10 Early Estimates of Quarterly GDP

Statistics agencies publish early estimates of quarterly GDP in response to a strong demand for timely macroeconomic statistics by users. Early estimates are generally produced on the basis of a partial set of information and a greater use of statistical methods to fill the data gaps. This chapter provides methodological guidelines and practical advice on how to calculate early estimates of quarterly GDP in the broader context of QNA, how to assess their quality, and how to communicate these estimates to the users.

Introduction

1 Early estimates of quarterly gross domestic product (GDP) are developed to satisfy the demand for timely macroeconomic statistics by users (in particular, policymakers). An early estimate of quarterly GDP is generally released within few weeks after the end of the reference quarter, in contrast with two to three months usually required for a complete publication of the quarterly national accounts (QNA).[1] The first estimate of quarterly GDP receives a great deal of attention by users and the media, because it provides the first signal from the system of national accounts about recent developments in the economy. For example, the early GDP estimate is often picked up to determine in real time whether a country is entering a recession or experiencing an economic boom. Given the relevance of early estimates, compilers of QNA should take particular care in the way they produce and communicate them to the users.[2]

2 Early estimates of quarterly GDP should be seen as complementary information of detailed and comprehensive QNA estimates, not as their substitute. Countries producing early estimates tend to release aggregate information, sometimes only the GDP growth rates. An early estimate can only provide a preliminary measurement of the economy on the basis of an incomplete amount of information available at the time of its publication. However, they cannot provide the same level of comprehensiveness, consistency, and detail that are typically expected by a full-fledged system of QNA and are subject to a larger risk of revision. The complete version of the QNA should always be published after the release of early estimates, possibly within a quarter from the reference period. This is necessary to incorporate new and updated information in the quarterly source data and provide users with additional details about changes in production and expenditure GDP components.

3 Early estimates of quarterly GDP should be compiled using the same methodological framework adopted for later estimates. These include both data sources, methods, and compilation techniques. Ideally, the only difference between early estimates and later estimates should lie on the amount of source data they rely on. Early estimates are based on a partial set of source data. At the time of the early estimate, the quarterly source data are generally incomplete. Consider the case of an early estimate published 30 days after the end of the reference quarter. At that time, monthly indicators used for the QNA may be available only for one or two months of the reference quarter. The missing information in the source data (e.g., the missing months) should be covered by statistical methods or assumptions. Early estimates differ

[1] For the quarterly gross domestic product, the IMF's Special Data Dissemination Standards specifies a maximum lag of one quarter after the reference period.

[2] The methodology discussed in this chapter can also be used to develop monthly gross domestic product (GDP) estimates. Monthly national accounts compilation raises no methodological issues compared with quarterly national accounts. However, higher volatility in the monthly data may make it more difficult to pick up underlying trends. Furthermore, additional resources are needed to compile GDP on a monthly basis and generally the need for techniques to fill in data gaps is much higher.

from subsequent estimates, because they use a higher proportion of statistical methods and assumptions to complete the missing information.

4 Because they are based on a partial set of information, early estimates have a higher degree of uncertainty than later estimates. Data gaps may be filled using a wide range of techniques, from very basic assumptions (i.e., use the previous observation) to sophisticated time-series or econometric models. Generally, when computing the standard QNA estimates, the results obtained from these techniques are replaced with actual data, already made available. Inevitably, incorporating new and updated source data leads to revisions to the early estimates. Therefore, it is very important to assess the accuracy of the various assumptions and models used in order to minimize revisions and increase the reliability of early estimates.

5 Data gaps for early estimates may be covered using a variety of methods and assumptions. The best solution depends on the type of missing information. As far as possible, early estimates should be based on direct measurements of detailed items of the accounts. However, even in countries with well-established QNA based on extensive set of short-term indicators, there may be some items of the accounts for which no timely direct or indirect indicators are available at the time of the early estimate. When no information is available, the missing information should be estimated on the basis of past trends or other assumptions based on related items of the accounts. Although these methods are necessary to fill the data gaps and reach the necessary coverage for the GDP calculation, compilers should use great caution in applying any of these techniques. Overreliance on such assumptions may fail to detect sudden changes in the direction of the economy, which may compromise the serviceability of the GDP as a real-time indicator for turning points and business-cycle analysis.

