Chapter 11

THE NATIONAL ACCOUNTS MACHINERY: COMPILATION AND REPORTING

1. The quarterly national accounts
2. The annual national accounts
3. The revisions to the national accounts and their precision
4. Comprehensive revisions
5. Other datasets related to the national accounts

Previous chapters concentrated on the definitions of the variables in the national accounts. This chapter is quite different; its aim is to explain how national accounts are compiled *in practice* and to describe the main consequences of this process for the user. We will start by discussing the quarterly accounts; then we will examine the relationship between quarterly national accounts and annual national accounts. Finally, we will look at ordinary revisions and comprehensive revisions in the national accounts. The example used will be France, but the lessons to be learned apply also to other countries.

1. The quarterly national accounts

In the United States or the United Kingdom, the national accounts have been from the start almost entirely quarterly. In France and in many other countries, they have been essentially annual for a long time but are becoming increasingly quarterly, thanks to the progress made in the collection and processing of statistics. It is therefore essential for the macroeconomist to be well-informed regarding the timing, format and publication of quarterly national accounts.

Why have quarterly accounts?

One of the crucial objectives of macroeconomic statistics is to help the authorities make the right decisions at the right moment. It would not be appropriate to launch a policy boosting the economy when the upswing has already started, or conversely to "cool down" the economy when it is already entering recession. It is therefore desirable to have the most refined possible information regarding the economic cycle and its turning points. In this context, the annual national accounts, which in the French case are published in April of the following year, arrive far too late. Moreover, exclusive reliance on annual averages can in fact be misleading about the true state of the economy (see Exercise 1 at the end of this chapter). Hence, the importance of compiling accounts that are more timely than annual ones. The present situation regarding the resources available and the reliability of statistics limits this effort to quarterly accounts, but some countries such as Canada calculate GDP monthly.

The quarterly national accounts constitute the central instrument for short-term economic analysis at the OECD. The first pages of *Economic Outlook No. 78* dated December 2005 open with the following graph and the attached comment: "*World growth has been broadening over the past few months. Already strong in North America and most of Asia, economic momentum now looks well established in Japan, and continental Europe is progressively recovering from its latest bout of weakness. The fledgling European expansion*

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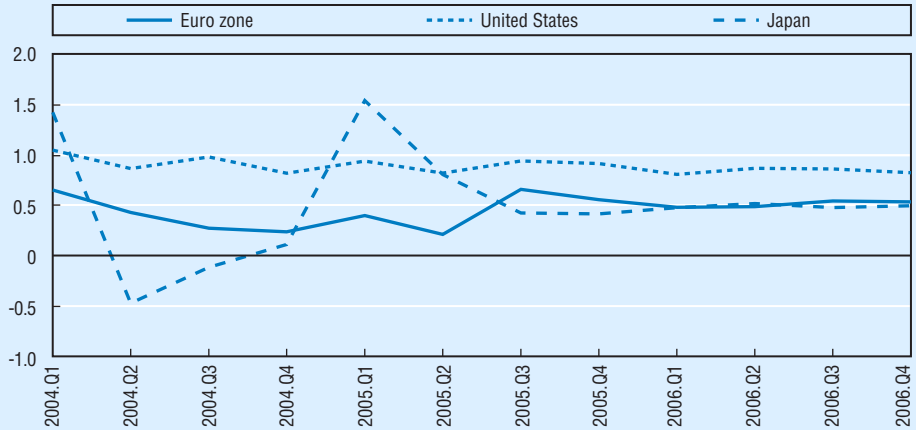
Figure1. **Quarterly real GDP growth rate: USA, Japan, Euro area**



Source: OECD (2006), *Economic Outlook,* December No. 78 – Volume 2005 Issue 2, OECD, Paris.

has been facilitated by low long-term interest rates, euro depreciation and buoyant export markets, although final domestic demand is still growing below trend."

Quarterly accounts are much used by forecasters, whether in the Finance Ministry helping in the preparation of the government budget or in public or private research institutions such as those connected to the large banks. Thanks to the quarterly accounts, these economists are in a position to update their forecasts for the coming year as quarterly information becomes available for the current year. ▶ I. In France, the quarterly accounts are also used in connection with the six-month forecasts made by INSEE's Short-Term Economic Forecasts Department. These are presented in the regular publications entitled *Conjoncture in France*, which contain numerous quarterly figures accompanied by comments regarding average year-on-year changes or statistical carryover (see Box 1 "Annualisation and various growth indicators"). The French INSEE is in fact one of the few statistical institutes that has been given the authority to make forecasts.

I. A good forecast is, above all, one that is based on the most recent past figures.

Specific features of the quarterly accounts

In certain countries such as the United States or the United Kingdom, the user of the national accounts sees no real difference between the annual accounts and the quarterly accounts. These are countries where the national accounts were developed *simultaneously* on a quarterly and on an annual basis from the start. In France and certain other countries, the quarterly accounts were developed much later than the annual accounts (in the mid-1970s for

II. This does not apply to the accounts published in the United States, which are annualised, and thus multiplied by 4 (see Box 1 "Annualisation and various growth indicators").

France, as compared with 1950 for the US and the UK). It is in fact only recently that the teams of INSEE accountants involved have been attached to the same department. This means that the user could think there were two separate sets of publications.

However, there is *strictly* no difference between the quarterly accounts and the annual accounts as regards the basic principles and the definitions of the variables. The difference is merely that the size of the flows shown in the quarterly accounts are roughly one quarter of those shown in the annual accounts (as is logical, given that one calendar quarter accounts for only three months out of 12). ▶ **II.** Conversely, the annual flows are equal (in theory, as we will see later) to the sum of the flows for the four quarters.

