Double deflation methods and deflator improvements to UK National Accounts: Blue Book 2021

Methodology for implementing double deflation including the method for an improved telecommunication services deflator.

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1 . Main changes

- Annual volume estimates of gross domestic product (GDP) will be calculated through the supply and use tables framework, enabling us to implement double deflation.

- Improvements to telecommunications services and clothing deflators will be introduced.

2 . Overview

Supply and use tables (SUTs) are used to set the annual current price level of gross domestic product (GDP), linking industry outputs, inputs, and gross value added (GVA). From Blue Book 2021, these annual SUTs will also be used to compile volume estimates of GVA, which in doing so will enable us to implement double deflation for the first time.

Double deflation is widely recognised as the best approach for producing volume estimates of GVA, that is, output minus intermediate consumption. Under double deflation, for every industry, the current price estimate of its output is deflated by a price index for output, and the current price estimate of its inputs is deflated by an input price index (Equation 1).

Equation 1

$$GVA = \frac{P_O Q_O}{P_O} - \frac{P_{IC} Q_{IC}}{P_{IC}}$$

Where P_O and P_{IC} represent output and intermediate consumption prices respectively, Q_{IC} and Q_O represent real intermediate consumption and output. When multiplied by their respective price terms, they represent nominal values.

The application of double deflation within the UK National Accounts will affect industry volume growth rates of GVA for existing SUT-balanced years. This does not simply reflect the removal of single deflation bias but also further improvements, for example, in the measurement of current prices and the balancing of volume estimates at a more detailed level. We are also incorporating improvements to the quality of our telecommunication services and clothing deflators, which explains why there will also be revisions to headline estimates of GDP.

3 . Industry gross value added

Estimating annual volume gross domestic product (GDP) through the extended application of the Supply and Use Tables framework (SUTs) results in changes to our volume GVA industry estimates, which reflects improvements in our use of data sources and methods. The drivers of these improvements can be broadly summarised as:

- Improved current price data: Expanding the SUTs framework to current and volume leads to more coherent estimates of industry-level GVA; industry-level current price estimates from within the SUTs framework are richer than those that historically fed our industry short-term volume estimates, which now reflect a wider range of annual surveys and administrative information.

- Double deflation: Single and double deflation real value added industry estimates differ when prices for inputs rise at a different rate to outputs; double deflation also tends to produce more volatile estimates of gross value added than single deflation, which in part reflects the higher volatility in input prices.

- Reconciliation of volume in the annual SUT framework: Confronting volume estimates of production and expenditure will be taking place at a lower industry and product level; this ensures a holistic approach to data quality to inform the estimates and therefore facilitate a more consistent application of balancing adjustments and improved implied production deflators.

- Quality of deflators: Improvements to the telecommunication services and clothing deflators are incorporated for Blue Book 2021.

Our previous article provides further detail on this new framework.

4 . Deflating transactions

To calculate volume estimates, current price data within the supply and use tables (SUTs) framework are deflated separately using the best available deflator for each transaction by product.

For most transactions (for example, household expenditure), estimates are already available on both a current price and volume basis. For transactions where an existing method is not available the following approach will be adopted from Blue Book 2021.

Domestic output

Market output and output for own final use are deflated using deflators broadly consistent with those in the gross domestic product output approach GDP(O), applied at a detailed product level. Direct volume measures are used for some products such as agriculture (A01), mining and quarrying (B05 and B06), coke and refined petroleum products (C19), electricity (D35.1), land transport services (H49) and air transport services (H51). For non-market output, existing direct volume measures from General Government final consumption expenditure are used.

Intermediate consumption

Intermediate consumption includes the value of goods and services consumed as inputs by a production process (excluding the use of fixed assets), which consists of the use of domestically produced products and imported products.

As intermediate consumption consists of the use of domestically produced products and imported products, weighted domestic and import prices are used for deflation at a detailed product level.

Distributor trading margins

Distributor trading margins (DTMs) play an important role in the transformation from basic to purchasers' prices. At basic prices, the margin made by wholesalers and retailers are captured as separate products. This covers three products:

- wholesale and retail trade of motor vehicles and servicing vehicles

- wholesale trade

- retail trade

At purchasers' prices, this margin is recorded on the product that was actually traded. The role of DTMs is to reallocate this margin from the margin products at basic prices to the products actually traded at purchasers' prices.

The approach we are adopting is a widely used approach, which is to assume volume of margins follows volume of sales.