6 Early estimates of GDP should be compiled using the same approach and at the same detail level of later estimates. A more aggregate compilation level may cause additional revisions, because it would require a different aggregation process of the components. In some cases, however, countries may opt for a simplified compilation system for early estimates. Source data for production and expenditure components may not be available at the time of early estimates, whereas they could be available for the regular publication of QNA. In such case, compilers may decide to focus on the approach with the largest amount of information.

7 In contrast, publication details of early estimates should be different from later estimates. The release of early estimates may cover only selected items of the accounts (e.g., only total GDP growth) or be presented in a more aggregated form (e.g., only main economic activities). Publication of less detail shows a greater level of uncertainty in disaggregated data and emphasizes the limitations of early estimates to users. Publication of detailed data should take into account the reliability of underlying source data and the possibility of significant revisions with the publication of the standard estimates.

8 The publication of early estimates should follow a clear and transparent communications policy. The press release should clearly state that early estimates are subject to a larger risk of revisions than later estimates. The additional uncertainty lies in the difference between the imputations made for the early estimates and the quarterly source data that arrive subsequently. Ideally, compilers should provide the user with a quantitative assessment of the expected amount of revisions between early estimates and subsequent estimates: for example, by comparing the GDP rate of change obtained in both cases. This can be done on the basis of early estimates already published or internal calculations (when the early estimate is released for the first time). Metadata should indicate the amount of missing information and the main assumptions and methods used to fill the data gaps.

9 Early estimates should not be confused with forecasts. Early estimates are derived using as much contemporaneous information available as possible, while forecasts only rely on past values to derive future ones. Forecasts of national accounts data should not be a task for QNA compilers. Forecasting models are often based on behavioral equations that relate variables based on economic theory (e.g., output and interest rates). In contrast, early estimates of the GDP (and also later estimates) should maintain a close link between the national accounts variables to be estimated and their source data. In some cases, econometric models exploiting behavioral relationships with leading indicators can be used to validate the results of

the early estimation process. However, because these models are not based on strict accounting principles, econometric/forecasting models should not be used as a substitute for statistical measurement and should remain outside the scope of QNA compilation. Behavioral relationships change over time, and they are not suitable to replace measurements. As these models require different skills from those used in national accounts compilation, forecasts are best undertaken by other agencies or other specialized units within the compiling agency.

10 The next section offers some considerations on how to choose an appropriate release lag of early estimates. "Filling Data Gaps for GDP Indicators" section illustrates methods and assumptions that can be used to fill the missing information, and discusses how to assess the quality of the methods used. Finally, "Communicating Early Estimates" section provides guidance on how to communicate early estimates to the users.

How Early? Balancing the Trade-off Between Timeliness and Reliability

11 A key decision when a country decides to produce early estimates of quarterly GDP is to determine their timeliness: namely, the lapse of time between the end of the reference quarter and the release of the early estimate. If the estimate is released too early, it may miss too much information about the quarter and be subject to large revisions when a fuller set of source data is available for subsequent estimates. Unreliable early estimates should never be published, as providing inaccurate signals about the current state of the economy can create more problems than benefits for the users and undermine the credibility of compilers. If released too late, the early estimate may not be relevant for users, as the publication of the regular, more accurate, estimates would take place in only a few days or weeks. Private companies may decide to build their own system of early estimates based on available short-term indicators, which could generate confusion between official and private estimates of the GDP. Compilers should strike the right balance between timeliness and reliability of the early estimate. This section discusses some factors that should be considered in taking this decision.

