FURTHER STEPS TOWARD A FRAMEWORK FOR ASSESSING DATA QUALITY

Carol S. Carson and Claire Liuksila *

I. INTRODUCTION

1. The volume and range of papers being presented at this conference is evidence of the current high level of interest in the quality of official statistics. There are probably several reasons for this interest, but at least one high-profile reason stems from the more explicit use of statistics in policymaking and goal setting over the last decade.

   • The central banks of a number of countries have adopted inflation targets as their primary guide in determining monetary policy. As a result, the consumer price index, a perennially political sensitive indicator, has been put even more into the spotlight.

   • The workings of the European Union (EU) and the Economic and Monetary Union (EMU) have given rise to a number of explicit uses of statistics in policy. For example, the need to meet Maastricht targets has focused the attention of EMU members on the quality of the data used to make this determination.

   • The UN global conferences of the last decade have often led to statements of goals in quantitative terms. For example, a Conference on Least Developed Countries earlier this year used statistical criteria to define the group of countries to be included within its purview and to be graduated.

A. Reasons for our work

2. Against this background, the IMF’s Statistics Department has had several specific reasons to intensify its work on data quality.  

* The authors are, respectively, Director of the Statistics Department and Chief of the Country Data Review Division of the Statistics Department, International Monetary Fund. The views expressed in this paper are those of the authors and not necessarily those of the IMF. Further, the framework for assessing data quality that is described in this paper is a work in progress and is made available to stimulate further comment and debate. The authors would like to thank the many people in the IMF Statistics Department who have contributed to the initiative described in this paper, especially the members of the Department’s Data Quality Working Group.

1 For a more detailed discussion of the motivation for this work see: Toward a Framework for Assessing Data Quality, Carol S. Carson, presented at the Statistical Quality Seminar 2000, (continued…)
3. **The first reason** centers around the desire to complement the quality aspects of the Special Data Dissemination Standard (SDDS) and the General Data Dissemination System (GDDS).² The SDDS identifies best practices in the dissemination of economic and financial data in four areas—the so-called four dimensions: data (coverage, periodicity, and timeliness); public access to the data; integrity of the data; and data quality. The quality dimension calls for the provision of information that would facilitate data users’ assessment according to their own needs, specifically, the dissemination of methodological statements and information that permits cross checks for reasonableness. The GDDS focuses explicitly, given the wider range of countries for which it is intended, on encouraging countries to improve data quality and helping them evaluate needs for data improvement.

4. In the five years since the launch of the SDDS, questions about data quality have taken on an even higher profile. In addition to the impetus from the more explicit use of statistics in policy and goal setting, increased access to data on the Internet that is, indeed, partly attributable to the SDDS, can be cited as a cause. Access to vast quantities of data has become much easier, but how can a user know how good the data are? What assistance can be provided to data users, including those in financial markets, to help them evaluate the quality of the available data? More broadly: Is there a way to focus more attention on data quality issues? In effect, these questions were a challenge to supplement the SDDS and the GDDS to make the link with data quality more active.

5. **The second reason** is that the international financial crisis of 1994–95 highlighted the need for countries to provide adequate data to the IMF to support it in meeting its responsibilities for surveillance of members’ economic policies. In a series of discussions beginning in 1995, the IMF’s Executive Board noted that it was imperative for the IMF, as well as for member countries, to improve the quality of data, and encouraged the staff’s work on a framework to assess data quality.³

6. **The third reason** traces to the more recent financial crises in Asia, Russia, and elsewhere. In the wake of these crises, there has been widespread agreement that the adoption of internationally accepted standards, or codes of good practice, can make an important contribution to the efficiency of markets and to strengthening the international financial system. The IMF is responding to the request by the international community that it prepare, as held on December 6-8, 2000, at Jeju Island, Republic of Korea. The paper is available on the Internet on the IMF’s Data Quality Reference Site at [www.imf.org](http://www.imf.org).

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² The SDDS and GDDS were established in 1996 and 1997, respectively, to provide guidance to countries on the provision of data to the public.

³ For the most recent discussion of the subject by the Executive Board see *IMF Public Information Notice 00/59*, (August 11, 2000), “IMF Executive Board Reviews Data Provision for Surveillance,” available on the Internet at [www.imf.org](http://www.imf.org).
part of its mandate to conduct surveillance of its members’ economic policies, reports “that summarize the degree to which an economy meets internationally recognized disclosure standards.”

7. For data, the SDDS and the GDDS were identified as the relevant standards for these voluntary assessments—Reports on the Observance of Standards and Codes, or ROSCs. Data modules have been prepared for over a dozen countries thus far. The earlier reports focused on the disclosure elements of the standards—that is, the requirements to make information available to the public. The later reports also consider the quality of the information disclosed because it was found that the reports would be more useful if they dealt with, *inter alia*, the substance of the information provided.

