organisations. It is usually agreed that the traditional structure used for conventional and more straight-forward statistical products is not conducive – neither for users nor for producers – and that a customized structure is needed for so-called macro-aggregate compilations in order to satisfy the needs of specific users.

An example of a customized structure comes from one of the most important users in the European setting of the National Accounts i.e. Eurostat. Article 3 of the EU Gross National Income (GNI) Regulation stipulates that Member States provide an up-to-date inventory of the sources and methods used to calculate GNI and its components according to ESA 2010. This comprises the so-called GNI Inventories and process tables, the structure of which has been approved by the GNI Committee. These are used by Eurostat to assess the comparability, reliability and exhaustiveness of the GNI data from Member States. The GNI inventory is comprehensive and extensive – the present Swedish ESA GNI Inventory (October 2016) comprises 584 pages and is therefore not so readily accessible to most users. The Inventory for the Swedish Quarterly National Accounts, QNA, (September 2018) comprises 56 pages.

*1.2 General framework for all statistical products*

Statistics Sweden strives, generally and as far as possible, to apply standardised operational procedures, methods, and tools for all statistical products, regardless of the design. This is a strategy used in the production of statistics so that it will be carried out in an efficient and transparent manner. The agency strives also to present its statistics in a uniform and standardised fashion so that users can easily access information on the website and so that especially users of multiple statistics can more easily orient themselves among different statistical products.

In the next section we will briefly explain the quality concept that applies to all official statistics in Sweden[[1]](#footnote-1). Following this we will report on the results of its application on Gross Domestic Product, GDP, and likewise, the application of the template to quality declare official statistics. We will also share some lessons learned.

 **2. Quality concept for official statistics**

In 2016, Statistics Sweden launched a nationally regulated user-oriented quality concept for the official statistics of Sweden. The quality concept, with five main components, follow the quality criteria stipulated in Article 12 of the EU Regulation 223/2009 for European Statistics which were also re-stated in 2013 in the Official Statistics Act (2001:99) of Sweden. The five main components largely map to the five principles for statistical output in the European Statistics Code of Practice, ES CoP. The quality concept is to be used, by all 28 agencies in Sweden responsible for official statistics, to describe the quality in the development, production and dissemination of all official statistics, regardless of the design. Thereby the quality concept is also applicable to the National Accounts in the same manner as it is for statistics from the Labour Force Survey, Consumer Price Index, Population statistics, etc.

*The quality concept* communicated in Statistics Sweden’s regulation has five main quality components:

1. Relevance,
2. Accuracy,
3. Timeliness and punctuality,
4. Accessibility and clarity,
5. Comparability and coherence.

The last three main quality components – *Timeliness and punctuality*, *Accessibility and clarity*, and *Comparability and coherence* – are of standard character and need no further discussion in this paper. These components concern issues that users are interested in regardless of the design of the statistics and are also easily applicable to most products including the National Accounts.

We will however highlight some features and considerations for the components of Relevance and Accuracy, which are specific to the Swedish setting. These components are also useful but challenging for application to the National Accounts.

*2.1 Relevance*

Relevance refers to how well statistics illuminate the issues that are of importance for users of the statistics. The quality component *Relevance* has two subcomponents, both of which are further subdivided into sub-subcomponents as shown in Figure 1.

**Figure 1. Quality component *Relevance* with its subcomponents and sub-subcomponents**

|  |
| --- |
| * Relevance
	+ - * + Purpose and information needs

Purpose of the statisticsUser information needs * + - * + Content of the statistics

Units and populationsVariablesStatistical measuresStudy domainsReference times |

Source: A Handbook on Quality for Official Statistics of Sweden

The subcomponent *Purpose and information needs* refers tothe purpose, the information needs that the statistics are intended to meet, and the knowledge about the needs for statistical information. The subcomponent *Content of the statistics* refers to the target characteristics. Its sub-subcomponents follow naturally and give clear information to appropriately advise users regarding the uses of the statistics,

The quality component *Purpose of the statistics* is different in character from the other components. It is set early – when developing the statistics. It is also a prerequisite. The other quality components are taken into account in the design, and subsequently measured or assessed for the resulting statistics. The design of the statistical survey should be based on the stated purpose (re-considered, if needed) while simultaneously taking into account user needs, the quality of the statistics, the costs, and the response burden. Of course, this does not preclude that other usages are possible. User information needs are normally many and often diverse. There may be conflicts. Hence, some prioritisation is necessary. In the ESS, there are many instances where the statistics are governed by EU-regulations. These have a direct effect on the priorities of the statistical agency regarding user needs and a direct influence on the statistical agency in setting the purpose of the statistics, and thereby its choice of the target characteristics and regarding the quality requirements to be satisfied.

Regarding *Content of the statistics*, it is important to decide on and define the target population and its relationship to any populations of interest. Likewise, target variables are defined in relation to variables of interest and any observation variables.

