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BALANCING QUARTERLY GDP ESTIMATES

Note by the OECD Secretariat

INTRODUCTION

1.   If GDP is estimated by more than one approach, for example the production and the expenditure approaches, and these approaches are used simultaneously but independently, discrepancies between the results of the various methods are unavoidable. Opinions differ on the extent to which this is a problem. Some see merit in having alternative GDP estimates (to some extent size and development of the discrepancies indicates the accuracy and reliability of the approaches); others see this as confusing to users, for example, if discrepancies are larger than growth rates percentage wise, or if they growing through time. Thus, national accounts compilers have to make decisions about the extent to which discrepancies should be removed by balancing the different approaches to GDP.

2.   Obviously, this is a question that applies both to annual and quarterly accounts, but although many of the principles of annual balancing will also apply to quarterly balancing, there are a number of issues that are specific to the quarterly procedures:

- Frameworks will be simplified – e.g. less detailed input-output or sector accounts. This simplification is a function both of the reduced data sets available quarterly, and the need to compile estimates more quickly;

- Quarterly balancing can be done for both seasonally adjusted, and unadjusted, data;

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- Quarterly data will need to be aligned with annual data once the latter become available. This realignment (benchmarking) will often necessitate re-balancing.

3.   This paper gives an indication of the quarterly balancing practices used in some OECD countries, with the UK as a case study in Annex 1. It is interesting to note the extent to which countries either do not have independent approaches to estimating GDP in the first place (one or more components are derived as residuals), or, if they do, how many countries publish discrepancies between the different estimates. Eurostat strongly recommends producing fully balanced estimates, although for many countries this must be seen as an ideal which may be unattainable in the medium-term. A summary of Eurostat's recommendations is given in this paper, to give an idea of what many countries are aiming towards.

FULLY RECONCILED ESTIMATES VS. DISCREPANCIES?

4.   In contrast to the Eurostat view, the IMF paper (1997) on quarterly discrepancies suggests that no consensus exists on how to deal with discrepancies or, more generally, with conflicting data. The paper explains that many Europeans countries share a tradition of balancing on a detailed level, strongly supported by the practice of compiling annual supply and use or input/output tables. Several countries continue publishing discrepancies. One reason for this may be that it can be difficult to convince users that balancing does not provide an easy route towards corruption (political manipulation) of the original data. Balancing is extremely complex and it takes a lot of work to convince users of the expertise and integrity of the statisticians involved.

5.   It is also argued that many balancing procedures are too simplistic and do not take the relative accuracy of the estimates into account, and even if relative accuracy is considered, it is quantified in a subjective way. In fact, balancing as a whole relies on a high degree of subjective judgement, and many users feel uncomfortable with this. It must be stressed that the expertise of the national accountants is the most important element of the balancing process, and that, combined with other techniques such as supply and use analysis, it is a totally legitimate factor.

6.   Some users may prefer to see discrepancies explicitly published, as they view them as an indication of the reliability of the data. However, it is certainly the case that small discrepancies do not necessarily mean strong estimates – the various approached may be biased in the same direction, and this is quite likely in cases where the same source data are used for several approaches (e.g. the same government finance statistics are often used in the alternative approaches).

THE BASIC APPROACHES TO BALANCING

7.   One way of avoiding discrepancies is to balance data at a detailed level **before** the macro-aggregates are derived, using supply/use and commodity flow techniques where adjustment decisions are based on judgements about the relative accuracy of conflicting the supply/use data. In many senses this is the ideal approach to quarterly GDP compilation, but of course it is very expensive in terms of data requirements and staff/computing resources. A few countries (e.g. Norway, the Netherlands) have implemented quarterly supply/use systems, and many others make extensive use of commodity flow models in their balancing process.

8.   This powerful technique should not be confused with the use of commodity flow methods to derive estimates for variables for which no source data are available, i.e. when unobserved variables are derived as residuals and discrepancies are avoided. The use of this residual technique cannot be considered as GDP estimation from independent approaches.

9.   If the macro-aggregates are not derived through a process of detailed supply/use balancing (balancing from the bottom-up), then discrepancies will be detected only after the macro-aggregates have been derived, at which point they can be removed, to a lesser or greater extent as required. Discrepancies can be completely removed by putting all the discrepancy into only one component, e.g. changes in inventories. If the discrepancies are large, however, this is almost equivalent to deriving the component as a residual.

10.   Discrepancies can also be removed or reduced by a more comprehensive system of balancing and reconciliation. Such a system usually involves several iterative steps for reconciling the estimates at the aggregate level, both with each other and with their components (top down), and for balancing (and re-balancing) the components and feeding these adjustments back up to the aggregates (bottom up). On a quarterly basis, most countries use a combination of manual balancing techniques, plus automatic allocation and alignment tools (see the UK example in Annex 1). It is worth noting that, although some countries publish statistical discrepancies, they will still have put a lot of effort into balancing the estimates as far as possible, i.e. reducing the discrepancies.