**B. Approach to the work**

8. The Statistics Department identified two main areas of work, which we pursued simultaneously so that they reinforced each other. First, we sought to clarify the meaning and promote understanding of data quality in the community of data users and compilers. For this purpose, we established a Data Quality Reference Site on the Internet. Second, we sought to provide structure and a common language for data quality. For this purpose, we worked toward what came to be called our Data Quality Assessment Framework (DQAF), which is a suite of assessment tools. So far, these consist of a generic data quality assessment framework, dataset-specific frameworks, a “preview” tool, and a summary presentation of the results of an assessment. Each of these tools plays a distinct part in meeting the purposes of the DQAF.

9. The DQAF that we will describe emerged from an iterative, consultative process. A national statistics office provided early input into work on the generic framework. Drafts of the

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5 Most of these reports, for which publication is voluntary, are available at [www.imf.org](http://www.imf.org).

6 The IMF’s Executive Board recently reaffirmed the need to look into the substance of the observance of standards. The Board also stressed that by establishing a consistent, although not mechanistic approach to assessments, ROSCs can provide rigor, content, and focus to the work. See: IMF *Public Information Notice 01/17* (03/05/01), available on the Internet at [www.imf.org](http://www.imf.org). In addition, an IMF/World Bank conference on standards and codes attended by a regionally diverse group of high-ranking officials was held on March 7, 2001. A report on the conference is in the *IMF Survey* (April 2, 2001) available at [www.imf.org](http://www.imf.org).

7 The features of the Data Quality Reference Site are discussed in detail in Section IV.
dataset-specific frameworks were discussed at numerous topical and regional statistical
meetings, and feedback on the preview tool and the summary presentation of the assessment
results has been sought from private sector users, both individually and at regional seminars
presented by Statistics Department staff.

C. Plan for the Paper

10. This paper is a part of this consultative process. In addition to summarizing the work as
of mid-April, it will also seek comments on some of the areas that are still emerging.

Following this introduction, Section II describes the DQAF, the comments received so far,
some practical experiences in using the generic and dataset-specific frameworks, and the
refinements that are in process. Section III describes parts of the DQAF that were derived from
the generic and dataset-specific frameworks once feedback from statisticians indicated that we
were on solid ground. These parts—a preview tool and a summary presentation of results—
were designed to meet the needs of non-statisticians in particular. Section IV discusses plans to
develop the Data Quality Reference Site into an electronic portal for data quality. Finally,
Section V discusses the work ahead to further refine and extend the DQAF and to engage
others in the work.

II. THE DATA QUALITY ASSESSMENT FRAMEWORK

A. An Overview

11. The goal of providing a structure and a common language for data quality was clearly
challenging. Early in the Statistics Department’s work, we identified a set of characteristics
that we thought should shape the work. The DQAF would need to be:

- Comprehensive in coverage,
- Balanced between the expert’s rigor and the generalist’s bird’s-eye view,

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8 These meetings included the Meeting of National Accounts Experts (6/00), Heads of National Statistical Offices of the East Asian Countries (8/00), the European Central Bank Working Group on Money and Banking Statistics (9/00), the Meeting of the Technical Expert Group on the Producer Price Index and the Voorburg Group on Service Statistics in Madrid (9/00), the IMF Balance of Payments Statistics Committee (10/00), the Statistical Quality Seminar 2000 in Jeju, Republic of Korea (12/00), and the Government Finance Statistics Expert Group Meeting (2/01), and will include the forthcoming OECD Meeting on the Consumer Price Index in Singapore (6/01).

9 See in particular paragraphs 27, 31, 35, and 39 of this paper in which comments are invited.
Applicable across a broad range of stages of statistical development,

Applicable to the major macroeconomic datasets,

Designed to give transparent results, and

Arrived at by drawing on best practices of national statisticians.

12. One of the first decisions to emerge from thinking about these characteristics was that the DQAF would have a cascading structure, going from the general to the more concrete and specific. Furthermore, the DQAF would have two central parts. First, recognizing the emerging consensus that data quality, in the sense of fitness for use or meeting users’ needs, is multidimensional, there would be a common set of dimensions of quality and of elements and indicators that constitute “pointers to quality.” Second, there would be a more detailed, more concrete set of pointers that could vary across datasets. These two parts came to be called the generic framework (Annex I) and the dataset-specific frameworks, respectively.

13. As shown in Annex I, the structure cascades from left to right:

- The first level defines five dimensions of quality: integrity, methodological soundness, accuracy and reliability, serviceability, and accessibility.

- For each of these five dimensions of quality, the framework proceeds to identify pointers, or observable features, that can be used in assessing quality. Thus, there are elements (second level) and indicators (third level).

14. For each dimension, element, and indicator, the generic framework presents a brief statement of good practice. The dataset-specific frameworks provide more detail in the form of focal issues for each indicator that are tailored to the dataset in question. Further, bullet points below each focal issue are key points that describe quality features that may be considered in connection with the focal issues. Although they are considerably more specific than the generic framework, the dataset-specific frameworks can not, and indeed are not meant to, exhaustively cover all quality issues.

