# 1 Introduction

*This chapter introduces the scope and role of quarterly national accounts in the framework of macroeconomic statistics. It emphasizes the time-series nature of quarterly GDP data to analyze recent trends and business-cycle movements. The chapter also highlights the importance of temporal consistency between quarterly and annual accounts. Finally, the main changes to the 2001 edition are summarized.*

## Background

**1** Quarterly national accounts (QNA) constitute a system of integrated quarterly time series coordinated through an accounting framework. QNA adopt the same principles, definitions, and structure as the annual national accounts (ANA). In principle, QNA cover the entire sequence of accounts and balance sheets in the *System of National Accounts 2008 (2008 SNA).* In practice, the constraints of data availability, time, and resources mean that QNA are usually less complete than ANA. The coverage of the QNA system in a country usually evolves. In the initial stage of implementation, only estimates of gross domestic product (GDP) with a split by industry and/or type of expenditure may be derived. Gross national income (GNI), saving, and consolidated accounts for the economy can follow next. Extensions can be made as the use of the system becomes more established, data sources become available, and users become more familiar with the data. Additional breakdowns of GDP, institutional sector accounts and balance sheets, and supply and use reconciliation may be added.

**2** This second edition of the *Quarterly National Accounts Manual* (hereafter, the manual) revisits and expands the first edition published in 2001. An update of the manual was required in view of the many developments in the compilation of QNA that have taken place since 2001, and also to make the manual fully consistent with the international statistical standards resulting from the adoption of the *2008 SNA*.

**3** The manual is written for both beginning and advanced compilers. In addition, it will be of interest to sophisticated data users. Most of this manual addresses issues, concepts, and techniques that apply to the whole system of national accounts. The discussion on data sources in Chapter 3 focuses on components of GDP by production, by expenditure, and by income. Although this reflects the main interest of first-stage compilers, it should not be taken to mean that QNA should stop there. As shown in Chapter 4, GNI and saving for the total economy can be readily derived in most cases, and further extensions are also feasible. In particular, the quarterly expenditure and income components of GDP, in conjunction with balance of payments data, provide all items for the full sequence of consolidated accounts for the total economy.

**4** Several countries with advanced QNA have expanded their systems to include a complete set of quarterly accounts by institutional sector. Other countries are currently aspiring to do so in the medium term. Most of the sources and methods discussed in this manual are also relevant for the compilation of quarterly sectoral accounts. However, this manual remains primarily oriented toward the compilation of GDP and other components for the total economy.

**5** This manual is intended for readers who have a general knowledge of national accounts methodology. The manual aims at full consistency with the *2008 SNA,* and duplication of material presented in the latter is avoided as much as possible. Thus, for general national accounts issues, readers are referred to the *2008 SNA.*

**6** This chapter discusses the main purposes of QNA and the position of QNA between ANA and short-term indicators. It also discusses some important aspects of QNA, such as their time-series character, the usefulness of seasonally adjusted QNA data, their relation to ANA, the importance of transparency, and the rise of early estimates for policymaking.

An outline of the manual is given. Finally, a brief summary of the changes to the 2001 edition is provided.

## Purposes of Quarterly National Accounts

**7** The main purpose of QNA is to provide a picture of current economic developments that is more timely than that provided by the ANA and more comprehensive than that provided by individual short-term indicators. To meet this goal, QNA should be timely, coherent, accurate, comprehensive, and reasonably detailed. If QNA fulfill these criteria, they can serve as a framework for assessing, analyzing, and monitoring current economic developments. Furthermore, by providing time series of quarterly data on macroeconomic aggregates in a coherent accounting framework, QNA allow analysis of the dynamic relationships between these aggregates (particularly, leads and lags). Thus, QNA provide the basic data for business-cycle analysis and for economic modeling purposes. Also, QNA have a particular role to play for accounting under high inflation, sharp changes in relative prices, and where annual source data are based on varying fiscal years. In addition, as with the annual accounts, QNA provide a coordinating conceptual framework for design and collection of economic source statistics and a framework for identifying major gaps in the range of available short-term statistics.

**8** QNA can be seen as positioned between ANA and specific short-term indicators in many of these purposes. QNA are commonly compiled by combining ANA data with short-term source statistics and ANA estimates, thus providing a combination that is more timely than that of the ANA and that has increased information content and quality compared with short-term source statistics.