Box 1. **Annualisation and various growth indicators**

The most important use made of the national accounts is to forecast the following year in order to provide the macroeconomic framework for the government budget. The prime aim is to evaluate the volume growth in GDP for the following year, on an "annual average" basis. This expression signifies that one is trying to evaluate the variation between GDP in calendar year Y and GDP in year Y + 1, *i.e.* (Y + 1)/Y. The information given in the quarterly accounts generally shows quarterly changes, *i.e.,*(Q + 1)/Q. The further one moves into the year, the more information there is on recent quarters thanks to the quarterly accounts, and the closer one comes to the prime aim of forecasting annual average growth.

Certain national accountants (Canada, Japan, Mexico, United States) usually express quarterly figures "at annual level", meaning that quarterly levels are multiplied by four. They also express quarterly changes "at annualised rate", which amounts to raising them to the power of 4. The advantage of this method is to place the quarterly growth rate on a slope that uses the same measurement framework as for the annual data. This practice has not however been generalised to the other countries. This practice is indeed not without problems as it is based on the assumption that the observed changes for the quarter are going to continue, which is by no means certain. Thus some short-term analysts prefer to use "year-on-year changes" and/or "the statistical carryover" in order to give indications regarding the annual growth rate. Year-on-year changes consist of calculating the change for the current period (quarter, in this case) since the corresponding period of the previous year (Q/Q-4). The "statistical carryover" consists of calculating an annual average for the current calendar year on the assumption that the remaining quarters are at the same level as the last known quarter. The further one moves into the year, the closer the statistical carryover comes to the future annual average, the two becoming equal when the fourth quarter is known. Exercise 1 at the end of this chapter provides an opportunity to work with these notions. One of the indispensable conclusions to be drawn is that one should be careful to avoid the trap of comparing an American growth figure (raised to the power of 4) with a French or European figure that is not. To make valid comparisons, either one takes the fourth root of the American growth or one raises the European figure to the power of 4.

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The aim of the quarterly accounts is to provide at the earliest possible moment reliable figures for the changes in the major macroeconomic aggregates. Thus, the quarterly accounts are simplified compared with the annual accounts and are presented slightly differently. In France, for example, quarterly accounts are calculated using a classification consisting of 41 items, and the accounts made available to the users are based on a 16-item classification. The detailed analyses of structural changes in the economy are left to the annual accounts, which are calculated for a 472-item classification and published for a 116-item classification. On the same lines, the detail of the transactions in the accounts for institutional sectors is not as great in the quarterly accounts as in the annual accounts. This enables INSEE to reduce the workload entailed by the more frequent calculation of quarterly accounts which are calculated three times for each quarter, as shown in the following table. This frequency of calculation is made possible by highly effective estimation procedures using rapidly available indicators (see "Sources and methods for the French quarterly accounts" and "Resources of national accounts departments").

Table 1. **France calendar for the publication of the accounts for quarter Q**

2006*

Q + 42 days	Q + 50 days	Q + 90 days
Preliminary estimate: GDP in volume only	First results: Revised GDP + goods and services accounts + certain elements of the income approach of GDP.	Detailed results: Revised GDP + revised goods and services accounts + fairly complete accounts for institutional sectors

* This calendar reflects the situation as of May 2006. It is not carved in stone: France has recently announced that it may suppress the Q + 42 and the Q + 50 publications to replace them by a new Q + 45 publication containing the same data as the current Q + 50 publication.

The "preliminary estimate" of the change in French GDP in volume in quarter Q is published 42 days[1] after the end of the quarter concerned. For the time being, no other figures are provided at this time, since INSEE considers that subsequent revisions would be too substantial. This GDP figure is then revised at Q + 50 days, at the time of the publication of the "first results", and is then accompanied by a complete set of goods and services accounts and certain elements regarding profits and the total wage bill. The next revision takes place at Q + 90 days in the form of "detailed results", this time including fairly complete accounts for institutional sectors. As a result, figures are published quarterly for the household saving ratio or the corporate profit ratio at Q + 90 days. A similar calendar applies for other countries (see Table 2). For completeness, mention should also be made of the existence in some countries of a monthly series of national accounts. In France, it is limited to "household expenditure on consumption of manufactured goods". This monthly national accounts series makes it possible to know, roughly 23 days after the end of the month, the change in consumption expenditure – limited to manufactured goods, admittedly. However, since

changes in total consumption are closely linked to consumption of manufactured goods, this indicator is useful for the short-term analysts.

Despite the fact that the definitions of the variables are the same in the two sets of accounts, it turns out in practice that the sums of the four quarters from the quarterly accounts are not equal to the corresponding annual figures, because the French quarterly accounts are "working-day adjusted" (wda). To be more precise, the French quarterly national accounts are now calculated "wda-sa" meaning that they are adjusted both for the number of working days and for seasonal variations.[2] In statisticians' terminology and in this context, "wda" and "sa" are in opposition to the unadjusted figures. The **working-day adjustment** consists of calculating the quarterly accounts as if each quarter contained the same number of working days. This means that changes in GDP are not affected by differences in the numbers of working days in each quarter. The adjustment gives a better indication of the actual ongoing tendency in the economy and leads to smoother quarterly variations than shown in the unadjusted figures. Many countries make this adjustment (see Table 2).

The difficulty created in some countries (France, Italy and Germany) by the working-day adjustment is that the sum of the four quarters no longer equals *by definition* the unadjusted figures for the year because there are often differences in the number of working days between one year and the next, partly because of leap years, but it is not the most important factor. More important, for example, is the fact that public holidays fall on week-ends in some years, but on working days in other. The difference can be quite significant, as in the case of the year 2004 compared with 2003 (see Box 2). Does this not suggest that all national accounts, including annual accounts, should be calculated after adjustment for the number of working days? Economists are divided on this point because, while adjusted data is more useful to analyse the trend, some major economic aggregates are unadjusted. For example, the government budget that is voted by Parliament is unadjusted (*i.e.* is not working-day-adjusted). The best solution would be to have a choice between the two, as is given in the case of France where there are two sets of accounts: one (wda) consisting of the quarterly accounts and one (unadjusted) for the annual accounts. In order to obtain the annual accounts on a wda basis, one merely has to add up the four quarters from the quarterly accounts; to have the unadjusted annual figures, all that is needed is to take the figures in the annual accounts. In some other countries, such as the US, wda is conducted for quarters but the data are then benchmarked to the unadjusted annual figures, or the annual data are obtained by the sum of the quarters so that, at the end, there is no difference between the sum of the four quarters and the annual figure.