12 First, compilers should verify the coverage of source data available at different release lags from the end of the quarter. The shorter the lag, the smaller the amount of information available. After a few days, it is very likely to receive only the first month of the quarter for some monthly indicators, while quarterly indicators may be completely missing. At 30 days, there could be one or two months available plus the timeliest quarterly indicators. At 45 days, the information set of the QNA may be full for agriculture, manufacturing, and a few service activities, although revised data may be available in time for the regular estimates. Once three or four possible release lags are identified, the exact share of source data available at each lag can be calculated for each item of the GDP (e.g., if only a month is available, the share is 0.33). Then, a weighted average of these shares can be calculated, taking as weights the relative GDP size of the corresponding national accounts items. This weighted share can provide a proxy measurement of how much source data for the GDP calculation is available at the different release lags. Compilers may decide, for example, that an early estimate can be published only with a coverage of 50 percent of GDP sources and choose the shortest release lag that allows to achieve that coverage.

13 Timeliness of early GDP estimates should also take into consideration the release schedule of other macroeconomic statistics that are used in the compilation. Other statistical frameworks follow different timeliness requirements from those of the national accounts. Balance of payments data or government finance statistics, for example, are important pieces of information for the GDP compilation by expenditure. When these statistics are released with long delays (say, 90 days from the reference quarter), an early estimate can only be based on production data and it may not be possible to publish the GDP by expenditure. Discussion with other compiling agencies (Central Bank, Ministry of Finance, etc.) is advisable to verify if preliminary, confidential data can be provided ahead of the official publication. If possible, a coordinated release schedule of macroeconomic statistics should be designed to minimize future revisions of the GDP estimates.

14 A very useful tool to analyze the reliability of early estimates at different release lags is the analysis of revisions. For early estimates, the best revision stage is the difference between the early estimate and the second estimate. This stage quantifies the impact

of monthly and quarterly source data that arrive immediately after the release of the early estimate. Summary statistics of the revisions can be calculated and compared at the different release lags. Release lags showing small revisions and no systematic direction should be preferred. The revisions analysis should be conducted for detailed GDP components, using the same disaggregation as in the regular estimates, so that it is possible to trace back which items cause changes in the revisions statistics at the different lags. A detailed assessment may indicate, for example, which components are more reliable than others. It could also indicate, for example, that only an early estimate of the aggregate GDP is sufficiently reliable to be published to the users (see Chapter 12 for a formal illustration and example of revisions analysis).

15 From the user's point of view, it is desirable to receive as timely information as possible on the quarterly GDP. Important policy decisions may be taken with a fixed and regular schedule during the year. For example, the central bank may convene a meeting at the end of each month to decide its monetary policy stance. As the quarterly GDP is a fundamental ingredient in the monetary policy decision process, there could be a push for statistics agencies to release an early estimate ahead of these meetings. Furthermore, statistical regulations established by regional or international organizations may impose strict requirements on timeliness for the first release of quarterly GDP to their member countries.[3]

16 On the other hand, users should accept and account for the relatively higher degree of uncertainty of early estimates. Revisions to early estimates are indispensable to incorporate monthly and quarterly source data that arrive after the publication. The absence of revisions between early estimates and subsequent estimates in a given quarter should be considered with great caution, as regular estimates of QNA generally use a more complete set of source data, which leads to more accurate results. Estimates that are released too early could be too unstable and create confusion in the users. If there is a strong sentiment against revisions to national accounts data in the country, compilers should consider longer release lags for early estimates or, if there is space to do so, not producing an early estimate at all.

Filling Data Gaps for GDP Indicators

17 To produce an early estimate of GDP, all gaps in the quarterly source data should be filled. Missing data for GDP indicators should be estimated using statistical methods and assumptions that demonstrate a high degree of accuracy and robustness in reproducing the true values of the indicators. Using inaccurate methods may compromise the reliability of quarterly GDP and the credibility of the compiling agency, which may be forced to communicate large and systematic revisions in subsequent GDP estimates or, even worse, may be tempted to disregard new and updated source data to avoid revisions.