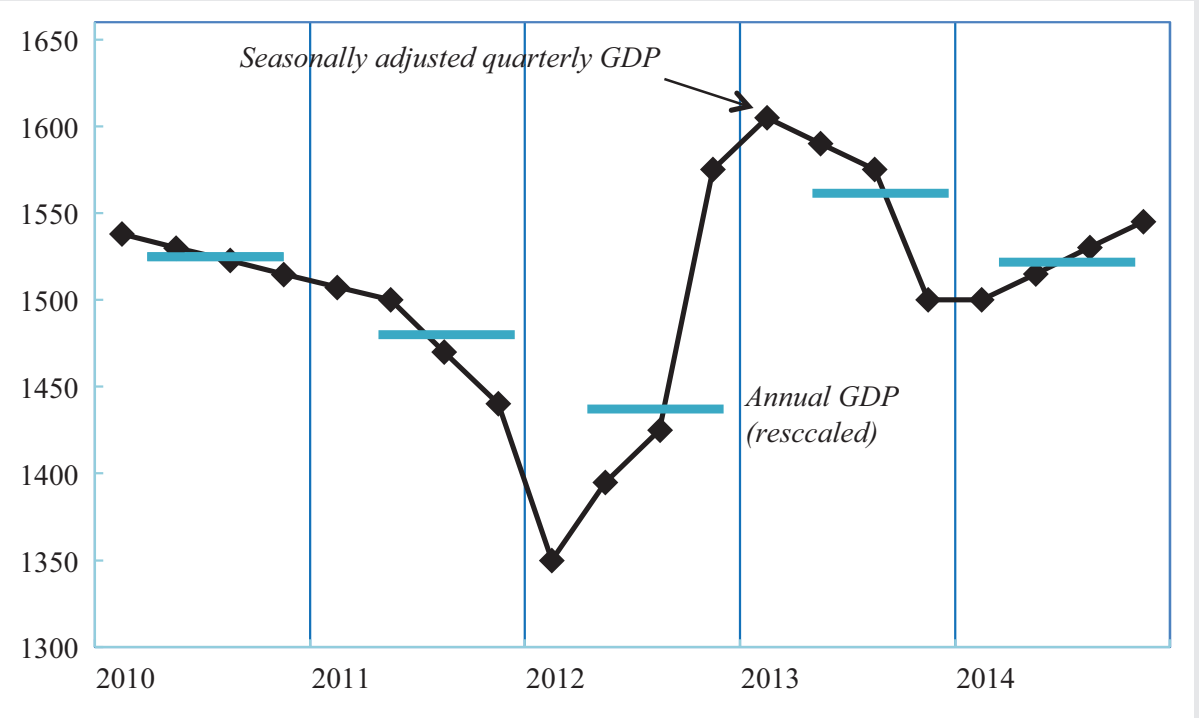
**9** QNA should be available within three months after the end of the reference quarter. ANA, on the other hand, are produced with a considerable time lag. The initial ANA (accounts based on annual data as opposed to first estimates on the basis of the sum of the four quarters) are often available six months or more after the end of the year. Even if the ANA were as timely as the QNA, they would not provide timely information about the current economic situation since the information for, say, the first quarter would be delayed. Also, annual information is insufficient for monitoring of the business cycle, and the timing of economic policy aimed at affecting the business cycle, since it masks higher frequency developments. Within-the-year economic developments are not shown in the ANA. In addition, developments that started in one year and end in the next may not be visible in the ANA (see Example 1.1). The strength of the ANA is to provide information about the economic structure and long-term trends, rather than to provide data needed for monitoring the business cycle.

**10** QNA are best positioned for forecasting purposes as they provide up-to-date information on the current economic situation. Furthermore, quarterly data more adequately reflect the dynamic relationships between economic variables (leads and lags in particular), and they provide four times as many observations, which is very helpful when using mathematical techniques such as regression analysis.

**11** QNA are indispensable during times of high inflation or sharp changes in relative prices for at least two reasons. First, in these circumstances, one of the basic axioms of the ANA is violated: namely, the assumption of price homogeneity over time. Although this basic axiom never fully applies (unless there are no price changes), in times of low inflation, it does not affect the usefulness of the ANA. However, in situations of high inflation, adding up current price data over a year becomes meaningless because the prices vary so much within the year. QNA are much less affected by this situation (although under extreme circumstances the accounting period should even be shorter). Second, the problem of holding gains is much less severe for QNA than for ANA and can more easily be eliminated because changes in valuation are less frequent in a shorter accounting period.

**12** QNA are less timely than short-term indicators, but they provide a more comprehensive picture of current economic developments organized in an integrated framework for analyzing the data. Short-term indicators such as price indices, labor market indicators, industrial production indices, and turnover data for retail trade are often available on a monthly basis shortly after the reference period. These short-term indicators provide valuable information on specific aspects of current economic developments. However, these indicators do not provide a coherent, comprehensive, and consistent picture of the different aspects of the current economic situation. This hampers tracing the causes of current problems and identifying potential future developments. For instance, for a country facing decreasing domestic output growth,

**Example 1.1 Monitoring Business Cycles—Quarterly GDP Data (Seasonally Adjusted) versus Annual GDP Data**




The chart shows quarterly and annual constant GDP (gross domestic product) price for a hypothetical economy and illustrates how annual data may mask the cyclical movements. In this example, the QNA (quarterly national accounts) data show that the economy was growing during 2012 and that the upturn from the preceding slump started around the first quarter of 2012. In contrast, the ANA (annual national accounts) data show that the economy contracted in 2012 compared with 2011. The growth during 2012 first emerges in the ANA when the annual estimates for 2013 become available.

The situation is further aggravated by the usual time lag of the ANA, with the first annual estimates for 2013 not available until 2014.While the QNA will show the upturn in the first quarter of 2012 in 2012, the ANA will not show that upturn until 2014. By that time, the economy in this example has just gone through a second downturn. Thus, an upturn in economic activity would already have changed into a downturn while the ANA would still show positive growth.

in addition to identifying affected industries (as a detailed production index would allow), it would be helpful to identify causes such as decreasing domestic demand or falling exports and to further trace deeper causes such as income, saving, and investment patterns affecting demand categories. A key advantage of the QNA is that they assemble and integrate these indicators into the consistent analytical framework of the national accounts.

**13** A criticism of QNA is that quarterly GDP is not a good business-cycle indicator, because GDP includes activities such as government and agriculture that do not necessarily respond to changes in the business cycle. For this reason, it is argued that a less comprehensive measure, such as a volume index for manufacturing industries, is preferable as a business-cycle indicator. However, the QNA should not be reduced to being a vehicle for compiling summary aggregates such as GDP. Quarterly GDP can be broken down into specific economic activities or expenditure components, which provides a view of economic activities that are deemed more relevant for business-cycle analyses. The QNA also provides an integrated framework for analyzing economic statistics, thus allowing the examination and analysis of developments and behavior.