The other calendar adjustment of the quarterly accounts is the **seasonal adjustment**. This consists in eliminating, by means of complex statistical processes based on moving averages, the changes from one quarter to the next that are due simply to seasonal effects. For example, the output of transport services rises systematically and steeply before Christmas and the summer holidays. It is therefore better to eliminate the impact of this seasonal effect in order to know whether holidaymakers actually consumed more or less in

Box 2. **Calendar effects: the years 2003 and 2004**

In France, the years 2003 and 2004 were very special from the point of view of the calendar. The number of working days in 2003, at 252, was in fact slightly below the average of 253. The year 2004 was exceptional with 255 working days, a figure not seen since 1976. The impact of this greater number of working days on the annual change in GDP, everything else remaining equal, is estimated to have been 0.2/0.3 of a percentage point, which is by no means negligible. It is nevertheless smaller than the simple ratio of the numbers of working days: 255/252 = +1.2%. This is because INSEE's estimate of the impact of the number of working days attaches different weights to individual days of the week, especially for the months of July and August, and the "catching-up" that takes place between different months. The estimation method used is econometric. The unadjusted monthly figures are projected on variables representing the different types of days of the week (number of non-worked Mondays, non-worked Tuesdays, etc.) and the number of Sundays.

Table 2. **Some features of quarterly national accounts for selected OECD countries**

	First estimate (Q + 60 means published 60 days after end of quarter)	Second estimate	Third estimate	Working Day Adjustment (in italics countries for which the sum of four quarters do not equal the annual value)	Mean absolute revision of quarterly GDP growth* (in %)
Australia	Q + 60			Yes	0.36
Canada	Q + 60			Yes	0.24
France	Q + 42	Q + 50	Q + 90	*Yes*	0.29
Germany	Q + 44	Q + 54		*Yes*	0.36
Italy	Q + 44	Q + 70		*Yes*	0.20
Japan	Q + 48	Q + 73		Yes	0.69
Korea	Q + 26	Q + 80		Yes	0.97
United Kingdom	Q + 25	Q + 56	Q + 86	Yes	0.18
United States	Q + 30	Q + 60	Q + 90	Yes	0.33

* In terms of quarterly rates (*i.e.* Q/Q-1), absolute rates, first estimate *versus* three years after (see the "Revision Database" on the OECD website). This is different from what appears in the US tables of revision published for the accounts of the United States, in which all quarterly growth rates are systematically "annualised" (see Box 1 "Annualisation and various growth indicators").

the quarter in question than in the previous quarter. Unlike the working-day adjustment, things are so arranged that the sum of the quarterly seasonal adjustments for the year as a whole is zero. In other words, the sum of the quarterly seasonally adjusted figures is equal to the unadjusted figure for the year.

2. The annual national accounts

If all one needs are the major economic aggregates, one needs look no further than the series and publications of the quarterly accounts. However, if one wants detailed results, it is necessary to consult the series and publications of the annual national accounts. In particular, the very important general government account is still, for many OECD countries, available only on an annual basis, as are the financial accounts and the balance sheet accounts. However, there is a sustained effort by OECD countries to expand the number of tables compiled quarterly. It is therefore possible that in the coming years, general government accounts will be available quarterly for most OECD countries.

In France, like in all OECD countries, there are major dates for publications. The main publication for the annual accounts is the report entitled *The French Economy*, published in June and providing indispensable analysis of the recent economic evolution. This publication goes hand-in-hand with the publication on the INSEE website of a set of tables giving details for institutional sectors accounts, external flows of goods and services, gross fixed capital formation by products and institutional sectors, final consumption expenditure and population and employment.

The annual accounts are the backbone of the whole system of national accounts. They are based mainly on four sources: 1) the aggregation of company accounts (in France, INSEE receives and processes each year the accounts of more than 2 million corporations and unincorporated enterprises); 2) the complete accounts of all general government, consisting of central government and the attached agencies, local authorities and all the Social Security bodies (around 120 000 organisations in all in France); 3) the detailed accounts of the financial institutions that are supervised by the central bank (Banque de France) whose statistical directorate is, as in all countries, the main collaborator of the National Statistical Office for production of the national accounts; 4) the balance of payments (generally published by the central bank), which makes it possible to trace relations with the rest of the world.

Much of these data, however, are available only after a certain timelag, generating a specific calendar of compilation and publication. In what follows, Y will refer to the year for which new accounts are calculated. In France, each year, at the end of April in year Y + 1, new annual accounts are published containing new data for year Y (the so-called "provisional" accounts), for year Y – 1 (the so-called "semi-final" accounts) and for year Y – 2 (the so-called "final" accounts). The mechanism used for the annual accounts therefore implies two systematic revisions for each set of published accounts, revisions that obviously, by definition, have an impact on the quarterly accounts. For example, the annual GDP for year Y will be published in April Y + 1 as "provisional", in April Y + 2 as "semi-final" and in April Y + 3 as "final" (as we shall see later, the term "final" is in fact inappropriate). This sequencing is explained mainly by the delays in obtaining data from the principal source mentioned earlier, namely company accounts. Other countries may have some difference in the timing and terminology, but basically the system is similar to that of France.