18 Ideally, all data gaps should be filled in at the level of indicator series. Estimates should be based on the statistical and economic features of the indicators, and not on the QNA items that are produced using these indicators. For example, when a production index is used to extrapolate value added of an industry, the missing months of the production index should be estimated, not the quarterly value added. This approach allows the compilers to follow the standard procedures used in the QNA, including benchmarking and seasonal adjustment. Working at the indicators level and maintaining the same compilation system used for later estimates guarantee that revisions between early estimates and later estimates are due exclusively to changes in the source data. Furthermore, compilers can keep track of the imputations made and discuss them with data providers, which could lead to improvements in the estimation accuracy of the methods.

19 Deriving estimates of missing information using past trends only should generally be avoided. The objective of QNA is to provide accurate signals about the current developments in the economy. Replicating short-term trends from previous observations may introduce an artificial smoothness in the estimates, and may fail to incorporate sudden changes in the economy. Past trend extrapolations should be avoided in particular for current price data, which mixes together different evolutions of prices

[3] In the European Union, member countries are invited to submit their "flash" estimates of quarterly gross domestic product within 30 days after the end of the quarter. However, this is not a requirement in the ESA 2010 data transmission program. For more information on flash estimates of the European Union, refer to Eurostat (2016b).

and volumes. Price statistics are generally very timely, and when not, price indices for similar or related products may provide acceptable proxies to complete the missing information. Past trends may be an option only for those indicators showing a very stable pattern over time.

20 Frequency and timeliness of indicators are two other important elements to consider. Monthly indicators present the advantage that partial information for the quarter can be available at the time of the early estimate (i.e., one or two months of the quarter). This reduces the impact of methods and assumptions on the early estimate, as only partial information for the quarter needs to be estimated. For this reason, any estimation methods or assumptions used for early estimates should be applied to monthly indicators. Consequently, monthly indicators should not be aggregated into quarterly ones (a preference for monthly series has been expressed also in Chapter 8 for the adjustment of calendar effects). Moreover, quarterly indicators that are available with a long delay should be identified and analyzed carefully. If these indicators move forward important components of the GDP, bad-quality imputations and assumptions used for the early estimate may lead to large revisions in later estimates of quarterly GDP.

21 Additional indicators could also be considered to complement the source data used for early estimates. It could be useful to expand the list of possible indicators and consider economic and financial indicators that are not used in the regular QNA compilation. In particular, indicators that are available with a short delay may be particularly suitable in the context of early estimates. Possible examples are business and consumer sentiment surveys, Internet-based search indicators, or financial and monetary statistics. The predictive ability of such indicators should be tested to verify whether they can improve the estimation accuracy of early estimates.

22 Finally, compilers of early estimates should pay continuous attention to what is happening in the economy. A strike, a drought, a government reform, a major sport event, or a financial crisis may cause sudden shifts in past trends of quarterly GDP and should be taken into account promptly in the national accounts estimates. It is good practice to read the news and understand how major economic events reflect in the national accounts and, in particular, be recorded in the GDP. At the time of the early estimate, these events may not be recorded in the limited source data available. Ad hoc intervention to early estimates may be necessary to limit future revisions of the quarterly GDP. Clearly, these adjustments should be documented and communicated clearly to the users to avoid any suspicious of manipulation.

Methods

23 Data gaps for early estimates of GDP fall into two main groups. The first group comprises cases with related information available. Within this group, the most common situations are the following:

a. use of related indicators that directly relate to the missing information either from outside or within the QNA system, and with available information for the complete quarter; and
b. use of the same data sources as in regular estimates, but containing only partial information, either by lower sample coverage or by shorter time spans (two out of three months for instance).

The second group comprises those situations where no related information can be used to produce plausible results. Methods that are applicable in the two cases are discussed below.[4]

24 The methods discussed in this section may also apply for filling data gaps for later publications of QNA. These gaps are more significant for early estimates of GDP because a larger proportion of information is missing and needs to be estimated. It is important to maintain consistency between the methods used in early estimates and later QNA estimates. For instance, in many countries, the quarterly activity of agriculture is derived from annual forecasts, which are temporally disaggregated by means of a particular method. If no revisions on the annual figure (or in the related indicator) occur, then both early and later GDP estimates should be based on the same methodology.