*2.2 Accuracy*

The Swedish quality concept for official statistics defines also Accuracy, such that it refers to how well a statistical value estimates its target characteristic. It acknowledges that statistics may be disseminated using preliminary statistical values, once or more, followed by final statistical values disseminated at a later stage. Preliminary statistics are generally regarded to have lower accuracy than final statistics. The quality component, *Accuracy*, has three subcomponents. One of these subcomponents is further subdivided.

**Figure 2. Quality component *Accuracy* with its subcomponents and sub-subcomponents**

|  |
| --- |
| * Accuracy
	+ - * + Overall accuracy
				+ Sources of uncertainty

SamplingFrame coverageMeasurementNon-responseData processingModel assumptions* + - * + Preliminary statistics compared with final statistics
 |

Source: A Handbook on Quality for Official Statistics of Sweden

*2.3 Quality declaration template*

Statistics Sweden has also launched a nationally regulated template for quality declarations, or quality reports, of official statistics that follow the structure of the quality concept. The template is also applicable to all statistics, regardless of their design. In providing descriptions of quality, the focused readers are the prioritised users. In addition to providing information on quality, a well-written quality declaration may also serve to facilitate the communication between the user and the producer on user needs.

*2.4 Advantages for users and producers*

With all statistical products following the standard structure described above, there are presumable benefits to producers and users alike.

Firstly, users will clearly recognise the presentation format and more readily understand the information provided for their respective uses.

Secondly, with the use of common terminology across all statistics given by the standard, communication among producers (or statistical agencies) and also between internal users (like the National Accounts) and producers of statistics will be facilitated. As well, the common terminology and understanding of quality descriptions should ultimately benefit the work to coordinate and achieve better coherence between statistics that are inputs to the National Accounts.

Following the above structure to describe issues pertaining to Relevance and Accuracy has proven to be possible for the National Accounts. Some findings and lessons learned of applying this common standard template to GDP will be shared in section 4 following a brief delineation of this statistical product in section 3.

**3. Some general features of the national accounts**

The purpose of the national accounts (NA) is to provide a summarised description of the size, structure and development of the domestic economy and its economic relation to the rest of the world. For member states in the European Union the compilations follows the rules set down in the European System of National and Regional Accounts (ESA 2010), which is consistent with the international standard, System of National Accounts 2008 (2008 SNA). European Union member states are obliged by law to follow the European standard. The requirement for comparability between countries is particularly high due to administrative purposes, the most important one being to determine the EU member fee.

This paper describes the work on the quality declaration for the parts of the accounts called the product accounts and the real sector accounts. These accounts provide numerous aggregates that are of interest for economic analysis. The main aggregate in the product accounts is GDP, which is the value of all the goods and services produced during a period. In the real sector accounts, income re-distribution and uses are shown per institutional sector, with the final balancing item being net borrowing / net lending. The present quality declaration describes the accuracy of the main aggregate, total GDP.

The Swedish national accounts are compiled on an annual basis as well as on a quarterly basis. The annual accounts are published with a delay of 21 months following the reference year. This allows the use of quite comprehensive, detailed and reliable annual data, as well as sufficient time to make more in-depth analyses in order to reveal and adjust for deficiencies and inconsistencies in the source statistics. This is in sharp contrast to the quarterly accounts which are published two months after the reference quarter utilising much less data and much less resources for analysis and adjustment of data.

GDP is compiled from the *production side* as the sum of value added – the value of output less intermediate consumption in the production of that output – generated by the respective industry (line of business) as well as from the *expenditure side* as the sum of all the final uses – final consumption expenditure, capital formation and exports – less imports. Due to insufficiencies in source data and models, these estimates typically differ and still differ after data have been edited and adjusted. Therefore, to arrive at a single estimate requires a *balancing* where the results of the two sides are confronted and adjusted to arrive at one common estimate between the two. The analyses may reveal errors that are corrected, but it may also reveal more or less *likely* causes of inconsistences which are also adjusted. Typically, the components deemed as the least reliable are adjusted the most. Although the circumstances and methods are very different for the annual and the quarterly accounts, the description of balancing applies to both.

Above, the annual and quarterly accounts have been described as two independent statistics. They are however combined into one single quarterly series where the final balanced annual estimates for each year form the backbone and the balanced quarterly estimates are used for quarterly disaggregation and to provide results for more recent periods.

A particularly important difference between the annual and quarterly accounts which is an issue of accuracy, particularly for the quarterly accounts, is that data on intermediate consumption for the business sector is presently available only on an annual basis. Therefore, it is possible to make a direct calculation of value added in the annual accounts only, whereas the value added in the quarterly accounts is model estimated assuming constant input shares. The annual accounts are thus important not only for allowing detailed structural analysis but also for studying long-term economic trends while the quarterly accounts serve merely the purpose for short-term analyses of economic activity which is none-the-less given much attention by the users.