15. An example of this cascading framework, using the government finance statistics framework, appears in Box 1. The example focuses on the consistency of government finance statistics with corresponding data in other systems. This is an important issue for users, particularly those involved in macroeconomic analysis. Box 1 illustrates how the framework cascades from the quality dimension, serviceability, to the element of consistency, then further to the indicator and focal issues. Finally, detailed pointers to quality appearing below the focal issue level are included as key points. These cover, for example, detailed pointers relating to
the question of whether government financing items correspond to relevant data in the balance of payments and in the monetary accounts.10

16. The DQAF recognizes that the quality of an individual dataset is intrinsically bound with that of the institution producing it. In other words, data quality encompasses quality of the institution or system behind the production of the data as well as the quality of the individual data product. Taking off from this approach, the DQAF also includes some elements and indicators that, although not constituting a quality dimension in themselves, have an overarching role as pointers to, or institutional preconditions for, quality. They generally refer to desirable attributes of the agencies of the statistical system. An example is quality awareness—the idea that quality should be recognized as a cornerstone of statistical work. These pointers to quality appear in the first segment of the data quality assessment frameworks as prerequisites of quality.

17. As of mid-April, dataset-specific frameworks have been prepared for national accounts, balance of payments, producer prices, analytical accounts of depository corporations, and government finance statistics. A framework for consumer prices is under way.

B. The State of Play: Comments, Field Testing, and Response

18. The DQAF has been well received by the large and diverse group of statisticians from national agencies and international organizations with whom we have consulted over the last year. The draft frameworks were found to be careful and thoughtful, and they were seen as providing a coherent and practical way forward in a complex field. As well, appreciation was expressed for the consultative approach that we followed.

19. We worked in an iterative fashion, and based on comments received, have gone through several revisions of the DQAF. We have, for example, tried to clarify the element about resources for statistics and identify more explicitly an element and indicators relevant to reliability. As well, the dataset-specific frameworks have benefited from the in-depth review by topical experts. Some commentators have wondered if the frameworks would be operational for small countries—citing the burden on small statistical offices—while others wondered if the dataset-specific frameworks were sophisticated enough to be able to identify areas of weakness within a developed statistical system. These questions are being addressed in our field testing.

20. It is envisaged that the DQAF, when completed and widely accessible on the Internet, could be used by three main categories of users—national producers of official statistics, the IMF and other international organizations, and other data users, including those in the private sector. For example:

10 Full details of a dataset-specific framework, using balance of payments statistics as an example, are provided in the paper by Carol S. Carson, cited in footnote 1.
• **National Statistical Office.** One could envision a statistical office undertaking an internal assessment using the frameworks. This assessment might be the basis for its own internal planning. Going further, if the statistical office wanted to make the case with the country's legislative body (or other allocator of resources) that it needed additional resources for, say, national accounts, it would point to the framework as an internationally accepted tool to identify needed improvements.

In this connection, participants at the March 2001 Conference on Standards and Codes (see footnote 6) endorsed the view that self assessment of observance of international standards was particularly important as a means of developing ownership and commitment to standards and codes. Self assessments were viewed as complementary to external assessments (e.g., ROSCs), which were needed to establish credibility and due diligence of the assessment process.

• **IMF.** Within the IMF, the framework could be seen as an important tool to be used both by specialists from the Statistics Department and by general economists working on country operations. Within the Statistics Department, we have already begun to use the frameworks on an experimental basis in preparing ROSCs, conducting technical assistance, and working with countries that wished to participate in the GDDS to prepare metadata, including their plans for improvement.

• **Financial market participants and others.** Financial market analysts and others—researchers, for example—may find summaries included in a ROSC useful as a reference tool.

21. Given that we are still in the development phase, so far, the DQAF has been mainly used by the IMF Statistics Department. The Statistics Department has tested DQAFs of various vintages both in technical assistance and in ROSCs. The DQAF, or parts of it tailored to the purpose to be undertaken, was found to be useful, in particular because it gave structure to what we wanted to know about a country’s data before giving advice, and it provided a framework in which to record information for future reference. For ROSCs, we have found the suite of tools that comprise the DQAF to be helpful from a number of aspects. The suite provides a clear, even-handed approach to undertaking the assessment, and the summary presentation has provided a useful focus for concentrating on key issues. We expect to prepare about 15 data module ROSCs over the next 12 months using the DQAF. However, feedback from country authorities in the context of its use in ROSC and technical assistance has also brought up some concerns, mentioned below.
22. In using the DQAF, several interrelated points were confirmed. First, the DQAF is not, and cannot be, a checklist nor an audit of statistical practices. It is not exhaustive. Second, the application of the DQAF cannot be mechanical. Assessment is not intended to be an exact science; judgment will necessarily be involved. Third, those applying the DQAF will need to be constantly alert to the country setting—the culture, the legal environment, the stage of statistical development. They would need to ask, when finding that a certain practice is not observed, whether the intent of the practice is achieved by some other means. Conversely, when a formal process or procedure has been found to be in place, they would need to explore whether the objective of the practice is being achieved. Fourth, the DQAF results will necessarily be dependent on the willingness of representatives at both senior and technical levels in the country being assessed to be forthcoming with information.