## Quarterly National Accounts as Time Series

**14** QNA data should be presented in a time-series format. A time series is a collection of observations

ordered in time. To be temporally comparable, a time series should present the following characteristics:

a. Observations of a time series should measure the same concept over time.

b. Measurement of the same concept should be consistent over time with respect to statistical standards and units of measurement.

c. Time periods should be in the same unit (e.g., months, quarters, etc.). Periods of different length are not comparable.

d. QNA should be compiled and disseminated in quarterly discrete form. Cumulative data do not constitute time series.[1] Observations of a cumulated series cannot be compared, because they measure periods of time with different length.

**15** For time series recorded in a consistent manner over time, series of period-to-period changes (e.g., GDP quarter-to-quarter growth) or changes from the same period of the previous year (e.g., GDP growth between the third quarter of the current year to the third quarter of the previous year) are generally used to assess short-term movements or annual trends from quarterly data. However, these changes should be analyzed with caution, as the comparison between quarters may be influenced by changing seasonal and calendar effects, international standards, or methodological advances that intervened over time.

**16** A time-series format of QNA data is essential for a number of uses: business and trend cycle analysis, identifying turning points, studying dynamic relationships between economic variables (in particular, leads and lags), and forecasting. Most of these analyses require long time series. In a situation where QNA have only recently been started, it is recommended to extend the series backward. As a rule of thumb, for purposes of regression analysis and seasonal adjustment, the time series should cover at least five years. A QNA series that is restricted to two consecutive years cannot be considered a time series, because such a presentation would not allow comparisons with preceding years. This requirement for a time-series character of the QNA has important implications for the design of QNA compilation techniques (as described in later chapters).

**17** The importance of presenting monthly and quarterly data as time series for the purposes of analyzing trends and turning points is illustrated in Annex 1.1. The numerical example provided there shows that in measures of change from the same period of the previous year, turning points in the data can be seen with a systematic delay, which in most circumstances is substantial. The average delay is around half a year in discrete data and around three quarters in cumulative data. As shown in Example 1.1, rates of change from the same period in the previous year can indicate that an economy is still in recession when it has actually been recovering for some time.

## Seasonally Adjusted Data and Trend-Cycle Estimates

**18** Seasonal adjustment[2] is the process of removing seasonal and calendar effects from a time series. The purpose of seasonal adjustment is to provide users with additional series where some of these components have been removed. In seasonally adjusted data, the effects of recurrent within-a-year patterns—the seasonal and calendar patterns—are removed, while in trend-cycle estimates the impact of irregular events are also adjusted for. Calendar adjusted data remove only the impact of calendar effects from the original series.

**19** Opinions differ among both users and compilers whether it is the role of statistics agencies to produce seasonally adjusted and trend-cycle estimates. Opinions differ on the usefulness of seasonally adjusted data and whether seasonal adjustment and trend-cycle estimation should be the responsibility of compilers of official statistics. Consequently, country practices in this respect differ. Some statistical offices do not publish any seasonally adjusted data or trend-cycle estimates at all, considering it to be part of users' analysis of the data. Others focus on seasonally adjusted data and trend-cycle estimates, and may not compile or publish unadjusted QNA estimates. Most publish seasonally adjusted data and trend-cycle estimates in addition to the unadjusted figures (at least for the main aggregates), and this practice is encouraged.

[1] For instance, data covering January–March, January–June, January–September, and so on. Annex 1.1 illustrates the disadvantage of cumulative data when identifying turning points.

[2] Well-established techniques are available for seasonal adjustment, such as the X-12/X-13 and TRAMO-SEATS methods (discussed in Chapter 7).

**20** A basic principle of this manual is to compile QNA from unadjusted source data and to apply seasonal adjustment/trend-cycle estimation to the resulting estimates (or the short-term indicators used to derive them). The discussions on sources and methods in this manual, and in particular the discussions concerning benchmarking, are all based on this premise. This premise is derived from the need to serve different users' needs as well as from practical compilation considerations. As illustrated in Box 1.1, unadjusted data, seasonally adjusted data, and trend-cycle estimates are useful for different purposes. The unadjusted data describe what happened in each period, while the seasonally adjusted data and the trend-cycle estimates provide a perspective of the underlying movements in the series. Thus, users should have access to all three sets of data. While QNA estimates based on unadjusted data allow seasonal adjustment, the reverse—deriving unadjusted QNA estimates from seasonally adjusted data—is not possible. QNA compilation of adjusted and unadjusted data should ideally be derived using a coordinated and integrated process.

**21** Seasonally adjusted data and trend-cycle estimates are needed to identify changes in the business cycle and turning points. Turning points in the business cycle may not be visible if seasonal patterns and one-time events in the data are not filtered out. Using growth rates from the corresponding quarter of the previous year rather is not an adequate solution for business-cycle analysis, as explained above (see Annex 1.1 for further explanation of this issue). Furthermore, growth rates from the corresponding quarter do not fully exclude seasonal elements (for instance, religious holidays may rotate and take place

**Box 1.1 Seasonal Adjustment: Unadjusted Data, Seasonally Adjusted Data, Trend-Cycle Estimates—What Do Users Want?**

| Main Use of the Data | Components of Interest | Components of Less Relevance |
|---|---|---|
| Business-cycle analysis | Trend-cycle and irregular components | Unadjusted data |
| Turning point detection | Trend-cycle and irregular components | Unadjusted data |
| Short- and medium-term forecasts | Original unadjusted series and all its components (trend-cycle, irregular, seasonal factors, preadjustment factors, etc.) | |
| Short-term forecasts of stable but highly seasonal items (such as electricity consumption) | Seasonal factors plus the trend-cycle component | |
| Long-term forecasts | Annual data and possibly the trend-cycle component of monthly and quarterly data | Unadjusted monthly and quarterly data, seasonally adjusted data, and the irregular components |
| Analysis of the effect of particular events (such as a strike) | The irregular component and any preadjustment factors | |
| To determine what actually happened (e.g., how many people were unemployed in November) | Original unadjusted series | Seasonally adjusted and trend-cycle data |
| Policy formulations | Original unadjusted series and all its components (trend-cycle, irregular, seasonal factors, preadjustment factors, etc.) | |
| Macroeconomic model building | Could be unadjusted, adjusted, trend-cycle, or all components, depending on the main purpose of the model | |
| Estimation of behavioral relationships | Could be unadjusted, adjusted, trend-cycle, or all components, depending on the main use of the estimated relationships | |
| Data editing and reconciliation by statistical compilers | Original unadjusted series, seasonally adjusted data, irregular component, and trend-cycle component | |

in different quarters, the number and type of working days in a quarter differ from year to year, etc.).