In France, the "provisional" accounts are mainly the combination of the quarterly accounts for the goods and services accounts *plus* the complete accounts for the general government *plus* the financial accounts. At the time these provisional accounts are published, INSEE has not yet received any company accounts and has to wait until Q4 of year Y + 1 before receiving and processing a first substantial set of corporate accounts (for roughly 400 000 large firms), but still excluding the smallest firms. This information can thus only be processed to be published in April of the next year, on the occasion of the publication of the next year's provisional accounts. Finally, the totality of corporate accounts (for roughly 2 500 000 firms) is received and processed by INSEE only in Q4 of year Y + 2. Table 3 below recapitulates this sequence. In the end, it is necessary to wait two years and five months for national accounts that have "digested" the totality of the available statistical sources used for the national accounts for calendar year Y.

Table 3. **France: Sequencing of the calculation of the annual accounts for year Y**

April Y + 1	April Y + 2	April Y + 3
Provisional accounts Accounts at the F level (41 headings). Complete accounts for institutional sectors. *Source:* quarterly accounts, general government accounts.	**Semi-final accounts** Revised accounts at the G level (116 headings). Complete revised accounts for institutional sectors. *Source:* first version using directly corporate accounts, excluding the smallest firms. Complete revised version of the general government accounts.	**Final accounts** Re-revised accounts at the G level. Complete revised accounts for institutional sectors. *Source:* version fully using the corporate accounts, including the smallest firms.

3. The revisions to the national accounts and their precision

As we have just seen for France (and the situation is similar in other countries), the complete sources for the national accounts are available only in Q4 of year Y + 2. If they had to wait as long as this for this information, short-term macroeconomic analysts would have no use for the national accounts. This explains the complex sequencing of successive quarterly and annual accounts, the aim being to provide the most reliable information possible as rapidly as possible. However, the price paid for this rapidity is the need to revise the initial figures. Some macroeconomists complain about revisions to the national accounts. However, it is not possible to "have one's cake" in the form of reliability and at the same time "eat it" in the form of rapidity. Nor should one be fooled: the countries that performed little or no revision were the Soviet bloc countries, where statisticians, for political reasons, were forbidden to make revisions. This did not mean

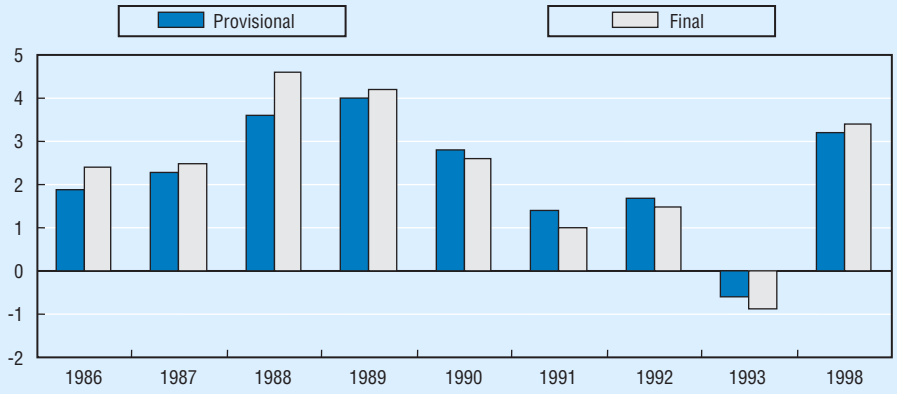
that the national accounts were reliable – quite the contrary. On the other hand, major revisions are obviously not a good thing. The professionalism of national accountants is judged by their capacity to combine a high degree of reliability with satisfactory rapidity.

When does a figure for quarterly GDP growth become "final"? The somewhat surprising answer is "never". As an illustration, this is the sequence of events that in France covers the repeated revision of the quarterly GDP change: 1) first publication at Q *plus* 42 days; 2) first revision at the time of the "first results" at Q + 50 (the source of the revision being the availability of figures for the final month of the quarter); 3) second revision at the time of the "detailed results" at Q + 90 (source: availability of new indicators); 4) minor revisions due to changes in the seasonal adjustment coefficients[3] occur at the time of publication for the following quarters; 5) major revision in April in the following year due to benchmarking on the semi-final annual accounts; 6) significant revision in April in the following year due to the benchmarking on final annual accounts; 7) later still, possible minor revisions due to changes in the seasonal adjustment coefficients, etc.

Clearly, the most significant revisions are the first two, followed in April of the following year at the time of the benchmarking of the unadjusted quarterly accounts on the annual accounts. The other revisions are very small. Even so, the user of the national accounts, if he or she wants to be really up-to-date, must study each publication to find the whole new series and not be content with adding the latest figure to an already existing series. Today, thanks to computer processing and the Internet, downloading an entire series costs no more than downloading the last figure, so no one need complain about this state of affairs. French policy regarding revision is an extreme case. Some other countries make revisions less systematically.

Numerous studies have addressed the question of the scale and sign of the revisions. In France, it is thought that the average revision of the GDP growth rate in volume for a given quarter (*i.e.,* Q/(Q-1)) is 0.3% in absolute value. In other words, there is a 90% chance that the revision in the quarterly growth rate (after a few years have passed) is between + 0.6% and – 0.6% compared with the initial published figure. This range is comparable to that for the American quarterly accounts (see Table 2). Some other OECD countries make slightly larger revisions, on average. As regards the annual accounts, the following chart illustrates a sequence of revisions between the provisional accounts and the final accounts for France. On average, over this period the average revision amounted to 0.4% (in absolute value). As can be seen, there are no earth-shaking revisions, but on occasion the annual revision has amounted to as much as 1.0% (for example, in 1988, a year of strong recovery), which is quite significant. Some observers have seen signs that the initial figures in the national accounts are understated in years of recovery and overstated in years of recession, because the sources used in the first estimates exclude small businesses that are more affected by the business cycle than large businesses.