11.   Quarterly GDP data are always subject to revisions, due to a variety of causes, such as updated source data, updated seasonal factors, alignment (benchmarking) with annual estimates, subsequent revision of annual estimates, etc. All these revisions will necessitate re-balancing to some extent, and it is worth repeating that this can best be done through a supply/use framework.

PRACTICES IN OECD MEMBER COUNTRIES

12.   The table from the OECD publication *Quarterly National Accounts: Sources and Methods by OECD Member Countries (1996)*, shows that 18 OECD countries compile quarterly GDP from two or three approaches:

- Eight countries publish GDP estimates from the expenditure, production and income sides;

- Eight use the production and expenditure approaches;

- Two use the expenditure and income approaches;

- All OECD members publish quarterly GDP from the expenditure side.

13.   Data on changes in inventories and operating surplus are often derived as a residual; in eight cases, changes in inventories are derived as the residual, and in five cases, operating surplus. In four cases both changes in inventories and operating surplus are derived as a residual; this shows that many OECD countries rely mainly on the production method to estimate GDP.

14.   Five countries – the USA, U.K., Canada, Australia and New Zealand – show discrepancies between quarterly GDP estimates from the different approaches. The other OECD countries have only one independent quarterly estimate, usually from the production approach. The main reason why these

other countries do not have discrepancies is that components of the other approach or approaches are derived as a residual. Another reason may be that data are balanced on a detailed level, as is the case in Sweden and Denmark. For some countries, such as Norway and the Netherlands, both reasons apply, because they use detailed balancing with a supply/use table and derive changes in inventories as a residual. Japan publishes both expenditure and income estimates but not simultaneously (expenditure data are published shortly after each quarter, but income data only after the annual data have become available.)

Table 1.

Scope and Coverage of Quarterly National Accounts: OECD Country Practices

	Production	**Expenditure**	**Income**	**Discrepancies**
Canada	X	X	X	Published
United States		X	X	Published
Japan		X	X	non existent
Australia	X	X	X	Published
New Zealand	X	X		Published
Austria	X	$X^{(1)}$		non-existent
Denmark	X	X	$X^{(2)}$	averted
Finland	X	$X^{(1)}$	$X^{(2)}$	non-existent
France	X	$X^{(1)}$	$X^{(2)}$	non-existent
Germany	X	$X^{(1)}$	$X^{(2)}$	non-existent
Italy	X	$X^{(1)}$		non-existent
Netherlands	X	$X^{(1)}$		non-existent
Norway	X	$X^{(1)}$	$X^{(2)}$	non-existent
Spain	X	$X^{(1)}$		non-existent
Sweden	X	X		averted
Switzerland	$X^{(3)}$	$X^{(1)}$		non-existent
Turkey	X	X		averted
U.K.	X	X	X	$averted^{(4)}$

(1)   Changes in inventories are mainly derived as a residual
(2)   Operating surplus is mainly derived as a residual
(3)   A production approach is used to estimate GDP but with no breakdown by kind of activity
(4)   Except in the most recent few quarters

EUROSTAT RECOMMENDATIONS

15.   The Eurostat view on quarterly balancing is fully described in Eurostat's *Handbook on Quarterly National Accounts* (1999), where the key principles of balancing are given[1] as:

- There should be a single, definitive estimate of GDP, i.e. no discrepancies;
- Full balancing should be undertaken so that there are no discrepancies between total GDP and the components;
- Adjustments may be made to any of the components, not just one or two;

- All of the following series should be balanced : seasonally adjusted and unadjusted series, in current and constant prices.

16. Eurostat then makes the following general recommendations:

- Balancing should be done using a supply/use or input-output framework. It may also be possible to use the structure of the institutional sector accounts, incorporating information on financial transactions;
- Measurement bias in GDP source data should be removed before balancing;
- Balancing should not be concerned solely with level data – account should be taken of growth rates and the time series nature of the variables;
- Adjustments should not be restricted to the national accounts variables – price data and seasonal factors should also be adjusted;
- Adjustments should be made based on the estimated accuracy of the component data, and should not generally fall outside the estimated error range;
- Balanced quarterly data should be reconciled (benchmarked) with balanced annual data;
- Although balancing may rely to a large extent on the expertise of the compilers, balancing procedures should be transparent and documented, and staff responsibilities clearly established with national accounts compilers playing a key role (as opposed to economists in other departments or ministries);
- Balancing will have implications for revisions policies, and should be explicitly recognised;
- The need for, and nature of, balancing should be clearly explained to all users.

FURTHER INFORMATION

The following sources contain detailed information on balancing techniques, and were also used as sources for this paper:

Handbook on Quarterly National Accounts (1999) – Eurostat.

Handbook on Quarterly National Accounts Compilation (**Draft**) – IMF.

Quarterly National Accounts – Sources and Methods Used by OECD Member Countries – 1996.

IMF Working Paper *Discrepancies Between Quarterly GDP Estimates* – Adriaan M. Bloem et al. September 1997 (WP/97/123).

Quarterly integrated economic accounts – the UK approach – Economic Trends, March 1997 – UK Office for National Statistics (ONS).

Commodity flow analysis in quarterly balancing of GDP – Economic Trends, January 2001 – UK ONS.