**22** Unadjusted data and other components of the series are needed for other purposes, including various aspects of monitoring current economic developments. For short-term forecasting of highly seasonal series, all components may be needed, particularly the seasonal component. Economic policy formulation may also require information on all components of the series; while for analysis of the effects of particular events, identification of the irregular component may be most important. Unadjusted data are also required for purposes such as econometric modeling, where the information contained in the seasonal component of the series may play a particular role in determining the dynamic relationship among the variables.[3] Also, for the most recent data in the series, seasonally adjusted data and trend-cycle estimates are subject to additional revisions compared with the unadjusted series.

**23** Some users may prefer the unadjusted data because they may want to seasonally adjust the data themselves by applying their own seasonal adjustment procedures. Some aspects of seasonal adjustment remain controversial, partly reflecting the many subjective and somewhat arbitrary choices involved in seasonal adjustment, including the choice of method (e.g., X13-ARIMA versus TRAMO-SEATS), the model decomposition (additive or multiplicative), the treatment of outliers, and the choice of filters.[4] For these and other reasons, it has been argued that statistical offices "should produce the raw data and the users can then use their own software for treating seasonal data in the way they want and in which their analysis calls for."[5] However, the statistical office may have particular information about special events impacting on the series. A key advantage in carrying out seasonal adjustment is to provide a single and consistently estimated official GDP to all users.

**24** Seasonal adjustment may also assist compilers in detecting abnormalities in the data and allow better checks on plausibility of data (in particular, growth rates). Thus, it may be easier to identify some types of errors or discrepancies and their causes with adjusted data than with unadjusted data. On the other hand, the adjustments may obscure discrepancies and abnormalities in the unadjusted data that do not relate to seasonality. Also, it is more difficult to interpret discrepancies in the adjusted data, because it is uncertain to what extent the discrepancies were already implicit in the unadjusted data.

**25** Although seasonal adjustment removes the identifiable regular repeated influences on the series, it does not and should not remove the impact of irregular events. Consequently, if the impact of irregular events is strong, seasonally adjusted series may not represent a smooth and easily interpretable series. To further highlight the underlying trend-cycle, most standard seasonal adjustment packages also calculate a smoothed trend-cycle series, representing an estimate of the combined long-term trend and the business-cycle movements in the series. Several countries include these estimates in their publications, and this practice enhances transparency and credibility of the seasonal adjustment results. However, the presentation should highlight the lower reliability of the trend-cycle estimates for the latest observations (as explained in Chapter 7).

## Consistency Between Quarterly and Annual Accounts

**26** To avoid confusion about interpreting economic developments, it is essential that the QNA are consistent with the ANA.[6] Differences in growth rates between QNA and ANA cause confusion in the users and uncertainty about the reliability of the actual measurements. Consistency means that the sums (or averages if the system is based on index numbers) of the estimates for the four quarters of the year should be equal to the annual estimates. In a situation where the ANA or ANA components are built up from the QNA, consistency is achieved by construction. ANA are more commonly based, however, on different sources than the quarterly estimates, and therefore, differences are expected. To overcome this issue, the QNA data should be aligned with the annual data; the process to achieve this is known as "benchmarking." One advantage of benchmarking is that incorporating the usually more accurate annual information into

[3] See, for instance, Bell and Hillmer (1984), pp. 291–320.
[4] See, for instance, chapter 5 of Alterman, Diewert, and Feenestra (1999) for a discussion of many of these controversial issues.
[5] Hyllenberg (1998), pp. 167–168.
[6] Consistency is a strict requirement for nonseasonally adjusted quarterly national accounts. For seasonally adjusted data, inconsistencies with annual national accounts may derive from the application of seasonal adjustment procedures.

the quarterly estimates increases the accuracy of the quarterly time series. Benchmarking also ensures an optimal use of the quarterly and annual source data in a time-series context.

**27** Benchmarking deals with the problem of combining a time series of high-frequency data (e.g., quarterly data) with less frequent but more accurate data (e.g., annual or less frequent data). Benchmarking also arises when the annual estimates are anchored to more comprehensive and detailed surveys and censuses that are performed only every few years. The same basic principle applies to quarterly and annual benchmarking; however, as shown through the technical discussion in Chapter 6, quarterly benchmarking is technically more complicated.

**28** Benchmarking has two main aspects, which in the QNA context are commonly looked upon as two different topics: (a) *quarterly distribution*[7] of annual data to construct time series of historical QNA estimates ("back series") and to revise preliminary QNA estimates to align them to new annual data when they become available, and (b) *extrapolation* to update the QNA series by linking in the quarterly source data (the indicators) for the most current period ("forward series").

**29** The general objective of benchmarking is to preserve as much as possible the short-term movements in the source data under the restrictions provided by the annual data and, at the same time, ensure that the sum of the four extrapolated quarters is as close as possible to the unknown future annual data. Preserving the short-term movements in the source data is important, since the indicator provides the only available explicit information to estimate QNA components. The optimal preservation of the short-term movements in the data is one of the basic premises of this manual. Therefore, the core problem of benchmarking in a quarterly context is how to align a quarterly indicator time series to annual data while maintaining the quarterly pattern and without introducing artificial discontinuities from the last quarter of one year to the first quarter of the next year. This problem is known as the "step problem." To avoid the step problem, several mathematical techniques have been developed. Chapter 6 presents two techniques: (a) the proportional Denton method, which is optimal under the general benchmarking objective stated above, and (b) the proportional Cholette–Dagum method with autoregressive errors, which under certain conditions may improve accuracy when extrapolating quarterly estimates beyond the available annual benchmarks.