Figure 2. **France: Comparisons of estimates of annual growth for the "provisional" and "final" accounts**



Source: INSEE.

The various revisions to the GDP *growth rate* listed above show that the national accounts cannot claim to be absolutely precise. It would in fact be by no means wrong to conclude from the previous paragraphs that the initial estimates of the quarterly GDP growth rate for France should probably be presented in the form of a range of ±0.5% of the estimated figure (and even greater amplitude for the other detailed items in the accounts, especially GFCF). American quarterly accounts are indeed presented with an accompanying note presenting this type of range for the main aggregates. ▶ **III.**

It would be good to know the precision attached to the *level* of GDP. Unfortunately, there is no way of knowing this. While it is fully possible to calculate scientifically the precision of an extrapolation of a random sample survey to the total population, it is impossible to do so for the national accounts, whose sources are a blend of surveys and comprehensive databases that are then the subject of "arbitration". ▶ **IV.** vis-à-vis many other sources. Another consideration is that, as we saw in Chapter 4, the national accounts attempt to take into account the "underground economy", but the calculations to do this are inevitably tainted with substantial error. In the end, the "real" level of GDP could well differ from the published figure by several percentage points, although probably less than 5% in France. Just as there is no need to react to all the exagerated accusations levelled at statisticians, it is equally necessary to recognise the limitations of the national accounts, and in

III. As explained in a previous footnote, US quarterly growth rates are systematically annualized in US publications (see Box 1 "Annualisation and various growth indicators"), so the range of deviation published in the US quarterly accounts may (wrongly) appear much larger than for France or other countries.

IV. "Arbitration" is a key word in the machinery of annual national accounts. In France, there are two ways of estimating GDP: the approach based on output and final uses and the income-based approach. It is therefore necessary to "arbitrate" (... see next page)

IV. (...) between the two resulting values. This is an operation that INSEE is trying to make increasingly scientific. Some countries, like the United States, do not perform arbitration, and there are therefore officially two GDPs and a statistical adjustment reconciling the two.

particular, recognise that changes are better known than absolute levels. Thus, as was explained in Chapter 3, international comparisons based on the levels (of GDP or other variables) are to be treated more cautiously than comparisons between variations in national aggregates. Moreover, in all countries, preference is given to changes over levels when there is a choice in the matter. This means that, if an error is discovered in a figure in the national accounts, but for technical reasons it is not possible to correct all the past series, national accountants will not correct this last point, since it would introduce bias into the changes. Instead, they will maintain the error in absolute level until the following comprehensive revision in order to preserve the changes. National accountants in France give this approach the somewhat bizarre title of "constant error computation".

4. Comprehensive revisions

In addition to the revisions described above, which might be qualified as ordinary, national accountants from time to time make "comprehensive revisions", also called "base changes" or "benchmark years", and these involve much more substantial overhauls of the system. In France, INSEE has recently decided to carry out base changes every five years. The last took place in 2005, and the next will be in 2010 (see Box 3 "France: Latest and future base changes".). A base change involves four distinct operations: 1) the absolute levels for the year known as the "base year" are re-estimated using statistical sources that are not available every year (population or economic census, housing surveys, etc.) and corrected for past errors; 2) changes of a definitional nature are introduced in conformity with the evolution of the international standards for national accounts; 3) the reference year for chained prices is modified; 4) all past data are re-estimated using past changes, corrected as needed for benchmarking on the new level of the base year. The latter operation, known as "retropolation" or "back-calculation", is quite costly in terms of resources.

A base change therefore leads to fairly generalised modification of all the series, often accompanied by changes in classifications. The macroeconomists using these series need a certain amount of time to update their databases and re-estimate their models. The principal difficulty from their point of view is that statistical offices do not always immediately provide the long time-series, because of the difficulty of "retropolation".

5. Other datasets related to the national accounts

For reasons of space, we can only describe in this manual the central national accounts framework. However, numerous other datasets gravitate around this framework and use broadly the same definitions as the national accounts, while at the same time adjusting them

Box 3. **France: Latest and future base changes**

In France, the latest base change (the so-called "base 2000") was introduced in May 2005. The main conceptual change was the allocation of imputed banking services (FISIM), which raised the level of GDP by roughly 1%. In addition to this "conceptual" rise, there were also modifications in absolute levels related to numerous upward or downward revisions affecting the base year, one of which was an upward revision in GFCF in the form of software. All the volume series are presented on the 2000 base year (instead of on the 1995 base in the preceding base). The next base change (base 2005) will take place in 2010 and will take into account the new international statistical classification (ISIC 4). It will probably not be before the base change in 2015 (base 2010) that the French accounts will apply the recommendations of the new SNA manual published in 2008. Significant changes should then be introduced, such as the recording of R&D and military hardware spending as GFCF.

for their own special purposes. They are known as "satellite accounts". Below is a listing of satellite accounts existing in France, including the agencies that compile them:

- Regional accounts, or GDP by region. Most OECD countries calculate regional accounts. In Europe, these accounts are used by the European Commission as the basis for the allocation of structural funds; in Canada, they are used to allocate VAT.
- Housing accounts – data published by the statistical service of the Ministry of Equipment and Housing.
- Health accounts – statistical service of the Health Ministry.
- Social welfare accounts – statistical service of the Health Ministry.
- National defence accounts – statistical service of the Defence Ministry.
- Education accounts – statistical service of the Education Ministry.
- Research accounts – statistical service of the Research Ministry.
- Environment accounts – IFEN (French Institute for the Environment).

These accounts are not necessarily available every year. In countries other than France, the range of satellite accounts differs from country to country. Most countries compile health, tourism and environment satellite accounts. Some researchers (such as in the US) publish a household satellite account, which includes an estimate for unpaid domestic services produced by household members.