25 As a general principle, all the available information should be used at the highest frequency. If quarterly figures are derived from monthly data, data gaps should be filled at the monthly level. The quarterly

[4] This chapter presents basic methods to fill data gaps. A more comprehensive discussion on methods for early estimates is available in Eurostat (2016a).

indicator should be derived by aggregating available months and projected months.

Methods with Related Information Available

26 The best situation is when there exists related information that can be exploited to fill the gaps of GDP indicators. These types of information might not be completely in line with the concept intended to be estimated, but they may be strongly related with it. One example is the use of input data or sales as proxies of output. Preliminary results from surveys may also be available with a partial coverage. Using actual information allows to "nowcast" the current value of the indicator: that is, deriving the most recent periods using related contemporaneous information. This information could be extremely helpful to improve the reliability of early estimates.

27 Particular attention should be given to the case when preliminary/advance survey results or administrative data are available. Preliminary results are usually based on reduced samples or incomplete response so totals are not comparable as such, and should not be used directly for extrapolation since the activity levels derived from reduced samples are likely to be lower than those derived from the full samples for previous ones. Then, intermediate procedures are to be applied in order to derive comparable figures. Two procedures can be used in these cases: (i) grossing-up procedures to expand the results of the sample to population levels or (ii) use paired units of a sample in different periods and assume the same behavior for the rest of population.

28 Specialists from survey units usually deal with sampling and grossing-up procedures. However, national accountants should be aware of the procedure used to derive the preliminary source data for the early estimates. The grossing-up procedure should be based on the same re-weighting methods used for later survey results to minimize the size of revisions. The common approach is to gross up survey data provided by respondents by using comprehensive totals from a business register or a population census.

29 Matched pair procedures are particularly relevant when partial administrative data are received for the early estimate. This is a task that QNA compilers may be required to do directly if administrative data are transmitted from other agencies to the national accounts unit. Generally, only a small number of units is available for the current quarter after a short delay. This subset of fast responders cannot directly be compared with the larger samples in previous quarters. Responding units in different periods should be linked using unique identifiers available in the register, such as tax code or personal identification numbers. Percent changes from the previous year (or the previous quarter) of economic variables such as turnover, employment, etc. should be calculated based on the matched responding units by economic activity. This information can be used to extrapolate the relevant QNA variable.

30 When setting up an early estimate system, compilers should consider all the sources of economic information available with short delay (even those that are not considered in the regular QNA compilation). A continuous review of available information should be conducted to improve the reliability of the early estimates. Proxy indicators may complement the set of existing QNA indicators, or help predict the missing information for the early estimate.

31 In absence of external related information, compilers may decide to exploit behavioral relationships within the QNA system to estimate missing information in the indicators. For instance, agricultural output from the QNA can be used to project the output indicator for foods processing industries (or vice versa).

32 There are several ways to use related information to fill data gaps, from simple extrapolation using related indicators to more complex econometrics models. Simple extrapolation using related indicators consists in applying the movement of a related series to derive the unavailable current value of the indicator. To avoid any bias due to differences in seasonality, the (annual) trend of the indicator series should be moved forward using the annual change in the related series:

$$\hat{I}_T = \frac{R_T}{R_{T-s}} \times I_{T-s}, \tag{1}$$

where

$\hat{I}_T$ is the estimate of the indicator for the current period,

R_T is the related series in period T, and

s is the periodicity of the series (4 for quarterly and 12 for monthly data).

33 When seasonally adjusted information is available, a period-to-period extrapolation may provide more accurate results than using the annual trend. As explained in Chapter 1, year-on-year movements may fail to detect turning points in the series. Alternatively, quarterly/monthly extrapolation could be used:

$$\hat{I}_T^{SA} = \frac{R_T^{SA}}{R_{T-1}^{SA}} \times I_{T-}^{SA}, \tag{2}$$

where

$\hat{I}_T^{SA}$ is the seasonally adjusted estimate of the indicator for the current period and

R_T^{SA} is the seasonally adjusted related series in period *T*.