**30** To be consistent, QNA and ANA should use the same concepts. As mentioned, the manual seeks full consistency with the *2008 SNA* and aims to avoid any unnecessary duplication. Nevertheless, some conceptual issues have a stronger incidence and more substantial consequences on a quarterly than on an annual basis, which necessitates some further discussion. The most important conceptual issue in this respect is the time of recording, particularly in two cases: (a) long-production cycles and (b) low-frequency payments. Long-production cycles (or production cycles that are longer than one accounting period) mainly concern construction, manufacturing of durable goods, and agriculture and forestry. The problems involved can be very substantial for QNA compilation and are discussed in Chapter 11. Low-frequency payments are payments made on an annual basis or in infrequent installments over the year. Examples of such payments are dividends, end-of-year or vacation bonuses, and taxes on the use of fixed assets and other taxes on production. These issues are discussed in Chapter 4.

## Transparency in Quarterly National Accounts

**31** Transparency is a fundamental requirement of QNA for users, particularly when it comes to revisions. To achieve transparency, it is important to provide users with documentation regarding the source data used and the way they are adjusted. As well, documentation should be provided on the compilation process. This will enable users to make their own judgments on the accuracy and reliability of the QNA and will preempt possible criticism of arbitrary data manipulation. In addition, users should be informed about release dates according to a preannounced advance release calendar to avoid any impression of manipulative timing of publication. To avoid misperceptions, it is advisable that the compiling agency takes a proactive approach to educate users.

**32** Revisions are undertaken to provide users with data that are as timely and accurate as possible. Resource

[7] It encompasses the techniques of interpolation for stock data and temporal distribution for flow data. For more on this, see Chapter 6.

constraints and respondent burden can cause tension between timeliness of published data, on the one hand, and reliability, accuracy, and comprehensiveness on the other. To balance these factors, preliminary data are compiled and later revised when more and better source data become available. Revisions provide the possibility to incorporate new and more accurate information into the estimates, and thus to improve their accuracy, without introducing breaks in the time series.

**33** Although revisions sometimes may be perceived as reflecting negatively on the trustworthiness of official statistics, delaying the implementation of revisions may increase the size of later revisions (e.g., if they are in same direction, because they are cumulative). Experience has shown that more sophisticated users understand that publishing large revisions, especially when supported by improvements in source data and methods, is a sign of integrity. Not incorporating known revisions actually reduces the trustworthiness of data, because the data do not reflect the best available information, and the public may know this or find out (for instance, the public may wonder why a revision in the monthly production index is not reflected in the QNA). In a time-series-oriented compilation system, suppression of revised information can also be cumbersome and costly, and can cause estimation errors.

**34** To minimize the number of revisions needed without suppressing information, it is advisable to coordinate statistical activities. The revision schedule should be largely driven by arrival of source data, and coordinating their arrival would help reduce the number of revisions needed.

**35** Transparent publication and revision policies help address any concerns users may have about revisions. In addition, users need to be clearly informed about the causes of revisions and how these revisions are incorporated in the QNA estimates. Countries have adopted different approaches to revisions in response to their own circumstances. However, some important elements that constitute best practice are (a) candid and easily available documentation of sources and methods, (b) easily available documentation of the size and causes of revisions, and (c) release and revision dates that are well known and published through an advance release calendar. These practices are all required or encouraged by the IMF's data dissemination standards.[8] In addition, electronic release of the complete time series, not only the data for the most recent periods, will make it easier for users to update their databases. These issues are further discussed in Chapter 12.

**36** It is advisable to take a proactive approach to educate users. Educating users, while valuable for most statistical areas, is particularly important for QNA because of their policy relevance and technical complexity. This introductory chapter has not only emphasized the usefulness of QNA, but also has pointed out inherent weaknesses. Compilers must be candid about these issues with the public and pursue transparency of sources and methods for compiling QNA. For instance, experience has shown that a proactive approach can help reduce complaints about revisions. Also, compilers should educate users about the analytical possibilities and other benefits of the QNA data. Enhanced contact with users may also help compilers detect weaknesses in the estimates or their presentation. In addition, users sometimes have their own economic information that could be helpful to compilers.

**37** Users should be informed about the meaning of the data and the limitations, and inappropriate uses should be discouraged. Given the likelihood of future revisions, users should be cautioned about the lower relative robustness of the most recent release. To achieve a prudent appraisal of developments, users should be advised to also consider the trend in the data over several quarters in addition to the latest quarter alone. As well, if QNA data are presented in an annualized format, either as compounded growth rates or as levels multiplied by four, it is important to explain that this presentation magnifies the irregularity and uncertainty of QNA data. Similarly, using growth rates with more than one digit behind the decimal point gives the impression that the data are significantly more precise than they generally are.

**38** Several approaches can be taken to educate users. Seminars could be conducted for specific audiences, such as specialized journalists, interested parliamentarians, and users within the central bank, government agencies such as the Ministry of Finance

[8] Current data dissemination standards of the IMF include Special Data Dissemination Standard Plus (SDDS Plus), Special Data Dissemination Standard (SDDS), and the enhanced General Data Dissemination System (e-GDDS).

or the Department of Commerce, or with the academic community. Direct inquiries by users are good occasions for compilers to explain specific issues. For the general public, the occasion of new releases, which often brings the QNA to public attention, can be used to highlight points of interest. In particular, attention should be given to revisions and their causes. Also, in presenting the data, care should be taken to exemplify proper use, as indicated above. The best way to go about this is to provide press releases tailored to the style of the media, ready to print.