Notes

1. This figure is an order of magnitude. The exact number of days depends on weekends and holidays. The same is true for the other publication dates.
2. In the methodology used for the French quarterly accounts (see "The sources and methods used for the French quarterly accounts"), it is the indicators that are adjusted, first for the number of working days and then for seasonal variations. The calibration (see a definition of this term later in the same box) is then applied to each type of indicator: unadjusted, sa, wda-sa. There are thus three sets of quarterly accounts: the unadjusted accounts; the seasonally adjusted accounts; and the wda-sa accounts. The quarterly calibration residuals are the same in the three cases. The wda-sa accounts are the ones appearing in the principal publication and subjected to comment. The unadjusted figures are available on request.
3. The "seasonal adjustment coefficients" are the coefficients applied to the unadjusted quarterly series to eliminate seasonal variations. In the methodology used for the French quarterly accounts, these coefficients are re-estimated every quarter, leading to slight revisions, even affecting quarters going back as far as the 1970s, although to an almost imperceptible degree.

Key points

- The quarterly national accounts constitute the most important source of data for macroeconomists.
- Most OECD countries publish quarterly growth as the simple growth ratio based on Q/Q – 1. Some countries, however, "annualise" this figure. The OECD often uses annualised figures. Another indicator of growth is the year-on-year change which is the variation between the current quarter and the corresponding quarter of the previous year (Q/Q – 4).
- Most quarterly accounts are seasonally adjusted ("sa"); in addition, some are "working-day adjusted", or wda. In this case, the sum of the four quarters may not equal the corresponding annual account.
- The national accounts are the subject of regular revision. It is therefore necessary to use the whole of the newly published series and not be content with the latest published figure.
- In France, revisions to the growth rates in the national accounts average around 0.3% in absolute value for the quarterly accounts (Q/Q – 1) and 0.5% for the annual accounts (Y/Y – 1). The scale of revisions in other countries is slightly different.

Going further

Sources and methods used for the French quarterly accounts

In all countries, the full wealth of annual statistical data is not available on a quarterly basis. For example, there is no substantial quarterly database for company accounts, which are on an annual basis and often are one of the principal sources for the annual accounts. Instead, the quarterly accounts use monthly or quarterly "indicators" whose annual changes are similar to the change of the corresponding figures in the national accounts. For example, France's INSEE publishes monthly production indices, derived from small-scale surveys of a sample of firms. The quarterly accountants use the changes in this indicator to deduce movements in the figures for the quarterly accounts, basing themselves on the pre-existing structure of the annual accounts (*i.e.* the quarterly accounts are not themselves capable of providing levels, so they rely for this purpose on the annual accounts).

Many countries use indicators in a simple way: they simply use the change of the indicator to extrapolate the quarterly account. In France, and in some other OECD countries, a more sophisticated statistical method has been developed for using indicators to derive quarterly accounts. This is known as "benchmarking" or also "calibration/fitting" ("étalonnage/calage" in French). Calibration consists of estimating an econometric model that relates the annual value of the indicator to the annual series in the national accounts. Once the coefficients of this model have been estimated, the assumption is made that the same coefficients (divided by four) can be applied on a quarterly basis and this provides the basis for the calculation of the so-called "non-fitted" quarterly accounts. The annual sum of these quarterly accounts is not equal to the annual account, since there is no reason why the annual residuals estimated by the econometric method should be zero. Thus, there is an additional step to the calculation, known as "fitting", which consists of interpolating the sum of the annual residuals in a relatively "smooth" manner (one talks of "quarterly smoothing") in order to obtain a series of quarterly residuals which, combined with the non-fitted series, produce a quarterly so-called "fitted" series. These are equal by definition to the annual accounts series (ignoring at this stage the adjustment for the number of working days). Exercise 3 gives a simplified example of calibration/fitting. Because of the sophistication of the method used for the French quarterly accounts, some people consider that the quarterly accounts are more in the nature of an economic model. Fortunately, this is not true. If this were indeed the case, there would be confusion between statistical calculations and modelling. There are in fact no "behavioural" relationships in the calculation of the French quarterly accounts. The calibration/fitting relationship is purely statistical, linking two time series that are intended to measure roughly the same thing.

In France, the principal indicators for the quarterly accounts are as follows: for output, the industrial production indices and the sales indices derived from processing VAT declarations; for consumption, a variety of sources derived from panels of distributors (business surveys by the Banque de France) or from administrative data (for example, new

vehicle registrations in the case of car consumption); for exports and imports, the sources are the same as for the annual accounts, and since customs figures are available monthly the calibration is of excellent quality; investment (GFCF) is estimated either from sales sources or from indicators of availability on the domestic market (output + imports – exports). In France, contrary to some other countries that have better surveys, there is no direct source for variations in inventories and they are estimated as a balancing item in the supply-use balance. The price indicators are the major price indices compiled by INSEE (consumer price indices or producer price indices), which are available either monthly or quarterly. In this case, too, the sources are the same as for the annual accounts and calibration is therefore almost perfect.

Values added for institutional sectors are obtained by difference between output and intermediate consumption. Wages and salaries in the market sector are estimated using statistics of hours worked combined with hourly wage rates. Recently, the French quarterly accountants have introduced a direct quarterly indicator of the wage bill paid by general government. Taxes, social contributions and social benefits are for the most part available on a quarterly basis. The gross operating surplus is obtained as the difference between resources and uses, and not from a direct survey of profits, as in some other countries. Relations with the rest of the world are obtained through the balance of payments, which is available monthly. For certain items, no quarterly indicator is available. In this case, quarterly interpolation within the annual series is carried out by an automatic method known as quarterly smoothing; therefore, the quarterly accounts do not provide any real information regarding the within-year pattern of the series.

