Office for National Statistics

Balancing the Three Approaches to Measuring Gross Domestic Product, 2012

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Abstract

This article summarises the balancing of the income, expenditure and production approaches to the measurement of gross domestic product (GDP), on both annual and quarterly bases. It also explains the terms alignment adjustment and statistical discrepancy.

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Introduction

GDP is the primary indicator of economic activity and, as defined by the United Nations System of National Accounts 1993 (SNA93) and the European System of Accounts 1995 (ESA95), can be estimated in three ways, which are theoretically equal. However, as the data collected and processed by ONS are based on a variety of statistical surveys and administrative data, the three estimates can be different. In order to produce a definitive estimate of quarterly or annual GDP, balancing processes are followed and these are described in this article.

The three approaches to measuring GDP

According to ESA95, there are three approaches to the measurement of GDP. These are described in more detail in Lee (2011), ‘UK National Accounts – a short guide’, but in summary are as follows:

The production approach

The production approach to GDP, known as GDP(P), is the sum of all production activity within an economy. In the form of an equation, this is described by:

- GDP(P) = output – intermediate consumption + taxes on products – subsidies on products

Output is all the goods and services produced, whilst intermediate consumption comprises all the goods and services consumed or transformed in a production process. The taxes and subsidies are included in order to put all three approaches on a consistent valuation basis.

The expenditure approach

The expenditure approach to GDP, or GDP(E), is the sum of all final expenditures within an economy. In equation form, this is as follows:

- GDP(E) = household final consumption expenditure + final consumption expenditure of non-profit institutions serving households (NPISHs) + general government final consumption expenditure + gross capital formation + exports – imports

Final consumption expenditure is expenditure on goods and services purchased for the last time and not to be consumed or transformed in a production process. Gross capital formation comprises investment in fixed assets, changes in inventories and net acquisition of valuables. Exports and imports relate to trade in goods and services with the rest of the world and do not include other cross-border financial flows

The income approach

The income approach to GDP, or GDP(I) is the sum of all factor incomes within an economy. This could also be described as the sum of incomes directly generated by productive activity. In equation form:

- GDP(I) = compensation of employees + gross operating surplus + mixed income + taxes on production and products – subsidies on production and products

Compensation of employees is all income from employment, including employers' pension and social contributions. Operating surplus is primarily made up of trading profits and rental income, whilst mixed income is the income of the self-employed.

Published GDP estimate

ONS only publishes one, balanced estimate of GDP, taking account of the data from all three approaches to a greater or lesser degree. The next section describes the annual balancing process and the subsequent section describes the quarterly process.

Annual GDP balancing

Annual balancing in current price (nominal) terms is carried out by means of supply and use tables (SUTs). A detailed description of the compilation of supply and use tables in the UK is provided in Mahajan (2006) but a summary is provided here.

The supply and use framework is used to balance supply and demand for products at a detailed level (112 products in the UK). Additionally, data by industry groups (again 112 in the UK) are confronted and balanced to give definitive estimates of GDP for all years covered. It is possible to

compile SUTs on quarterly and annual bases and in both chained volume (real) and current price terms but, in the UK, only current price annual tables are compiled. Due to the large amount of data needed to produce SUTs and the iterative nature of the balancing process, SUTs are usually available approximately 18 months after the end of the latest balanced year (up to and including 2010 in the UK National Accounts Blue Book 2012).

Once the current price annual data are balanced, chained volume estimates of GDP(E) are then produced on an annual basis, using deflation and chain-linking (for more information on chain-linking, please see Lee (2011) and Tuke & Reed (2001) 'The effects of annual chain-linking on the output measure of GDP". No further balancing is required for these annual estimates, as they are based on fully balanced nominal estimates.

For the latest complete year (currently 2011) for which no SUTs exist, the annual balancing is part of the quarterly process described in the next section.

Quarterly GDP balancing

The different data content of the three approaches dictates the approach taken in balancing quarterly data. In the UK, there are far more data available on output than in the other two approaches. (For more information on data content, please see Skipper (2005), 'Early estimates of GDP: information content and forecasting methods'.) The rate of change in output is, for this reason, used to set the rate of change of UK GDP. As more data from all three approaches become available, the estimate will be improved and, potentially revised. For more information on revisions, please see Walker et al (2012).

Supply and use balanced years

As described above, the annual chained volume estimate of GDP is derived from the expenditure data consistent with the balanced nominal data. The assumption used within the output approach that output changes are the same as GDP changes works very well in the short-term, but over time it works less well. This is due to the fact that the relationship between output and intermediate consumption changes over time, due to technological and other changes. Thus the annual estimates from the output approach drift away from those derived from SUTs. To correct for this, the output data are adjusted by means of annual coherence adjustments, by industry, to bring the annual aggregate growth rates into line. Each year in chapter 2 of the Blue Book, ONS describes the size and industrial breakdown of these adjustments for each balanced year. Once these are applied, the resulting quarterly path of GDP is that to which the expenditure and income approaches are balanced, in the same way as for later periods described below.

Post-supply and use balanced years and quarters

For the later periods, there are no balanced supply and use consistent data to set an annual figure for GDP, so this is also led by the output data. It is accepted that there can be some divergence between the output estimates and the unbalanced income and expenditure estimates, so an annual "average" estimate is produced, led by the output approach. The annual difference between the expenditure and income estimates and this headline figure is known as the statistical discrepancy and is published explicitly in the quarterly national accounts and second estimate of GDP statistical

bulletins. Quarterly paths for these discrepancies are then interpolated and the resulting GDP – statistical discrepancy figures are those to which the expenditure and income estimates are aligned. For years where SUTs exist, the statistical discrepancies are zero.

For all periods, the expenditure and income estimates are aligned to the headline GDP figure. Initially, the statisticians responsible for each component will provide their best estimates, but these may be improved by means of quality adjustments, possibly after discussions with data suppliers. At the time when final estimates are produced, although the annuals will be aligned, there will still be quarterly differences, due to timing and data content issues. These are dealt with by means of explicit alignment adjustments which are applied to specific components (gross operating surplus of private non-financial corporations in the income approach and changes in inventories in expenditure) to align the three approaches. As these are purely quarterly discrepancies, the alignments sum to zero over the year and are published explicitly in the GDP statistical bulletins. They are also published as “of which” items within the specific components, to enable users to ascertain the underlying picture.

ONS uses an informal “tolerance” of plus or minus £1,500 million for the quarterly alignment adjustments. Alignment adjustments of larger than this imply that a quarter has been particularly challenging to balance.

Conclusion

The GDP balancing processes can be summarised as follows:

- Annual current price balancing (except in the latest complete year) is through the supply and use framework.
- The quarterly path is led by the output approach.
- The annual differences between the expenditure and income approaches and the headline GDP figure are known as the statistical discrepancies.
- The quarterly expenditure and income data are brought into line with output by means of the alignment adjustments.

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Background notes

1. Details of the policy governing the release of new data are available by visiting www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html or from the Media Relations Office email: media.relations@ons.gsi.gov.uk

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This document is also available on our website at www.ons.gov.uk.

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