## Early Estimates

**39** In some countries, early estimates of QNA are released fairly shortly after the reference period.[9] The terminology is designed to emphasize that shortcuts have been taken and that, consequently, the data are particularly subject to revision. The shortcuts usually include use of data for only one or two months of the quarter for some or all components, with the missing month(s) estimated by extrapolation using mechanical methods such as those discussed in Chapter 10. Another common shortcut is the use of data with less complete response rates than the data used for subsequent QNA estimates. Early estimates only differ from subsequent QNA estimates, in that they use a higher proportion of such methods. Consequently, early estimates do not raise additional conceptual issues, although the practical concerns about informing users of their limitations and assessing the record of revisions for QNA are even more crucial. Early estimates may be more limited in coverage of the *2008 SNA* variables (for instance, they may cover variables from the production account only) or be published in a more aggregated form. Publication of less detail is a recognition that the statistical noise is greater in disaggregated data and will emphasize the limitations of the estimates to users. Preferably, the level of compilation would be the same as for subsequent estimates, because a different level of compilation requiring the use of different methods may cause unnecessary revisions.

## Outline of the Manual

**40** This manual comprises four parts. The first part (Chapters 1 and 2) introduces the basic principles and concepts of QNA and lays out strategic issues for their implementation. It is intended to be of particular interest to those setting up a new system. In addition, it will also be useful to those reviewing existing systems. Chapter 1 defines the scope and role of QNA and discusses the links between QNA, annual accounts, and short-term statistics. Chapter 2 deals with managerial and organizational issues and suggests main steps in establishing and maintaining a QNA system.

**41** The second part (Chapters 3 and 4) deals with data sources. Chapter 3 reviews the commonly used data sources that are used by countries to compile quarterly GDP by industry, by type of expenditure, and by income category. Chapter 4 discusses the main sources to compile a complete sequence of accounts, possibly by institutional sectors. There is increasing interest in measuring the economy "beyond GDP" on a quarterly basis.

**42** The third part (Chapters 5–8) illustrates the basic methodology for QNA compilation. Chapter 5 is an overarching chapter that discusses how to resolve specific QNA compilation issues such as time of recording issues and seasonal effects. Chapters 6–8 discuss in detail specific methods required for compiling QNA. Chapters 6 deals with benchmarking and reconciliation techniques. These techniques are essential in all countries where annual sources are of higher quality and more comprehensive than quarterly sources, and there is a need to make QNA estimates consistent with ANA benchmarks. Basic principles of seasonal adjustment are discussed in Chapter 7. The chapter is intended particularly for those starting a new system as well as those with existing systems that do not yet have seasonally adjusted data. Finally, Chapter 8 deals with specific QNA issues related to price and volume measurement. The problem of aggregation over time is relevant to all compilers, while the issues associated with chain-linking pertain to more advanced systems.[10]

[9] Early estimates of quarterly GDP are also referred to as advance, flash, or preliminary estimates.

[10] The term "volume" is used for measures that exclude the effects of changes in prices of the components that make up the item. The exclusion of the effect of price changes means that changes in a time series of volume measures are driven by quantity and quality changes. Volume can be contrasted with quantity, which is limited to data that can be expressed in physical units. Accordingly, quantity measures do not take into account quality change and are not applicable for unquantifiable items or aggregates of different items. Volume can also be contrasted with estimates in *real* terms which refer (in precise national accounts terminology)

**43** The fourth part (Chapters 9–12) discusses advanced methods for improving the accuracy, reliability, and timeliness of the quarterly estimates. Chapter 9 provides a framework for compiling and validating estimates of quarterly GDP and other main quarterly aggregates. A quarterly supply and use model is proposed to integrate QNA compilation with available annual supply and use tables (SUT). Chapter 10 illustrates best practices to fill data gaps for calculating early estimates of quarterly GDP. Chapter 11 explains how to measure unfinished output as work-in-progress in the QNA. Finally, Chapter 12 emphasizes the importance of setting up a sound and coordinated revision policy of QNA data and explains ways to monitor the reliability of GDP estimates using revisions analysis.

## Main Changes to the 2001 Edition

**44** The second edition of the manual broadly maintains the structure of the 2001 edition. The new edition contains one additional chapter on specific QNA compilation issues. Two chapters are redrafted: Chapter 9 on editing procedures and Chapter 10 on early estimates. The remaining nine chapters are updated versions of the existing chapters with improved and additional content.

**45** The manual realigns with the main changes made by the *2008 SNA*, in particular those related to the scope of transactions and the production boundary (*2008 SNA*, Annex 3.C) and those related to the extension of the concept of assets and capital formation (*2008 SNA*, Annex 3.D). Chapters 3 and 4 on data sources have been amended accordingly.

**46** The updated manual adds a number of improvements based on best practices and country experience in the compilation of QNA. The most substantial additions refer to four areas of the QNA methodology: (i) reconciliation procedures, (ii) a supply and use model for validating quarterly GDP estimates, (iii) early estimates of quarterly GDP, and (iv) real-time database and revisions analysis of QNA data.

**47** Chapter 6 on benchmarking is expanded to cover the problem of reconciling QNA series subject to both annual benchmarks and quarterly contemporaneous constraints. An optimal simultaneous procedure based on the Denton method is identified and recommended. A two-step reconciliation procedure is also recommended when the dimension of the problem is too large to be resolved simultaneously. These procedures may be relevant to reconcile discrepancies between ANA, QNA, and quarterly accounts by institutional sectors.