The French system of quarterly national accounts covers all the input/output tables and institutional sector accounts (see Chapter 10), even if they are simplified compared to the annual accounts. The three approaches of GDP (expenditure, production, income) are thus present (even if they are not estimated independently from each other). Some other countries, such as the US, do not cover all approaches. For example, the production approach is not yet available quarterly in the US national accounts.

Box 4. **Resources of national accounts departments**

Good statistics are the result of a complex process which needs appropriate human resources. For example, INSEE, the French statistical office, employs 6 300 staff. National accounts departments constitute only a very small part of this: only 126 are directly employed to process the national accounts in France. In Japan, the staff for national accounts is even less: 47. This is explained by the fact that national accountants do not directly organize surveys and/or other basic statistics, which are resource-costly. They use statistical or administrative data that are already processed by other statistical units and transform these data into the definitions of the national accounts. Thus, in fact, the total cost for processing national accounts is much more than the cost of the staff directly devoted to its compilation.Still, when compared to the resources devoted to company accounts, those devoted to national accounts appear low. Some may consider that it is already sufficiently costly for statistics. Others consider that, in the context of the increasing importance of national accounts, in particular for the monitoring of public finance, the resources directly devoted to national accounts remain insufficient.

Exercises

Exercise 1: Quarterly *versus* annual results

Answer

Calculate the annual averages for years A and B of the series for quarterly GDP in volume as shown in the following table. Make a graph for the quarters, including points for the annual averages. Illustrate the difference between the change in the annual averages and the within-year economic situations.

AQ1	600.00
AQ2	420.00
AQ3	300.00
AQ4	150.00
BQ1	180.00
BQ2	250.00
BQ3	380.00
BQ4	450.00

Exercise 2: Annualisation, year-on-year changes, statistical carryover

The table below shows the quarterly series for French GDP in volume for the years 2001, 2002 and 2003. *Question 1:* calculate the annual GDP for the years 2001 and 2002. *Question 2:* show the quarterly absolute levels in 2001 "at annual level". *Question 3:* calculate the 2001 annual average on the basis of these figures and find the GDP for 2001. *Question 4:* calculate the annual average change between 2001 and 2002. *Question 5:* calculate the quarterly change between Q3 2003 and Q2 2003. *Question 6:* Express this change at "annualised rate". *Question 7:* calculate the year-on-year change for Q3 2003. *Question 8:* calculate the statistical carryover in Q3 2003. Comment on all these results.

Table 4. **GDP at constant 1995 prices**

	2001	2002	2003
Q1	345.75	348.61	350.91
Q2	345.78	350.94	349.68
Q3	347.22	351.70	350.98
Q4	346.22	350.73	

Answer

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Exercise 3: Calibration/fitting: the French method for calculating the quarterly accounts

This exercise consists of breaking down the stages of the "calibration/fitting" method used for the French quarterly accounts and described in the section "The sources and methods used for the French quarterly accounts". Note that the statistical methods used in this exercise are ultra simplified compared with the methods used by INSEE or other countries that also use this type of methods, but the exercise at least makes it possible to understand the underlying principles.

The tables below show a series for the quarterly indicator (QI) and the corresponding annual item in the national accounts (AA). *Stage 1:* calculate annual averages AI for the indicator series. *Stage 2:* draw a graph showing the point cloud for the abscissa AI and the ordinate AA. Verify that the straight line regression equation AA = a*AI + b is an acceptable approximation. *Stage 3:* estimate, by the least squares method, the parameters a and b for the model AA = a*Ai + b. *Stage 4:* calculate the non fitted quarterly series (QA) by applying the same model to the quarterly absolute figure QA = (a/4).*QI + b/4 and calculate the annual residuals. *Stage 5:* deduce from this the quarterly residuals (by simply dividing by 4). *Stage 6:* calculate the calibrated/fitted QA series. This constitutes the final quarterly accounts series.

Table 5. **Quarterly indicator QI (over five years)**

	Y1	Y2	Y3	Y4	Y5
Q1	105.2	103.9	111.5	117.6	116.3
Q2	106.7	105.9	117.2	118.1	115.8
Q3	104.3	107.8	117.3	119.1	114.2
Q4	104.2	109.6	117.5	117.4	112.0

Table 6. **Annual accounts series AA (over same five years)**

Y1	Y2	Y3	Y4	Y5
6 658.1	6 813.2	7 435.4	7 455.9	7 302.4

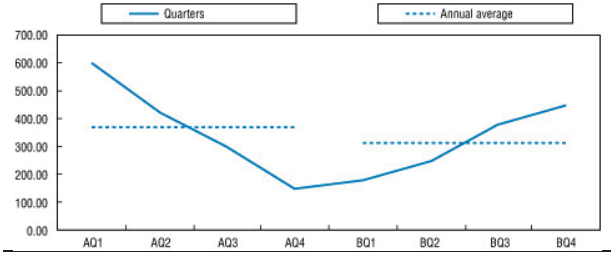
Answer

Answer to exercise 1. Quarterly *versus* annual results

To download the answers in Excel, please click the StatLink: http://dx.doi.org/10.1787/784028020420.

The average for year A Is 367.5; the average for year B is 315.0. The requested graph is shown below. It will be seen that although the annual average for the second year is lower than for the first, the within-year situation in the second year is good (upswing), whereas that of the first year is bad (recession). The picture thus given by the annual averages is misleading, and quarterly accounts are essential to show that an upswing has started in the beginning of year B.

Figure 11. :



Answer to exercise 2. Annualisation, year-on-year changes, statistical carryover

To download the answers in Excel, please click the StatLink: http://dx.doi.org/10.1787/131258702172.

Question 1:

The annual GDP for 2001 and 2002 is obtained by summing the four quarters. This is because an annual flow is equal to the sum of the component flows (ignoring the complications discussed in the text regarding working-day adjustments).