The seasonally adjusted estimate can be converted into unadjusted data using the seasonal factor for period *T* available from the seasonal adjustment procedure (such as X-13ARIMA-SEATS or TRAMO-SEATS)[5]:

$$\hat{I}_T = \hat{I}_T^{SA} \times SF_T. \tag{3}$$

34 Econometric models can also be specified to predict the missing indicator using related information. These types of models aim at filling the gaps by modeling the statistical relationship between the QNA indicator series and the related series. For example, a typical model used for short-term forecasting is the autoregressive distributed lags model:

$$\hat{I}_T = \alpha + \beta_1 I_{T-1} + \beta_2 R_T + \beta_3 R_{T-1} + \varepsilon_T, \tag{4}$$

where the current value of the indicators is explained by its lagged values and current and lagged values of the related series. Modeling techniques, however, require knowledge about time series and econometrics, and must be used with great caution. Misspecified models could produce odd results and reduce the reliability of the early estimates. If such models are required for a large proportion of GDP, it may be appropriate to assign this responsibility to another agency or a unit specialized on time-series methods and forecasts within the compiling agency. This would avoid undermining the credibility of official national accounts.

[5] Equation (3) assumes a multiplication seasonal adjustment. For additive models, the seasonal component should be added to the value of the seasonally adjusted indicator. See Chapter 7 for the difference between additive adjustment and multiplicative adjustment.

Methods with No Related Information Available

35 If no related information is available, for the entire quarter or for one or two months, the best solution is to use time-series extrapolation techniques to estimate the missing information. In normal situations, such methods can produce reliable forecasts in the short term. However, time-series models are unable to detect sudden changes of the underlying trend in the series due to unpredicted economic events. Their good forecasting accuracy stems mainly from their ability to repeat patterns of the series, such as recent trends and seasonality. Thus, the use of these methods should be limited and used as a last resort.

36 Autoregressive integrated moving average (ARIMA) models represent the best choice for forecasting QNA indicators in absence of related information. Chapter 8 provides some details on ARIMA models and their specification for seasonal adjustment purposes. Forecasts using ARIMA models are automatically produced by standard seasonal adjustment software, such as X-13ARIMA-SEATS or TRAMO-SEATS. The default options used by these programs generally produce satisfactory results. Users may also account for calendar-related effects in the corresponding period (such as leap year, Easter or Ramadan, or country specific holidays) and improve forecasting accuracy. ARIMA forecasts are available in the output results of these programs and can also be produced without running seasonal adjustment. As mentioned earlier, ARIMA models should be estimated on monthly series to complete the current quarter; if the indicator is quarterly, an ARIMA model should be used to generate a forecast for the entire quarter.

37 In some particular cases, simple mechanical extrapolation techniques could produce satisfactory results, and ARIMA models might not be necessary:

- If there is no clear trend or seasonality in the movements of the series (either in volume or price terms), one may simply repeat the last observation or set the value for the missing

period equal to a simple average of a number of past periods (e.g., the previous two months or the entire year).

- When a series shows strong seasonal effects but no clear trends, one may simply repeat the value of the variable in the same period of the previous year or set the value for the missing observation equal to the average for the same period in several of the previous years.
- If there is a clear trend in the series but no pronounced seasonal variation (e.g., for seasonally adjusted series), the past trend may be projected using a weighted average of the period-to-period rates of change for the last observations—for example, by using a weighted average for three last observations as follows:

$$\hat{I}_T = I_{T-1}\left[\frac{3}{6}\cdot\frac{I_{T-1}}{I_{T-2}}+\frac{2}{6}\cdot\frac{I_{T-2}}{I_{T-3}}+\frac{1}{6}\cdot\frac{I_{T-3}}{I_{T-4}}\right]. \quad (5)$$