**48** Drawing on recent country experience, Chapter 9 introduces a quarterly supply and use model as a validation tool to assess the coherence of independently derived quarterly estimates of GDP by production and by expenditure. When annual SUT are available, a quarterly supply and use model is proposed to transform aggregate GDP discrepancies into detailed product imbalances. A detailed view can facilitate the identification of the most critical areas of intervention for improving the quality of the quarterly GDP data.

**49** Chapter 10 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. This chapter is intended to help statistics agencies to develop early estimates of quarterly GDP.

**50** Chapter 12 proposes statistical measures to analyze revisions of QNA data. Following a well-established Organization for Economic Co-operation and Development (OECD) methodology, the manual proposes that a real-time database of QNA estimates is created and maintained over time, from which descriptive statistics of revisions can be calculated to quantify and summarize revisions made to preliminary estimates at different stages. From this analysis, compilers can derive valuable information on the magnitude and directions of GDP revisions, identify weaknesses in the compilation process, and implement the necessary improvements.

**51** Other relevant changes have been incorporated in the areas of benchmarking, seasonal adjustment, and chain-linking. A variant of the Cholette–Dagum benchmarking method is now suggested as an

to measures of the purchasing power of an item (i.e., in reference to prices of other items). In common usage, "real" is often used for purchasing power as well as volume measures. While constant price estimates are a common form of volume measure, the term also includes fixed-base and chain-linked volume indices.

alternative to the Denton method for extrapolation (Chapter 6). Guidelines on seasonal adjustment are aligned with recent developments and best practices, including the treatment for calendar effects (Chapter 7). Finally, new advances in the calculation of quarterly chain-linked estimates are accounted for in Chapter 8 (e.g., the formula to calculate additive contributions to quarterly GDP growth from chain-linked components).

**52** Finally, the new edition updates and incorporates the relevant content of chapters "V. Editing and Reconciliation" and "VII. Mechanical Projections" of the 2001 edition into "Editing Procedures" (Chapter 9) and "Early Estimates of Quarterly GDP" (Chapter 10), respectively.

# Annex 1.1 Identification of Turning Points

**1** This annex provides a numerical example illustrating the importance of presenting monthly and quarterly economic information as time series and the derived rates of change in the time series on a period-to-period basis, for the purposes of analyzing trends and turning points in the data (as emphasized in Chapters 1 and 7). In the absence of seasonally adjusted time series and trend-cycle estimates, it is common practice to present changes from the same period in the previous year, instead of period-to-period changes. As shown in Example 1.1, rates of change from the same period of the previous year can be inadequate in identifying the current trend in economic activity, indicating, for example, that an economy is still in recession when it has actually been recovering for some time. If changes from the same period of the previous year are used, turning points in the data show up with some delay, which in some circumstances can be substantial. The average delay can be shown to be around half a year in discrete data and around three-quarters of a year in cumulative data.

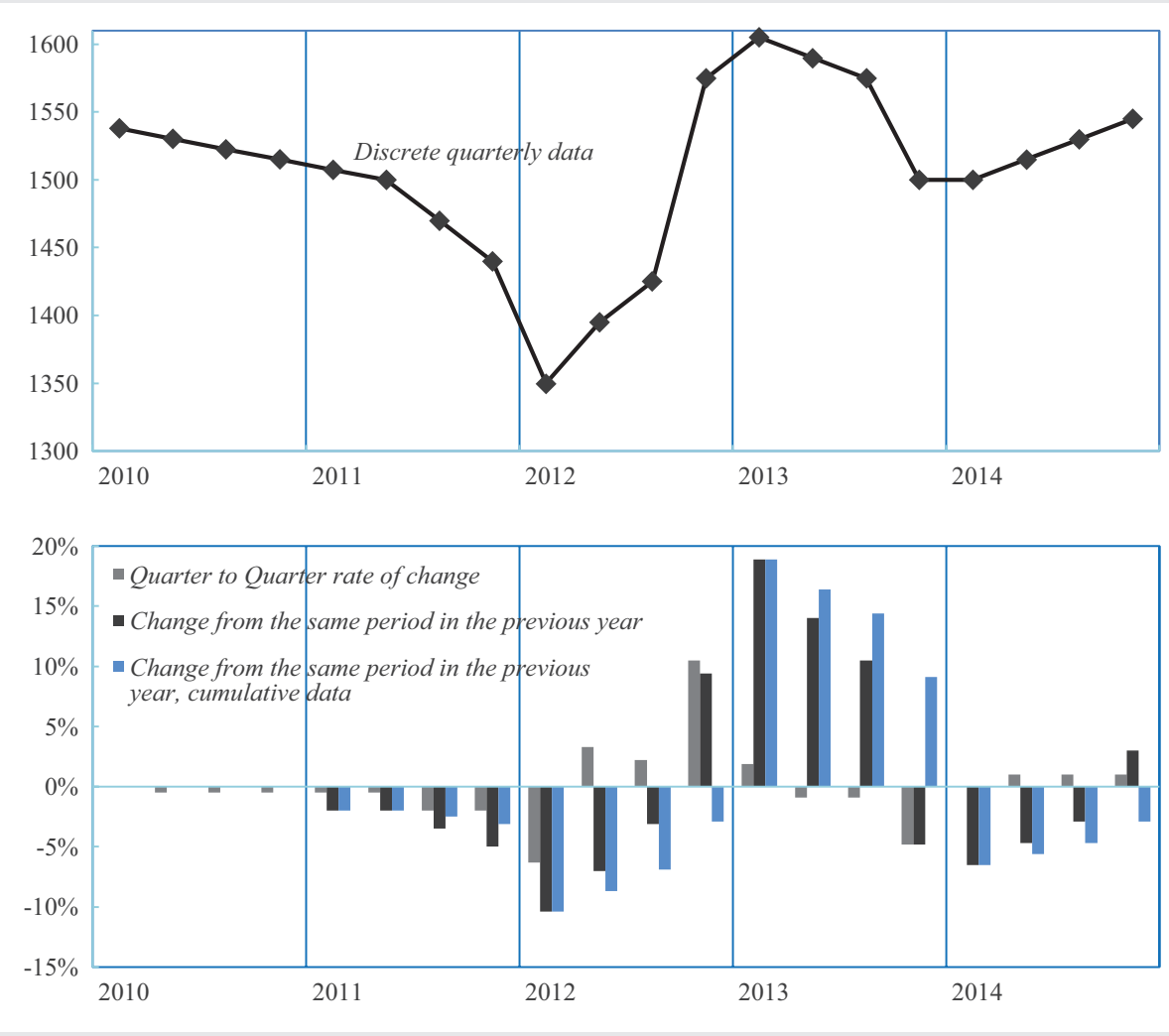
**2** In addition to delaying identification of turning points, changes from the same period of the previous year do not fully exclude all seasonal elements (e.g., religious holidays rotate and take place in different quarters, or the number of working days of a quarter