23. At this stage, in addition to some fine tuning, we expect to make at least two additional changes in response to comments and experience. First, some commentators have felt that the quality dimension, methodological soundness, was too oriented to derived statistics, reflecting perhaps the IMF’s particular focus on macroeconomic aggregates, and that indicators for datasets based on a single survey should therefore figure more prominently in the frameworks. Second, other commentators felt that more attention needed to be given to users’ views, especially in the areas of relevance and serviceability.

24. Taking up the first point, we have begun work on adapting the frameworks to cover sample surveys more adequately. First, we are considering including an additional element under the dimension, methodological soundness, which would be called collection design, to address quality issues connected with data collection, whatever they may be. Thus, it would cover sample surveys, but also censuses, by-products of administrative collections, and other data sources. Second, the element, statistical techniques (included in accuracy and reliability), covers a number of aspects of quality related to survey samples. But, to make this coverage more complete, we could consider including additional indicators under both source data and statistical techniques to cover the issues of the efficiency and effectiveness of survey questionnaires and the question of the treatment of missing data. Finally, we have been considering boosting the content of the element, metadata accessibility, by adding indicators to emphasize the importance of information about sample and non-sample variability.

25. On the second point, related to giving more attention to users’ views, elements and/or indicators will be added to bring in data users’ opinions to inform the assessment under the DQAF. This would strengthen the assessment of several elements of the serviceability dimension, especially relevance, and would shed light on the effectiveness of formal processes and procedures.

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11 As these points take shape, they are being formalized into a guidance note that will become part of the DQAF package.
C. Glossary

26. So far, we have focused in this paper on the DQAF as embodying our goal of giving structure to data quality and assessments of data quality. Let us turn now to the goal of a common language about data quality. Work toward this goal began with a search of the literature about data quality and reviews of statistical programs and agencies. That search identified the characteristics used to represent data quality and in the process identified the terms that are being used. For example, in a sample of national reviews of statistical programs and agencies, accuracy appeared in each list of characteristics. Often the term was not defined, even when the idea of “getting the numbers right” was seen as central to quality. Closely related, reliability appeared in most lists. In some reviews, the term was not defined. In some of the literature, accuracy and reliability seemed to be used interchangeably—that is, references were made to accuracy or reliability within the page or paragraph, but there did not appear to be any difference intended. In other cases, accuracy and reliability were used in tandem as though there was a difference. In yet other cases, reliability explicitly related to the question of whether the first, or provisional, estimates were close to being on target as shown by later estimates.

27. A consultation paper has been posted on the DQRS inviting comments on the draft definitions of a selection of terms in the generic framework. This glossary defines the term, presents a discussion of the term, compares and contrasts the terms with others in the DQAF, and provides some remarks to stimulate discussion. Box 2 reproduces the entry for accuracy.

III. OTHER TOOLS IN THE DQAF SUITE

28. As it became clearer from the feedback we received that the generic and dataset-specific frameworks were on solid ground, we moved into work on the parts of the data quality assessment framework that were derived from them. These parts of what we came to call the DQAF suite of tools—a preview tool and a summary presentation of results—were designed to meet the needs of non-statisticians in particular. These tools are also being tested in consultations with private sector users of data, statisticians, and in our field work.

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13 The glossary is available on the Data Quality Reference Site at www.imf.org. Comments on the glossary are welcome through May 25.
A. Preview Tool

29. The idea of a preview tool—a tool that could be used to diagnose whether a full DQAF-based assessment would be useful—came up early in the consultative process because the dataset-specific frameworks were viewed as daunting and were seen as resource intensive. The data quality preview (or “lite,” as we called it for short) in its present vintage comprises 13 specific indicators chosen to reflect the scope of the DQAF while being relatively nontechnical and drawing upon relatively accessible information. The preview is shown in Table 1.

30. Two principal criteria were taken into account in selecting the indicators to be included in the preview framework. First, it should be possible to undertake the assessment based on information that would be reasonably accessible to the non-statistician. This information would normally include statistical yearbooks, bulletins, other documentation, and electronic dissemination media, and at least some basic information about the agency or unit that produces the data. Second, indicators from the generic data quality assessment framework should be selected for their ability to serve as proxies for other indicators. In other words, they should be able to capture the essence of data quality. Field testing of the preview version by IMF staff has been initiated, and it has been presented for comments at seminars attended by financial market participants and others from the private sector.

31. Reactions to this set of indicators as a preview tool would be welcome. Specifically, are the indicators really non-technical; would the information needed really be accessible; would it be viable as a tool to diagnose where a full assessment could usefully be conducted; and would this tool also be viable on its own for use by non-statisticians? What health warnings would have to be on the label?

B. Summary Presentation of Results

32. The idea of developing a summary presentation of results also was a reaction to the volume of information that was envisaged as resulting from an assessment based on a DQAF. It was noted that policy advisors and private sector users would have neither the expertise nor interest in the detailed assessment—they would want a summary that would be concise and focused. Table 2 presents a sample of the summary presentation of the results of an assessment using the balance of payments framework. Based on the detailed assessment, the summary uses a four-point scale to indicate whether a practice for a given element was observed, largely observed, materially not observed, not observed, or whether the element was not applicable. A comments box is provided to explain why a practice was not fully observed or was not relevant for the country concerned.