- With both a clear trend and strong seasonal variation in the series, one simple option may be to extrapolate the value of the series in the same period in the previous year, using a weighted average of the rates of change from the same period in the previous year for the last observations as an extrapolator—for example, by using a weighted average for three last observations as follows:

$$\hat{I}_T = I_{T-s}\left[\frac{3}{6}\cdot\frac{I_{T-s-1}}{I_{T-s-2}}+\frac{2}{6}\cdot\frac{I_{T-s-2}}{I_{T-s-3}}+\frac{1}{6}\cdot\frac{I_{T-s-3}}{I_{T-s-4}}\right]. \quad (6)$$

Assessment

38 Methods used for early estimates should be assessed on the basis of their ability to predict the true values of indicators. The estimates obtained should be compared with actual data on a continuous basis. When different methods are available, statistical measures should be used to choose the most accurate approach. Although this is a procedure generally carried out in the implementation stage of the early estimate, the reliability of early estimates should be monitored on a continuous basis especially when new sources become available.

39 Real-time exercises should be conducted for some time before publishing early estimates to verify the reliability and robustness of the chosen methods. Testing the early estimation system for past observations allows the compiler to have an indication of the expected size and direction of revisions of subsequent estimates. In this way, it would be possible to identify ahead of publication areas of intervention for improving the reliability of early estimates (and reduce future revisions). For this reason, it is desirable initially to produce estimates on an experimental, unpublished basis to make these assessments.

40 A simple measure to assess alternative methods is to estimate the mean difference (*MD*) between the estimated value $\hat{I}_t$ and the actual value I_t of the indicator:

$$MD = \frac{1}{n}\sum_{t=1}^{n}(\hat{I}_t - I_t). \quad (7)$$

where n indicates the number of periods estimated. If the value of *MD* is around zero, the method produces unbiased results. If *MD* is large and positive (negative), the early estimate is expected to overestimate (underestimate) the value of the indicator (and the early estimates of GDP). The quality of early estimates deteriorates as *MD* moves away from zero. Methods with *MD* close to zero should be preferred.

41 The mean squared difference (*MSD*) can be used to measure the expected size of revisions. *MSD* calculates the average of squared differences between estimated values and true values of the indicators:

$$MSD = \frac{1}{n}\sum_{t=1}^{n}(\hat{I}_t - I_t)^2. \quad (8)$$

Methods with lower *MSD* values should be preferred.

42 When a full estimation system for early estimates is in place, compilers should calculate an expected size of revisions between the early estimate and the second estimate of the quarterly GDP growth (and possibly other key macroeconomic variables released with the early estimate). This can be done using standard revisions measures (see Chapter 12). Revisions to early estimates should be small and mainly related to the additional information acquired between the time of publication and the second release. If revisions are too large, users may lose confidence in the preliminary information provided and raise concerns about the credibility of the compiling agency. An acceptable size of revisions should be determined based on specific country situations. Fast-growing countries may expect larger revisions to GDP than countries with stagnant growth. On the other hand,

small economies may experience significant revisions in percent changes due to the small size of their GDP level.

Communicating Early Estimates

43 Transparency is a key aspect of communications policy for early estimates. Lack of detailed information on methods and sources used may generate mistrust in the quality of early estimates from users. Once early estimates are compiled and disseminated, they become a key variable for general users and policymakers. Thus, good practices on dissemination and revision issues should be put in place, since an additional set of official GDP series will be available in advance of the standard QNA results. Data sources and methods used in the compilation of early estimates of GDP should be well documented and made available to users. Furthermore, metadata should indicate information on timeliness and level of detail of the early estimate.

44 Early estimates of quarterly GDP attract a large amount of media coverage. The focus at this stage is to get an accurate top level GDP growth estimate. Much time and efforts should be spent on explaining the strengths and weaknesses of the early estimate to users. The GDP numbers should be presented to a wide internal audience, made of economists, national accounts, statisticians, and data experts. Regular articles on revisions should be released to highlight the relatively good performance of the estimate. The press release should be scheduled early in the morning to avoid miscommunications by the media.

45 Sources of revisions to the early estimate should be indicated clearly when the second estimate of quarterly GDP is released. Such analysis helps users understand the factors underlying revisions and interpret possible changes in the recent development of the economy. In particular, clear explanations should be given to users when there are large differences.