More specifically, the following "rate of the previous year" formula is used:

$$\text{DTM}_{PYP,t} = \frac{DO_{PYP,t} + IMP_{PYP,t}}{DO_{CP,t-1} + IMP_{CP,t-1}} \times DTM_{CP,t-1}$$

Where t is the year, CP is the current price estimates, PYP is the previous years' price estimates, DO is domestic output and IMP is imports.

The rate of the previous year formula is applied, by product, using supply side data, with each of the three margin types processed separately.

Taxes and subsidies

The "rate of the previous year" formula is similarly used to calculate the volume of taxes and subsidies. This can be represented as:

$$TAX_{PYP,t} = \frac{DO_{PYP,t} + IMP_{PYP,t} + DTM_{PYP,t}}{DO_{CP,t-1} + IMP_{CP,t-1} + DTM_{CP,t-1}} \times TAX_{CP,t-1}$$

Where DO represents domestic output, IMP represents imports and DTM represents distributors trading margins (DTM).

Balancing volume estimates of GDP

A sequential approach is followed; complete the compilation process at current prices (data collection, adjusting the data and balancing). After this task has been accomplished, the tables are deflated and, finally, volume estimates are balanced.

When balancing, we consider the reliability of the data as well as the plausibility of the assumptions that have been made, and the relationship between the current price and volume estimates. Adjustments can be carried out on the supply and on use of a product, trade and transport margins, and also on current price, volume or price indices. This process can take several iterations as the compilation process at current prices is revisited following assurance of the volume estimates.

5 . Deflators improvements

In Blue Book 2021, we will also incorporate some of the initial findings of our wider development programme to improve the quality of our deflators in the national accounts.

Telecommunication Services deflator

Historically, we constructed the [Telecommunication Services deflator (PDF, 802.3KB)](#) as a weighted combination of the Consumer Price Index (CPI) for Telecommunication Services and Equipment, and the Services Producer Price Index (SPPI) for Telecommunication Services. The CPI was included to represent business to consumer transactions, while the SPPI covered business to business transactions; the weighted combination of the two represented all transactions. The [coverage of the SPPIs has since been expanded](#) to represent business-to-all transactions, which now allows the removal of the CPI component from the deflator for Telecommunication Services used in the UK National Accounts.

The historical telecommunication services SPPI does not capture elements, such as mobile data services. In addition, it includes fixed line access ([line rental fee](#)) charges as separate items. Access charges are usually implicitly included in the price that consumers pay for the telecommunication services and are not explicitly visible. Therefore, users do not base their purchasing decision on the cost of these access charges but rather on their call, text and data allowances, alongside the speed of the service.

Improvements to the Telecommunication Services Deflator

Broadband and mobile data have been added to the historical SPPI. These are calculated as granular unit value indices (ratio of revenues to quantity in minutes of voice calls, number of SMS sent, terabytes of data consumed for a homogeneous group of products) and aggregated using revenue weights. The use of unit values is well established.

Access charges are also now proportionately redistributed to the fixed line services provided based on the share of total revenue that each service generates. These charges are usually included in the price for the whole service and therefore are no longer treated as a separate product. This also helps eliminate the problem encountered in the previous SPPI, which uses the number of fixed-line subscribers as a proxy for the volume associated with the use of access charges.
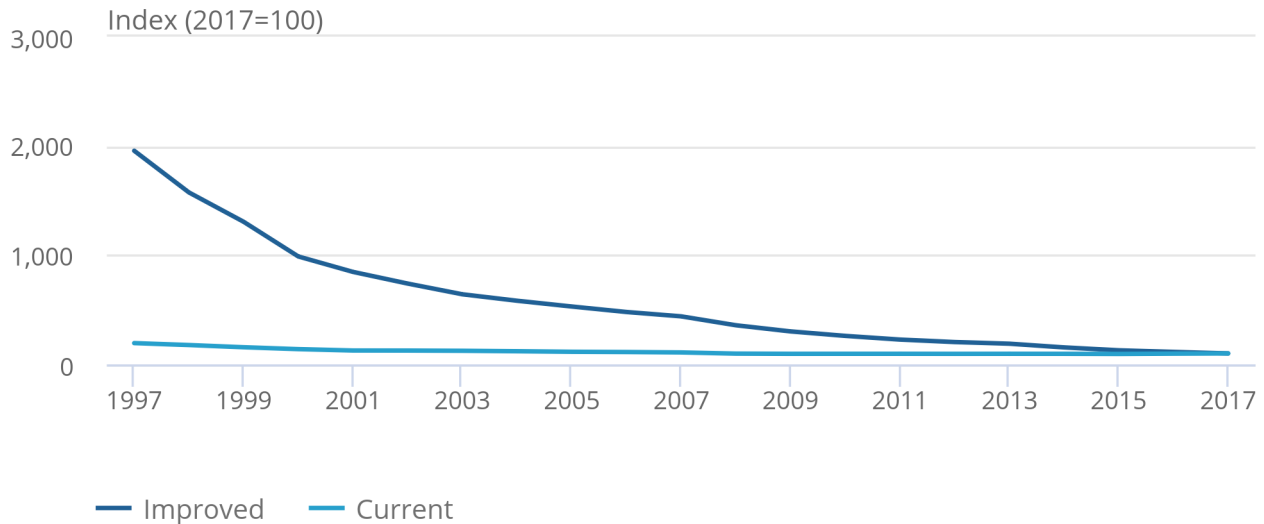
Our approach for telecommunication services is described in further detail as [option A.1 in Telecoms Deflators: A Story of Volume and Revenue Weights](#).