33. The approach taken for the summary of the assessment results parallels that taken in other contexts. For example, the summary of the results of Financial System Stability Assessments undertaken by the IMF, which are included in the Reports on the Observance of Standards and Codes, utilizes a similar presentation.
34. The Statistics Department has experimented with using the summary presentation recently for a couple of countries in the context of preparing ROSCs. The summaries have proved useful both for IMF staff and national authorities as they help to focus attention on key areas. At the same time, experience has shown that judgments need to be made in weighting the focal issues and indicators to determine to what extent a particular practice is observed. This requires the assessor to carefully synthesize the detailed information obtained from the dataset-specific frameworks and to apply the frameworks evenhandedly both across countries and across individual datasets. The challenge here is consistency.

35. Reactions to this format would be welcome. Specifically, is this tool user friendly—is it concise and focused; is the presentation, as built up from detail, an appropriate middle ground between too much to comprehend and, on the other hand, too simple and therefore too close to a pass-fail system; and what changes would make it more useful?

### IV. A Data Quality Portal

36. One of the first steps in the work on data quality undertaken by the Statistics Department was the creation of the Data Quality Reference Site. Initially, this Internet site had the modest ambition of making available to the public information concerning data quality from a wide variety of sources. It provided hyperlink access to a number of important articles and papers—for example, the chapter in the *Encyclopedia of Statistical Science* about the quality concept in official statistics, the report on the recent peer review of the Swiss Statistical System, and an agency’s own assessment of the quality of its balance of payments statistics—and provided citations for many more. As the data quality work progressed, new elements were added to the site to broaden the public’s awareness of the IMF’s work in this area and international gatherings devoted to the subject.

37. Thus, the site was set up as a documentary facility, pointing visitors to information, but for the most part, without interactive features. However, the interactive features of the site were broadened, albeit modestly, in April 2001 when a consultative paper was put on the site for comments. A group of about 100 statisticians, those who are working closely with the Statistics Department through various consultative groups on statistical methodologies, was notified of the posting of the paper and their comments were invited through the website.

38. For the future, the Statistics Department is considering adding features to the site to make it a more attractive forum for discussion. For example, in another context, the Statistics Department has launched a new communications forum, called the Statistical e-Exchange Forum, to collaborate with colleagues outside the Fund. The Forum uses *eRoom*, a digital workplace technology that builds on the concept of email discussion groups, but membership

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14 The site may be accessed through the Dissemination Standards Bulletin Board at [www.imf.org](http://www.imf.org).
and management is defined in a more formal manner and there are special tools for collaborative working, including threaded discussions, document and calendar sharing, database support and polling. This digital workplace tool could become a feature of the Data Quality Reference Site to facilitate electronic discussion of data quality issues. Moreover, links to other statistical agencies could be developed to facilitate access to other sites of interest.

39. Through field testing, we are exploring with our counterparts in national statistical offices and other international organizations how this site could be made more useful to them. Suggestions from participants at this conference would be welcome.

V. LOOKING AHEAD

40. The Statistics Department’s work on data quality should be seen within the context of the surge in recent years in international interest in the subject. This heightened interest in data quality has brought us here today, and approaches to assessing the quality of data products and statistical systems are themes that run through many of the conference papers.

41. With a good part of the development effort of the data quality assessment framework now behind us, the Statistics Department’s further work is now focused on the following areas:

- Further testing the suite of tools. It will be important to gather more experience in testing the frameworks among a wider range of country situations and with a wider range of users, especially non-statisticians.

- Refining and revising the suite. The experience from field testing and the comments received from statisticians and others will feed into the revised frameworks.

- Completing the supporting materials. Work is continuing on the glossary, the guidance notes for the dataset-specific frameworks, and on a methodological note that will provide guidance on how to use the suite of tools.

- Developing frameworks for other datasets, possibly in collaboration with other agencies. We would particularly seek a partnership for work on a dataset in the socio-demographic field that would buttress the GDDS’ socio-demographic sector. We would also look forward to working in an advisory capacity with a national statistical organization that wanted to use the DQAF as an assessment tool.

- Experimenting to see if one of the tools—most likely the preview tool or some variant of it—would be useful in assessing progress in statistical capacity building.
• Exploring how the DQAF suite can be adapted to serve the international community more fully. Here, exploring the implications of using the DQAF to guide our technical assistance will be important, especially in light of the fact that recommendations and action plans usually would be developed as an extension of the assessments.

• Experimenting with the Data Quality Reference Site to expand its functionality and its usefulness to the international community.