ANNEX 1

RECONCILIATION IN THE U.K.

1.   In the UK the accounts are balanced both on an annual and quarterly basis, although different methods are used for each, and the quarterly process depends on the results of annual balancing. The ONS believes that input-output tables provide a coherent definitive measure of the annual level of current price GDP, whereas quarterly growth in output is regarded as yielding the best short-term measure of changes in GDP and is thus given high weight in the quarterly reconciliation process.

2.   Whereas the aim of balancing the three measures of annual GDP is principally to reconcile levels, quarterly balancing is more concerned with aligning estimates of growth. This is because users of U.K. quarterly GDP data are more interested in changes than levels. Less formal methods are used in quarterly reconciliation than in the annual exercise mainly because the large volume of data necessary for input-output balancing is not available on time.

3.   There is also a lag between the production of annual GDP estimates and input-output tables and input-output data are therefore not available for balancing the most recent year's estimates. For example, if $200 = t$, then annual GDP estimates are published for 1999 (t-1) in August but are not reconciled using input-output; estimates prior to this (t-2, 3...) are fully reconciled. So, statistical discrepancies will appear in periods when data for input-output reconciliation are not available, that is, for annual GDP at t-1, quarterly GDP during t-1 and t. Annual GDP at t-1 is partially reconciled using estimates of current price value added, compiled using output data. So, for example, at August 2000 the position would be:

	1996	1997	1998 (t-2)	1999 (t-1)	2000 (t)
Annual GDP					
Input-output reconciliation	✔	✔	✔	n.a.	n.a.
Statistical discrepancy	zero	zero	zero	✔	✔
Quarterly GDP					
Statistical discrepancy	zero	zero	zero	✔	✔
Annual constraint	✔	✔	✔	✔	n.a.

(n.a. = not available)

4.   The lag in fully reconciled annual GDP is important because the quarterly balancing process is constrained by annual estimates.   The underlying principle of the quarterly balancing process is that similar quarterly movements for each of the three measures should be agreed upon, but that where annual estimates for GDP are known but not fully reconciled, the quarterly balancing process must not alter these agreed estimates. Obviously, for quarters in the current year, annual totals will not be known, but the effect of the future constraint is borne in mind.

5.   The quarterly balancing process [2] concentrates on constant price estimates, which are automatically available for output and expenditure measures, but constant price income must be derived by deflation of current price income by implied expenditure deflators. Once the constant price estimates have been balanced, current price estimates of expenditure and income components can be derived by reflation using the implied expenditure deflator.

6.   The output measure is considered to provide the best estimate of quarter-to quarter volume movements in GDP, owning to the absence of highly volatile components such as changes in inventories and company profits. Also, output components are available earlier and tend to be revised less than other measures.

7.   The balancing process consists of three stages:

- Scrutiny – The scrutiny of initial estimates tests the plausibility of the movements in individual series and the consistency across the accounts. Additional information from non-government surveys and sources is used. Supply-side analysis is used to validate expenditure at product level.

- Judgmental adjustments – After the scrutiny stage large discrepancies may still exist. A quarterly movement in aggregate GDP is agreed upon by discussions, giving a high weight to the movement in the output aggregate. Judgmental adjustments may be made to component data at this stage in line with the agreed to aggregate movement.   These adjustments are made to a variety of components, within their error ranges.

- Alignment adjustments – It is highly unlikely that, after judgmental adjustments to component series, the movements in aggregate expenditure and income will match that of output. The final balancing step therefore involves the mechanical calculation of alignment adjustments to alter the quarterly paths of income and expenditure so that they match, as closely as possible, the movements in output **without altering annual totals** (annual totals are known in year t-1 but not in year t). The adjustments are made to changes in inventories (expenditures) and company profits (income), because these components are believed to have the widest error margins.

8.   It is the alignment stage that will differ according to whether it is quarters in year t-2, t-1, or t that are being reconciled:

- t-2   After input-output data are available for year t-2, a single annual GDP estimate will exist and the quarterly movements for income and expenditure measures will automatically become the same as each other.

- t-1   Annual estimates of GDP(I) and GDP (E) will exist but will be different as a result of incomplete reconciliation. The quarterly movements (paths) of income and expenditure will have the same "shape" as the path for GDP (O) but will arrive at their respective annual totals at the end of the year.

- t   The quarterly paths of all three measures will be similar, but the end-points will be uncertain, although annual figures may be anticipated.

9.   Thus, the process results in similar movements for the three measures, which are then applied to earlier levels to produce aligned totals for income and expenditure.   The level for aggregate GDP is calculated as the average of aligned income and aligned expenditure. The difference between aligned income and average GDP is know as the statistical discrepancy (income) and is similar for expenditure. The income and expenditure discrepancies are shown explicitly in the income and expenditure analysis (the discrepancy is implicit in the output analysis).

10.   Current price GDP is derived by reflating the aligned income and expenditure levels by the expenditure deflator.

NOTES

[1] Chapter 11 – The Balancing of Quarterly Accounts, p. 240.

[2] Office for National Statistics, "Quarterly integrated economic accounts – the UK approach", *Economic Trends* (March 1997).