	2001	2002	2003
Q1	345.75	348.61	350.91
Q2	345.78	350.94	349.68
Q3	347.22	351.70	350.98
Q4	346.22	350.73	
Annual GDP = sum of the four GDP quarters	1 384.97	1 401.98	

Question 2:

Presentation of the quarterly flows for 2001 at "annual level": each flow is multiplied by 4 in order to give, for each quarter, a value paramount to an annual value.

	2001
Q1	1 383.00
Q2	1 383.12
Q3	1 388.88
Q4	1 384.88

Question 3:

In the presentation at "annual level", the annual GDP no longer equals the sum of the quarters, but it is equal to the mean of the quarters, *i.e.,* the sum divided by 4.

	2001
Q1	1 383.00
Q2	1 383.12
Q3	1 388.88
Q4	1 384.88
Annual GDP = mean of the four GDP quarters	1 384.97

Question 4:

In answering Question 1, the annual GDPs for 2001 and 2002 were calculated. The annual change (or the annual average change) is calculated by taking the ratio 1 401.98/1 384.97. This gives a growth rate of 1.23%.

Questions 5 and 6: the quarterly change between Q2 2003 and Q3 2003 is obtained similarly from the ratio 350.98/349.68 = 1.0037, giving an increase of 0.37%. The presentation at annual rate (or "annualisation") consists of raising this ratio to the power of 4, *i.e.*, $(1.0037)^4 = 1.015$, a growth rate of 1.5%. One may simply multiply the growth rate by 4: 0.37 x 4 = 1.48, but this is an approximation.

Question 7: the year-on-year rise in Q3 2003 is equal to the change between Q3 2002 and Q3 2003, also described as "Q/Q-4". In other words, one compares the current quarter with the corresponding quarter of the previous year. This gives: 350.98/351.70 = 0.998, a decline of 0.2%.

Question 8: the statistical carryover for growth in Q3 2003 is obtained by comparing an annual average for 2003 (calculated with the final quarter equal to the third quarter), and the average for 2002. First, calculate this fictitious annual average for 2003 (the missing quarter to be estimated is shown in italics).

Answer to exercise 3. Calibration/fitting: the French method for calculating the quarterly accounts

To download the answers in Excel, please click the StatLink: http://dx.doi.org/10.1787/215303011077.

Stage 1:

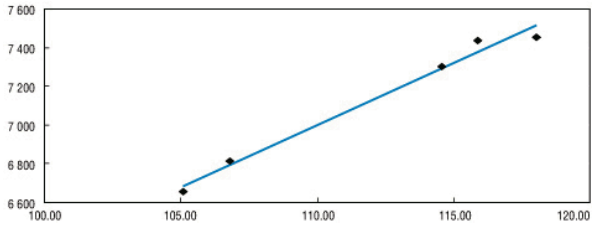
the annual average is calculated for each indicator.

	Y1	Y2	Y3	Y4	Y5
Q1	105.2	103.9	111.5	117.6	116.3
Q2	106.7	105.9	117.2	118.1	115.8
Q3	104.3	107.8	117.3	119.1	114.2
Q4	104.2	109.6	117.5	117.4	112.0
AI annual average	*105.1*	*106.8*	*115.9*	*118.1*	*114.6*

Stage 2:

a graph is made with the five points of abscissa AI and ordinate AA. One can verify that it is possible to imagine a straight-line regression linking AA and AI of the type AA = a*AI + b.

Figure 11. :



Stage 3:

use the ordinary least squares method to estimate the parameters of this regression line (we have used Excel's LINEST formula):

This gives: a = 63.98, b = – 38 (your results may be slightly different, owing to rounding).

Stage 4: the non-fitted quarterly series are calculated by applying the formula QA = (a/4) QI + b/4. This gives the table below. Annual residuals are obtained as the difference between AA and the annual sums of QAs:

	Y1	Y2	Y3	Y4	Y5
Q1	1 673.2	1 652.4	1 774.0	1 871.6	1 850.8
Q2	1 697.2	1 684.4	1 865.2	1 879.6	1 842.8
Q3	1 658.8	1 714.8	1 866.8	1 895.6	1 817.2
Q4	1 657.2	1 743.6	1 870.0	1 868.4	1 782.0
Annual sum	6 686.4	6 795.2	7 376.0	7 515.2	7 292.8
Annual residual	–28.3	18.0	59.4	–59.3	9.6

Stage 5:

calculate the quarterly residuals by dividing the annual residuals by 4 (note that it is clearly possible to find a better method of distributing these residuals: a frequently used method is based on minimising the difference of the squares of the residuals, under the constraint of equality with the annual sum).

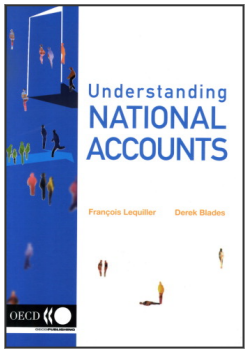
	Y1	Y2	Y3	Y4	Y5
Q1	−7.1	4.5	14.8	−14.8	2.4
Q2	−7.1	4.5	14.8	−14.8	2.4
Q3	−7.1	4.5	14.8	−14.8	2.4
Q4	−7.1	4.5	14.8	−14.8	2.4

Stage 6:

the final quarterly accounts series are calculated by summing the non-fitted series obtained in stage 4 and the quarterly residuals obtained in stage 5:

	Y1	Y2	Y3	Y4	Y5
Q1	1 666.1	1 656.9	1 788.9	1 856.8	1 853.2
Q2	1 690.1	1 688.9	1 880.0	1 864.8	1 845.2
Q3	1 651.7	1 719.3	1 881.6	1 880.8	1 819.6
Q4	1 650.1	1 748.1	1 884.8	1 853.6	1 784.4

By definition, the annual sums of these series are now equal to the annual figures (with slight differences due to rounding).



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