42. The DQAF will continue to be an evolving product, and we expect to stand back and take stock of the work in roughly a year. Looking ahead, we hope that the suite of tools will prove to be useful to both statisticians and non-statisticians alike. Experience so far has shown that the suite is very useful for our own work. However, we hope that it will also have important applications in the larger international environment.
The Quality Assessment Framework for Government Finance Statistics—An Example

**Dimension**

4. Serviceability

**Elements**

4.1 Relevance

4.2 Timeliness and periodicity

4.3 Consistency

4.4 Revision policy and practice

**Indicators**

4.3.1 Statistics are consistent over a period of time

4.3.2 Statistics are internally consistent

4.3.3 Statistics are consistent or reconcilable with those obtained through other data sources and/or statistical frameworks

**Focal Issues**

The following could be considered in an assessment of the focal issue 4.3.3 above:

- Major national accounts based aggregates, such as government consumption, capital accumulation, and net lending/borrowing, should be consistent between GFS and the national accounts
- Changes in the level of direct (i.e., excluding securities) government financial assets and liabilities held by the banking system, adjusted for valuation changes, should align closely with corresponding flows reported by the government
- Foreign financing in the form of direct loans from foreign governments and international institutions should correspond to data derived from balance of payments (BoP) collections
- Government financing by issue of securities should correspond in total with data on the take-up of such securities by other sectors, derived from BoP and financial institutions surveys. The GFS sectoral distribution of security liabilities should be adjusted to agree with data from other sectors (because creditors have better information than debtors on holdings of negotiable instruments)
- GFS data on foreign grants/loans should be reconciled with BoP data
- Reconciliation of GFS data with corresponding data from other sectors entails ensuring that the coverage and classification of government units is consistent between all data collection systems.
Definition: **Accuracy** refers to the closeness between the estimated value and the (unknown) true value that the statistics were intended to measure.

Discussion: Assessing the accuracy of an estimate involves evaluating the error associated with an estimate. In practical terms, there is no single aggregate or overall measure of accuracy; accuracy is evaluated in terms of the potential sources of error. In the case of sample survey-based estimates, the major sources of error include coverage, sampling, non-response, response, processing, and problems in dissemination. For derived estimates, such as for national accounts or balance of payments, sources of error arise from the surveys and censuses that provide source data; from the fact that source data do not fully meet the requirements of the accounts in terms of coverage, timing, and valuation and that the techniques used to compensate can only partially succeed; from seasonal adjustment; and from separation of price and quantity in the preparation of volume measures.

Cross references to other terms:

- Whether the statistics are measuring the right thing is captured by relevance (element 4.1) in *Serviceability*.

- Whether the first estimate (and later estimates) is close to a subsequent estimate is captured separately by reliability within *Accuracy and reliability*. Reliability is identified separately in light of the importance often attached to first estimates and in order to direct attention to the fact that estimates that are not revised are not necessarily the most accurate (see the definition of reliability).

*Remarks to trigger comments:* Many of the definitions of accuracy in current use are quite close to the one above, although many do not choose to bring out, as is done above, that the true value is unknown. Several, because they focus on survey-based estimates, go directly into discussion sources of error in such estimates (see, for example, Statistics [Canada] and [Evers and Rosen]. The discussion above of sources of error in derived estimates is taken from [Young] and [Australia]. Some sources present a less technical sounding definition along the lines that “accuracy refers to the degree to which data correctly describe the phenomenon that the statistics are designed to measure.”
## Table 1. Data Quality Preview

### Prerequisites of quality

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<td>0.1.1</td>
<td>The responsibility for compiling statistics is clearly specified.</td>
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<td>0.2.1</td>
<td>Staff, financial, and computing resources are commensurate with institutional functions.</td>
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<tr>
<td>0.3.1</td>
<td>Processes are in place to focus on quality, to monitor the quality of the production and dissemination of statistics, to acknowledge and deal with tradeoffs within quality, and to inform planning.</td>
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### 1. Integrity

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<tr>
<td>1.2.4</td>
<td>Advance notice is given of major changes in methodology, source data, and statistical techniques.</td>
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### 2. Methodological soundness

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<td>2.1.1</td>
<td>Concepts and definitions: see dataset-specific framework [for guidance about the applicable international standard].</td>
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<td>2.2.1</td>
<td>Scope: see dataset-specific framework [for guidance about the applicable international standard].</td>
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### 3. Accuracy and reliability

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<tr>
<td>3.1.1</td>
<td>Source data are collected from comprehensive data collection programs that take into account country-specific conditions.</td>
</tr>
<tr>
<td>3.3.3</td>
<td>Statistical discrepancies and other potential indicators of problems in statistical outputs are investigated and made available to inform users.</td>
</tr>
</tbody>
</table>

### 4. Serviceability

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.1</td>
<td>Processes to monitor the relevance and practical utility of existing statistics in meeting users’ needs are in place.</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Timeliness follows dissemination standards.</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Statistics are consistent or reconcilable with those obtained through other sources and/or statistical frameworks.</td>
</tr>
</tbody>
</table>

### 5. Accessibility

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1.3</td>
<td>Statistics are released on a pre-announced schedule.</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Documentation on concepts, scope, classifications, basis of recording, data sources, and statistical techniques is available, and differences from international standards are annotated.</td>
</tr>
</tbody>
</table>
### Table 2. DQAF: Summary Presentation of Results