**4. The description of Accuracy for GDP**

Regarding the accuracy of GDP, two main indicators are commonly highlighted i.e. the so-called statistical discrepancy described above as well as the size and direction of revisions between preliminary and final estimates of GDP. The former is explained in the quality declaration under the heading, Overall accuracy, and the latter is explained under the heading, Preliminary statistics compared with final statistics. Below we will describe the issues that are explained under the respective subsections of Accuracy.

*4.1 Overall accuracy*

From the short description above of the national accounts, it should be clear that measuring or estimating the accuracy of the statistics is a difficult matter. There is a large number of sources involved, the source data is also further processed and the estimates analysed, adjusted and finally balanced. The approach adopted for communication of the overall accuracy is instead to provide information about the *statistical discrepancy* between the production side and the expenditure side approaches to compile the GDP. If the two approaches are compiled independently from each other, which is not entirely the case, the difference between their resulting estimates gives at least a good indication of the presence of uncertainty. It is also clear that if the difference is large, the uncertainty also must be large. The opposite is not necessarily true though, since both estimates may suffer from a bias in the same direction and of a similar size. The possibility that small differences are the result of random errors of the same size and direction is ruled out by studying the discrepancy over a number of periods. The number of periods involved should be limited however to years for which the accuracy of source statistics and model assumptions can be assumed to be comparable with those used for the given reference period in the quality declaration.

Table 1 below shows the discrepancy of the annual accounts for each of the years 2011 to 2016. The initial discrepancies vary from -0,2 to +2,1. One should however not draw the conclusion that the accuracy is higher for years with a small discrepancy and lower for years with a large discrepancy. This could well be the result of random variation. Instead, the complete series of discrepancies tells us that there is an initial uncertainty in one or both of the estimates. Since many users tend to give some attention to a difference between 2 and 3 percent GDP growth, it is clear that these discrepancies indicate uncertainties which are not negligible.

**Table 1. Discrepancy, total supply less total use at current prices, as percent of GDP, at different stages of the process**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** |
| Before any analysis | 2,1 | 2,0 | -0,2 | 0,6 | -0,2 | 0,0 |
| Half way through the analysis | 0,4 | 0,2 | -0,4 | 0,6 | 0,0 | -0,1 |
| Before RAS[[2]](#footnote-2) | 0,1 | 0,0 | -0,2 | 0,0 | -0,2 | 0,0 |

Source: Quality declaration for National Accounts, quarterly and annual estimates, 2019-09-07 (version 2)

In conjunction to the analysis that follows the discrepancies are reduced which should contribute to reducing the uncertainties as well. To what extent a reduction is accomplished is difficult to quantify since the basis for the adjustments vary from identified errors to vague hypotheses in the form of subjective judgements. After all, the aim is to arrive at a single GDP estimate.

When the accuracy is assessed of these figures, two more circumstances should be considered:

* Compilations according to the production and expenditure approaches are not fully independent. In some areas, one specific error may appear in both calculations and therefore does not contribute to the discrepancy.
* There are also dependencies between years since part of the annual estimates are modelled *benchmark extrapolations* of direct estimates that are updated at intervals every few years.

The statistical discrepancies that are provided for the annual accounts refer to values at current prices. This unit of measure is important to serve the GNI administrative purposes, indicated in section 3. Current price values are largely used for structural analysis as well. For long-term analyses, however, the focus is on volumes and a later version of the quality declaration may well also include an analysis of discrepancies based on values in previous year prices. Volume changes are of most interest also regarding the quarterly accounts. The quality declaration therefore provides the analysis of quarterly discrepancies in terms of volume changes.

As will be seen in section 4.3 below, the quarterly accounts are revised several times. The analysis of statistical discrepancies comprises 40 quarters and refers to the first estimate of the respective quarter. Choosing a later estimate would not change the general picture however.

The quality declaration provides data on the absolute average and absolute median statistical discrepancy as percentage of annual GDP, as well as minimum, maximum positive and maximum negative discrepancy. The discrepancy varies from +2.7 (expenditure > production) to -1.8 percentage point with absolute mean and absolute median both at 0.9 percentage points. Clearly, this provides users with information and advice to be careful in drawing conclusions when estimates of the growth rate change only a few tenths of a percent. The balancing of the quarterly accounts is quite mechanical and follows fixed principles based on the historical outcome of the two calculation approaches in relation to the outcome of the detailed annual calculations in different phases of the business cycle.