**Example A1.1 Identification of Turning Points**

| | | | Rates of Change | | |
|---|---|---|---|---|---|
| Quarter | Discrete Data | Cumulative Data | Quarter-to-Quarter | Changes from the Same Quarter of the Previous Year (Discrete Data) | Changes from the Same Quarter of the Previous Year (Cumulative Data) |
| q1 2010 | 1,537.9 | 1,537.9 | | | |
| q2 2010 | 1,530.2 | 3,068.1 | –0.5% | | |
| q3 2010 | 1,522.6 | 4,590.7 | –0.5% | | |
| q4 2010 | 1,515.0 | 6,105.8 | –0.5% | | |
| q1 2011 | 1,507.5 | 1,507.5 | –0.5% | –2.0% | –2.0% |
| q2 2011 | 1,500.0 | 3,007.5 | –0.5% | –2.0% | –2.0% |
| q3 2011 | 1,470.0 | 4,477.5 | –2.0% | –3.5% | –2.5% |
| q4 2011 | 1,440.0 | 5,917.5 | –2.0% | –5.0% | –3.1% |
| q1 2012 | **1,350.0** | 1,350.0 | –6.3% | –10.4% | –10.4% |
| q2 2012 | 1,395.0 | 2,745.0 | **3.3%** | –7.0% | –8.7% |
| q3 2012 | 1,425.0 | 4,170.0 | 2.2% | –3.1% | –6.9% |
| q4 2012 | 1,575.0 | 5,745.0 | 10.5% | **9.4%** | –2.9% |
| q1 2013 | **1,605.0** | 1,605.0 | 1.9% | 18.9% | **18.9%** |
| q2 2013 | 1,590.0 | 3,195.0 | **–0.9%** | 14.0% | 16.4% |
| q3 2013 | 1,575.0 | 4,770.0 | –0.9% | 10.5% | 14.4% |
| q4 2013 | **1,500.0** | 6,270.0 | –4.8% | **–4.8%** | 9.1% |
| q1 2014 | 1,500.0 | 1,500.0 | **0.0%** | –6.5% | **–6.5%** |
| q2 2014 | 1,515.0 | 3,015.0 | 1.0% | –4.7% | –5.6% |
| q3 2014 | 1,530.0 | 4,545.0 | 1.0% | –2.9% | –4.7% |
| q4 2014 | 1,545.0 | 6,090.0 | 1.0% | **3.0%** | –2.9% |

Note: Bold type indicates turning points.

**Example A1.1 Identification of Turning Points (continued)**




may differ from year to year). Moreover, in addition to any irregular events affecting the current period, these year-to-year rates of change will reflect any irregular events affecting the data for the same period of the previous year.

**3** Consequently, year-to-year rates of change are not suitable for business-cycle analysis, and analyzing the economy only on the basis of these rates of change can have an adverse impact on the soundness of macroeconomic policy.

**4** If the changes from the same period in the previous year are based on cumulative data (e.g., data that cover January–March, January–June, etc.), which has been the tradition in some countries, the delays in determining the turning points are even longer.

**5** The numerical example presented in Example A1.1 is based on a time series of hypothetical data, starting in the first quarter of 2010, that can be viewed as representing tons of steel produced in each quarter, or alternatively, quarterly GDP at constant prices. It contains three turning points. The first turning point occurs in quarter 1 of 2012, the second occurs in quarter 1 of 2013, and the third in quarter 4 of 2013.

**6** From the discrete quarterly data presented in the first column of Example A1.1, these three turning points are easily seen as the series turns from

(a) decreasing to increasing in quarter 1 of 2012, (b) increasing to decreasing in quarter 1 of 2013, and (c) decreasing to increasing in quarter 4 of 2013.

**7** Similarly, from the quarter-to-quarter rates of change presented in the third column of Example A1.1, the first turning point is indicated by the shift in quarterly rates of change from a negative rate in quarter 1 of 2012 to a positive rate in quarter 2 of 2012, the second turning point by the shift from a positive to a negative rate of change from quarter 1 to quarter 2 of 2013, and the third turning point by the change from a negative to a positive rate of change from quarter 4 of 2013 to quarter 1 of 2014.

**8** When using changes from the same period of the previous year (e.g., comparing quarter 1 of 2011 with quarter 1 of 2010) instead of quarter-to-quarter changes, the delays in identifying the turning points can be substantial. In the example, the changes from the same quarter of the previous year are presented in the fourth column and show the third turning point as having taken place in quarter 1 of 2014 (i.e., three quarters after it actually occurred).

**9** If the changes from the same quarter in the previous year are based on cumulative data (as shown in the final column), the analysis gives the impression that the turning point took place even one quarter later.

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