**Country X: Balance of Payments**

<table>
<thead>
<tr>
<th>Elements</th>
<th>Assessments</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisites of quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1 Legal and institutional environment</td>
<td>X</td>
<td>No sanctions for failure to respond to surveys</td>
</tr>
<tr>
<td>0.2 Resources</td>
<td>X</td>
<td>Severe lack of human resources for surveys</td>
</tr>
<tr>
<td>0.3 Quality awareness</td>
<td>X</td>
<td>No process to focus on quality</td>
</tr>
<tr>
<td><strong>Integrity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Professionalism</td>
<td>X</td>
<td>No advance notice of major changes</td>
</tr>
<tr>
<td>1.2 Transparency</td>
<td>X</td>
<td>Little focus on ethical conduct</td>
</tr>
<tr>
<td>1.3 Ethical standards</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Methodological soundness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Concepts and definitions</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2.2 Scope</td>
<td>X</td>
<td>Reinvested earnings excluded from both current and financial accounts</td>
</tr>
<tr>
<td>2.3 Classification/sectorization</td>
<td>X</td>
<td>Goods for processing and repair classified under “Services” instead of “Goods”</td>
</tr>
<tr>
<td>2.4 Basis for recording</td>
<td>X</td>
<td>BOP transactions recorded on a cash basis instead of accrual</td>
</tr>
<tr>
<td><strong>Accuracy and Reliability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Source data</td>
<td>X</td>
<td>Sounder statistical methods should be employed to fill gaps in source data</td>
</tr>
<tr>
<td>3.2 Statistical techniques</td>
<td>X</td>
<td>Data neither regularly assessed nor validated</td>
</tr>
<tr>
<td>3.3 Assessment and validation</td>
<td>X</td>
<td>Time series too short for revision studies</td>
</tr>
<tr>
<td>3.4 Revision studies</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Serviceability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1 Relevance</td>
<td>X</td>
<td>Meets GDDS but does not meet SDDS</td>
</tr>
<tr>
<td>4.2 Timeliness &amp; periodicity</td>
<td>X</td>
<td>BOP not reconciled with national accounts</td>
</tr>
<tr>
<td>4.3 Consistency</td>
<td>X</td>
<td>No regular and publicized revision procedures</td>
</tr>
<tr>
<td>4.4 Revision policy &amp; practice</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Accessibility</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1 Data accessibility</td>
<td>X</td>
<td>No advance release schedule</td>
</tr>
<tr>
<td>5.2 Metadata accessibility</td>
<td></td>
<td>Metadata not available to public</td>
</tr>
<tr>
<td>5.3 Assistance to users</td>
<td>X</td>
<td>No catalog available</td>
</tr>
</tbody>
</table>

Note:  O = Practice Observed; LO = Practice Largely Observed; MNO = Practice Materially Non-observed; NO = Practice Non-observed; NA = Not Applicable
## Quality Dimensions

<table>
<thead>
<tr>
<th>Prerequisites of quality ¹</th>
<th>Elements</th>
<th>Indicators</th>
</tr>
</thead>
</table>
| **0.1 Legal and institutional environment** – The environment is supportive of statistics. | | 0.1.1 The responsibility for collecting, processing, and disseminating statistics is clearly specified.  
0.1.2 Data sharing and coordination among data producing agencies are adequate.  
0.1.3 Respondents' data are to be kept confidential and used for statistical purposes only.  
0.1.4 Statistical reporting is ensured through legal mandate and/or measures implemented to encourage voluntary response. |
| **0.2 Resources** – Resources are commensurate with needs of statistical programs. | | 0.2.1 Staff, financial, and computing resources are commensurate with institutional programs.  
0.2.2 Measures to ensure efficient use of resources are implemented. |
| **0.3 Quality awareness** – Quality is recognized as a cornerstone of statistical work. | | 0.3.1 Processes are in place to focus on quality, to monitor the quality of the collection, processing, and dissemination of statistics, to acknowledge and deal with tradeoffs within quality, and to guide planning for existing and emerging needs. |

### 1. Integrity

The principle of objectivity in the collection, processing, and dissemination of statistics is firmly adhered to.

<table>
<thead>
<tr>
<th><strong>1.1 Professionalism</strong> – Professionalism in statistical policies and practices is a guiding principle.</th>
<th><strong>1.2 Transparency</strong> – Statistical policies and practices are transparent.</th>
<th><strong>1.3 Ethical standards</strong> – Policies and practices are guided by ethical standards.</th>
</tr>
</thead>
</table>
| 1.1.1 Statistics are compiled on an impartial basis.  
1.1.2 Choices of sources and statistical techniques are informed solely by statistical considerations.  
1.1.3 The appropriate statistical entity is entitled to comment on erroneous interpretation and misuse of statistics. | 1.2.1 The terms and conditions under which statistics are collected, processed, and disseminated are available to the public.  
1.2.2 Internal governmental access to statistics prior to their release is publicly identified.  
1.2.3 Products of statistical agencies/units are clearly identified as such.  
1.2.4 Advance notice is given of major changes in methodology, source data, and statistical techniques. | 1.3.1 Guidelines for staff behavior are clear and publicized. |