*4.2 Sources of uncertainty*

Under this heading the uncertainty originating from the sources – sampling, frame coverage, measurement, non-response, data processing and model assumptions – are respectively assessed and indicated according to the simple classification – “small”, “moderate” and “large” regarding their influence on Overall accuracy. The quality declaration also gives a short comment on each source of uncertainty explaining how these classifications were reached. The basis for the assessment are quality declarations for source statistics and discussions with methodological experts with good knowledge of important source statistics as well as with national accounts experts.

The quality declaration concludes that the sources of uncertainty, model assumptions and measurement, have larger influence on overall accuracy compared to frame coverage and data processing are small sources. Sampling and non-response are classified as moderate for the quarterly accounts and small for the annual accounts. For volume estimates sampling is classified as a moderate source also for the annual accounts.

Uncertainty from measurement comes entirely from source statistics whereas model assumptions contribute to uncertainty both in source statistics and in the models used by the national accountants to fill information gaps and to adjust where source statistics do not comply with national accounts definitions. The quality declaration gives a short description of some of the most important national accounts models and explains their implications for uncertainty.

*4.3 Preliminary Statistics compared with final statistics*

Each quarterly estimate is revised and published again at several occasions in connection to the release of the last quarter. This part of the quality declaration provides statistics on the revisions of the 24 quarters of a six-year period at their first revision as well as their subsequent revisions. Depending on which quarter the number of revisions are 3, 4, 5 or 6 before all quarters are revised again when the result of the annual accounts adjusts the level of the series as from year y-2. On average the first revision amounted to 0.2 percentage units in absolute terms of the annual volume growth rate, ranging from -0.4 to 0.5 percentage units. Subsequent revisions are of the same size or slightly smaller. Positive and negative revisions cancel out in the first revision and still does after the subsequent revisions. Again, it is important not to extend the period studied longer than the methods and quality of sources used are still representative for the current situation.

The quality declaration also provides statistics on the average size of revisions for seasonally adjusted quarters on quarterly growth, which is the headline figure of the Swedish quarterly GDP release. This amounts to 0.2 percentage units on average in absolute terms at the first revision, then gradually decreasing to 0.1 in subsequent revisions and ranging from -0.7 to 0.4 percentage units.

For the period 2011-2015 the annual accounts have on average resulted in a 0.3 percent downward revision of GDP as compared to preliminary estimates based on the quarterly accounts.[[3]](#footnote-3) Being just four observations, this should not be interpreted as an evidence of biased quarterly accounts though.

Not even the annual accounts are final. With an approximate frequency of five years, the accounts are subject to a general review or *benchmark revision*. At these occasions new sources, methods and new standards are taken on board which affect the level of estimated GDP. In order avoid breaks in time series and to maintain comparability over time also previous periods are revised. The declaration therefore also describes the effect of such revisions implemented during the last two decades. The effect of these revisions range from +0.8 to +5.0 percent of GDP showing users that the level of GDP is very dependent on changes in accounting standards, the availability of statistical sources and the choice of methods. These revisions normally have minor consequences for the growth rates though.

**5. Conclusion**

The example of the national accounts for Sweden shows that it is possible to provide information to users on the quality of secondary statistics like the national accounts in the same format as primary statistics. In particular, although numerical *measures* of uncertainty cannot be provided, it is possible to give numeric *information* that is highly relevant for users who want to evaluate the accuracy of the estimates.

The work to adapt the National Accounts to the Swedish quality concept and apply the standard quality declaration template was important in several ways. Firstly, we believe that users and producers alike are benefitted by the fact that the National Accounts uses the same vocabulary and template that apply for other official statistics in Sweden. The results show that the quality in GDP can be summarised for users in a much shorter format than some of the more customised and extensive international formats. It is an accessibility and clarity issue for users. Secondly and perhaps just as important is that the descriptions in the quality declaration required close cooperation between the National Accounts staff and staff who provide the source data. We believe that the staff have through this work reached a deeper and more common understanding of the quality issues that the National Accounts faces.

The short format can of course also be a weakness. The national accounts is a comprehensive system from which numerous aspects of the economy are analysed at various levels of detail by the users. In that perspective, it is not sufficient to provide information on the accuracy of GDP only. To go further into detail in this format will need careful consideration, to ensure that the current clarity is not lost. Some general statement and examples of the accuracy of less aggregated data and specific indicators might be a reasonable compromise.

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1. For more information on the Swedish quality concept, see *A Handbook on Quality for Official Statistics of Sweden*. [↑](#footnote-ref-1)
2. RAS is an iterative proportional adjustment process for reducing the discrepancy of all product groups to zero, and hence also the total discrepancy. In the annual accounts, the analyses of discrepancies between supply and use are made on quite a detailed level for more than 400 product groups. RAS is a standard procedure in national accounts. [↑](#footnote-ref-2)
3. The latest quality declaration refers to the annual accounts for 2016 and thus analyses revisions up to and including 2015. The annual accounts for 2017 are to be published in September 2019. [↑](#footnote-ref-3)