46 A lower publication detail is justified on the grounds that there is greater uncertainty in disaggregated data. A reduced breakdown of the GDP also emphasizes the limitations of early estimates to users. Early estimates should cover at least the headline GDP figure in volume terms. The main interest of QNA users is on the short-term developments of quarterly GDP, rather than on the levels; therefore, the main focus should be on period-to-period changes. If only unadjusted data are available, the year-on-year rate of change of GDP should be published. A few aggregate GDP components should be published to explain the main drivers of GDP growth (e.g., one-digit level of ISIC Rev. 4 or main expenditure aggregates). Compilers should also consider publishing detailed items that are based on reliable information, particularly when they are very relevant for the economy (e.g., mining or refinery industries in oil-exporting countries). Ideally, early estimates should include the same types of information released in subsequent QNA publications (i.e., original series, seasonally adjusted, trend cycle, current prices, constant prices or chain-linked, etc.). However, preference should be given to the most relevant information for the users. In many countries, quarterly seasonally adjusted rate of change of the GDP is the preferred information.

47 Metadata for early estimates should include all additional sources of information and methods that are used to fill data gaps. Because early estimates of GDP broadly follow the QNA methodology, a large part of the metadata (sources, compilation methods, and classification) can be taken from the available metadata for the standard QNA. However, compilation of early estimates of GDP relies more heavily on estimates of missing information compared to the standard QNA compilation. In particular, metadata should indicate the relative size of estimated components by production and by expenditure components of GDP.

48 Given the provisional status of early estimates, it is necessary to develop a revision policy that fully integrates their dissemination into the broad system of ANA and QNA estimates. Revisions to early estimates are essential to incorporate new and updated source data made available after their release. Early estimates that are never revised may draw criticisms and dubious over the quality of the entire national accounts system. To avoid reputational and credibility risks, revisions to early estimates due to new or updated information should be published at the subsequent publication of the QNA. Revisions to early estimates should also follow a fixed and predetermined calendar, so that users are informed in advance about the timing of possible changes in the GDP estimates.

49 A quantitative assessment of revisions to early estimates should be given in the press release. When they are published for the first time, compilers may indicate an expected range of revision on the basis of internal tests that preceded the first publication (or refer to a research paper where these tests are described in detail). After some time, compilers should calculate and publish revisions statistics based on previously published early estimates. With this information, users should be able to appreciate the direction and size of revisions in the past, and possibly make judgments about the expected revision process of current and future early estimates.

Summary of Key Recommendations

- *Compilers of QNA produce early estimates of quarterly GDP in response to a strong demand of users for a rapid measurement of macroeconomic developments.*
- *Early estimates should be based on a partial set of source data, using the same compilation approach used for later estimates of the QNA. A greater use of statistical methods and assumptions is required to estimate missing observations at the time of the early estimate.*
- *In deciding the timing of early estimates, compilers should balance the trade-off between timeliness and reliability. Key factors to consider are timeliness of source data, expected size of revisions, and needs from users.*
- *The provisional status of early estimates should be stated clearly in the press release. Metadata on specific sources and methods used for early estimates should be publicly available for transparency reasons.*
- *Revisions studies should be conducted to analyze the revision process of early estimates and assess their reliability. Compilers should use these studies to identify and address systematic errors in the early estimates. Summary revisions measures should also be communicated to users to provide a measure of reliability based on the history of previously published estimates.*
- *Dissemination of early estimates should be coordinated with the publication calendar of national accounts data. Early estimates should include at least the headline GDP, and when possible the main production or expenditure components. The level of detail may be reduced due to a greater recourse to estimation methods.*

Bibliography

Eurostat (2016a), "Overview of GDP Flash Estimation Methods," Statistical Working Papers, Publications Office of the European Union, Luxembourg.

Eurostat (2016b), "Euro Area and European Union GDP Flash Estimates at 30 Days," Statistical Working Papers, Publications Office of the European Union, Luxembourg.