¹ The elements and indicators included here bring together the “pointers to quality” that are applicable across the five identified dimensions of data quality.
<table>
<thead>
<tr>
<th>Quality Dimensions</th>
<th>Elements</th>
<th>Indicators</th>
</tr>
</thead>
</table>
| 2. Methodological soundness           | 2.1 Concepts and definitions — Concepts and definitions used are in accord with standard statistical frameworks.  
2.2 Scope — The scope is in accord with internationally accepted standards.  
2.3 Classification/sectorization — Classification and sectorization systems are in accord with internationally accepted standards.  
2.4 Basis for recording — Flows and stocks are valued and recorded according to internationally accepted standards. | 2.1.1 The overall structure in terms of concepts and definitions follows international standards, guidelines, or agreed practices: see dataset-specific framework.  
2.2.1 The scope is broadly consistent with international standards, guidelines, or agreed practices: see dataset-specific framework.  
2.3.1 Classification/sectorization systems used are broadly consistent with international standards, guidelines, or agreed practices: see dataset-specific framework.  
2.4.1 Market prices are used to value flows and stocks.  
2.4.2 Recording is done on an accrual basis.  
2.4.3 Grossing/netting procedures are broadly consistent with international standards, guidelines, or agreed practices. |
| 3. Accuracy and reliability           | 3.1 Source data — Source data available provide an adequate basis to compile statistics.  
3.2 Statistical techniques — Statistical techniques employed conform with sound statistical procedures.  
3.3 Assessment and validation — Source data are regularly assessed and results validated.  
3.4 Revision studies — Revisions, as a gauge of reliability, are tracked and mined for the information they may provide. | 3.1.1 Source data are collected from comprehensive data collection programs that take into account country-specific conditions.  
3.1.2 Source data reasonably approximate the definitions, scope, classifications, valuation, and time of recording required.  
3.1.3 Source data are timely.  
3.2.1 Data compilation employs sound statistical techniques.  
3.2.2 Other statistical procedures (e.g., data adjustments and transformations, and statistical analysis) employ sound statistical techniques.  
3.3.1 Source data—including censuses, sample surveys and administrative records—are routinely assessed, e.g., for coverage, sample error, response error, and nonsampling error; the results of the assessments are monitored and made available to guide planning.  
3.3.2 Main intermediate results are validated against other information where applicable.  
3.3.3 Statistical discrepancies and other potential indicators of problems in statistical outputs are investigated and made available to guide users.  
3.4.1 Studies and analyses of revisions are carried out routinely and used to inform statistical processes.  
3.4.2 Revision studies and analyses are made public and used to guide data users. |
### DQAF—Generic Framework  
(Draft as of end-March 2001)

<table>
<thead>
<tr>
<th>Quality Dimensions</th>
<th>Elements</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Serviceability</strong></td>
<td>4.1 Relevance – Statistics cover relevant information on the subject field.</td>
<td>4.1.1 Processes to monitor the relevance and practical utility of existing statistics in meeting users’ needs are in place.</td>
</tr>
</tbody>
</table>
|  | 4.2 Timeliness and periodicity – Timeliness and periodicity follow internationally accepted dissemination standards. | 4.2.1 Periodicity follows dissemination standards.  
4.2.2 Timeliness follows dissemination standards. |
|  | 4.3 Consistency – Statistics are consistent over time, internally, and with major data systems. | 4.3.1 Statistics are consistent or reconcilable over a reasonable period of time.  
4.3.2 Statistics are internally consistent (e.g., accounting identities observed).  
4.3.3 Statistics are consistent or reconcilable with those obtained through other data sources and/or statistical frameworks. |
|  | 4.4 Revision policy and practice – Data revisions follow a regular and publicized procedure. | 4.4.1 Revisions follow a regular, well-established and transparent schedule.  
4.4.2 Preliminary data are clearly identified. |
| **5. Accessibility** | 5.1 Data accessibility – Statistics are presented in a clear and understandable manner, forms of dissemination are adequate, and statistics are made available on an impartial basis. | 5.1.1 Statistics are presented in a way that facilitates proper interpretation and meaningful comparisons (layout and clarity of text, tables, and charts).  
5.1.2 Dissemination media and formats are adequate.  
5.1.3 Statistics are released on a pre-announced schedule.  
5.1.4 Statistics are made available to all users at the same time.  
5.1.5 Non-published (but non-confidential) sub-aggregates are made available upon request. |
|  | 5.2 Metadata accessibility – Up-to-date and pertinent metadata are made available. | 5.2.1 Documentation on concepts, scope, classifications, basis of recording, data sources, and statistical techniques is available, and differences from international standards are annotated.  
5.2.2 Different levels of detail are provided depending on intended audience and type of collection. |
|  | 5.3 Assistance to users – Prompt and knowledgeable support service is available. | 5.3.1 Contact person for each subject field is publicized.  
5.3.2 Catalogues of publications, documents, and other services, including information on any charges, are widely available. |