Figure 1: The improved telecommunication services deflator has a stronger price decline over the last 20 years

Current and improved telecommunication services deflator, 1997 to 2017

Figure 1: The improved telecommunication services deflator has a stronger price decline over the last 20 years

Current and improved telecommunication services deflator, 1997 to 2017

Index (2017=100)

3,000	
2,000	
1,000	
0	

1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017

— Improved — Current

Source: Office for National Statistics

Improvements to the clothing deflator

We will implement improvements to the clothing deflator used in the UK National Accounts prior to 2010. In 2010, changes to the methodology used to collect prices in the consumer price inflation family of indices were made. As is common with consumer price inflation methodological changes, the back series was not revised.

The back series for this deflator will be aligned with the methodological improvements that have been made in the consumer price inflation family from 2010 onwards. This reflects better the changes in clothing prices within the calculation of volume estimates of household final consumption expenditure and the retail sales index.

Current and improved clothing deflator, 1997 to 2017

Figure 2: The improved clothing deflator differs to the current series prior to 2010

Current and improved clothing deflator, 1997 to 2017

Index (2017=100)

— Improved — Current
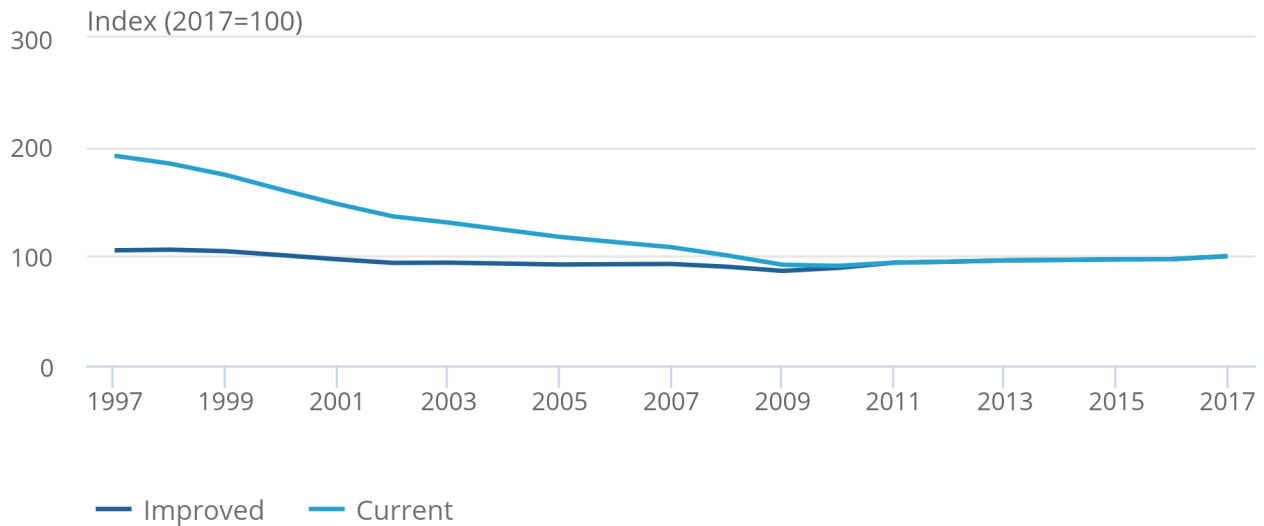
Source: Office for National Statistics

6 . Related links

UK National Accounts, The Blue Book: 2020
Compendium | Released 30 October 2020
National accounts statistics including national and sector accounts, industrial analyses and environmental accounts.

Producing an alternative approach to GDP using experimental double deflation estimates
Article | Released 2 November 2020
Research on the production of an alternative estimate of gross domestic product under a new framework, including experimental estimates of double-deflated industry-level gross value added. This is an economic review article.