The Unit Value Method in price indices – agreeing principles for the use of this method

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Unit Value Indices are a simple price index method which measure simply the average price per unit (unit price) of a good or service without further quality adjustment. The UK's approach to deflation in the National Accounts relies on the Eurostat Prices and Volume Handbook which ranks different methods for deflation using A, B & C rating[1]. In general, this guidance discounts unit value approaches as unsuitable C method for heterogenous products. This is for sound methodological reasons in relation to heterogeneous goods where more advanced methods to control for quality change are required. However, there are goods where UVIs would be appropriate driven by the homogeneity of the product, and for these types of products the unit value method can be seen as an acceptable B method.

This paper sets out principles to define the characteristics of goods where UVIs would be an appropriate method for consideration, as part of routine assessments to select the best method on a product-by-product basis. A trade in goods case study is used to illustrate a situation where an A method price index had to be swapped to a B method UVI. We ask NSCASE to recommend ONS to adopt the use of UVIs in the compilation of national accounts deflators based on the principles set out in section 2.

1. Issue synopsis

Deflators affecting the production side of the Supply-Use table are generally drawn from producer price indices (PPIs), including the import (IPI) and export (EPI) price indices. These price indices are produced by the ONS Business Prices team.

This data, alongside other data sources is then used by the Deflators Teams to supply the various compilation teams. This process is governed by the Eurostat Prices and Volumes Handbook, which balances statistical and international consistency pressures in delivering an assessment of different methods, by product, into A (preferred), B (tolerable) and C (unacceptable) methods. In general, for political rather than purely methodological reasons, UVIs are classified in all cases as B (for homogenous products) or C (for heterogenous products) methods. Further information on the international guidance can be found in the next section.

In practice using the preferred A method for every product in the Supply-Use framework can be challenging due to data availability and resource constraints. Therefore, B methods are used in the compilation of UK national accounts when A methods cannot be realised. The use of UVI for homogenous products would mean that ONS would extend its use of B methods in the deflation process. However, as the trade deflator case study later this paper highlights, in some instances using a B method deflator can lead to a more reasonable outcome than using an A method deflator, and for this reason UVIs could be seen as the preferred choice in some instances which would contradict the Price and Volume handbook guidance. From a methods perspective UVIs for heterogeneous products should remain a C method. More detailed information on the proposed UVI method can be found in appendix 1.

[1] A (preferred method), B (tolerable method) and C (unacceptable method)

2. Recommended Principles

Price and Volume Handbook (P&V)

The Price and Volume Handbook (p.27- 29) discusses the differences between unit value indices and price indices. The manual notes that UVIs often appear in the context of trade statistics and that the three main issues in their use are: the heterogeneity of products, the fact that UVIs cannot be quality adjusted the same way traditional price indices can and questions around the stability of the composition of products. The separate section on deflating trade in goods data in the Price and Volume Handbook (p.54-58) mentions the following things on the use of UVIs:

- The coverage of UVIs is often complete, but they often fail to capture changes in the product mix (quality change is not accurately captured).
- Products that may appear to be homogenous based on the classification may not be homogenous in practice.
- It may be possible to construct more homogenous UVIs if the country of origin is known for the product.
- UVIs could be used to adjust relevant PPIs to create trade deflators. This method could reduce the short comings of UVI method.
- Producing price indices can be resource intensive, so to strike a balance between the benefits of using price indices and the availability of UVIs, the existing UVIs could be explored first.
- UVI method can be considered as a B method[2] for sufficiently homogenous goods. Volatility of the goods[3] should be used to determine if they are suitable for the UVI method.

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System of National Accounts manual chapter 15 (p.295-323) mentions the following:

- UVIs cannot be expected to provide accurate measure for price changes for non-homogenous goods.
- Many countries use UVIs in the absence of suitable price indices, and sometimes a hybrid approach is taken where a combination of UVIs and survey-based price indices are used.
- The use of UVIs as deflators should be treated with caution due to the potential UVI bias which is caused by the change in the product mix.
- The two deflator related recommendations are:
    - In general, but not always, it is best to derive volume estimates by deflating the current value with an appropriate price index, rather than constructing the volume estimates directly. It is therefore very important to have a comprehensive suite of price indices available.
    - The price indices used as deflators should match the values being deflated as closely as possible in terms of scope, valuation, and timing.

[2] According to the Price and Volume Handbook, A method is the most appropriate method, B method should be used when A method is not available and C method should not be used.

[3] Volatility in this context measures how stable the underlying product mix used to for the UVI calculation is. For UVI index to be of a good quality, the product mix should remain stable over time.

The following principles are to be used to identify products for which the UVI method could be considered as the preferred method for deflation. They have been developed in the context of UK data and the stated ONS strategy[1] of improving the quality and consistency of deflators being used across UK economic statistics.

These principles are:

1. UVIs should not be used for heterogenous products in any circumstance. This method should only be used on products that are objectively homogenous. That is, the product, by definition, is subject to an externally set and regulated regime which sets clear (and tight) benchmark values for key characteristics or production standards which leave little room for product heterogeneity to be introduced over time. This includes examples such as E5 Petrol, E10 petrol, crude oil, gases, coal, basic metals, and liquids used for pharmaceutical, medicinal, or industrial purposes – such as purity grades of oxygen[2].

2. Data sources used for calculating UVIs align with the data used to derive current price estimates to ensure that conceptually the UVI deflators are a good match.

3. Data for the UVI calculations are sourced from a reliable source and the sample size for the data used for the UVI calculation is sufficient to ensure that the deflator is representative of the product.

4. The period of reporting is the same for the UVI as it is for the index itself.

5. Best international practice is (a) not feasible within reasonable cost; and/or (b) the UVI method is clearly superior in terms of coverage, reliability, and relevance of measurement to the existing price index used as a deflator.

6. The UVI method should only be applied to those products/services where producer price indices (PPIs), service producer price indices (SPPIs), import price indices (IPIs) and export price indices (EPIs) could be applied. Therefore, transactions that should be deflated using CPIs are outside of the scope of UVI method.

3. Trade deflator case study

The unit price method is already in use for some deflators such as the new telecoms deflator, (further information can be found in the appendix 3) and the improved gas deflator. These were implemented before NSCASE was formed.

The deflator associated with natural gas highlights some of the challenges with TiG (Trade in Goods) import deflators that are derived using method that is rated as A in the P&V handbook.

The ONS Trade team identified that using natural gas PPI as an import deflator created a volume series that was not supported by BEIS energy trends data, but volume series generated using the HMRC import deflator improved the volume series significantly and therefore the decision was made to use the HMRC deflator for TiG.

ONS is not the only national statistics institute looking to utilise UVI method to improve their trade deflators. For example, the BLS in the US is currently working on a similar project (further information can be found in appendix 4).

4. Conclusion

The P&V Handbook rates price indices as the preferred A method for deflation in the national accounts and the UVI method is rated as a B method for homogenous products and as a C method for heterogenous products. However, in the case of UK data, a case can be made to for the UVI method to be considered as the preferred method for certain products as highlighted by the natural gas deflator case study. Therefore, the ONS Deflator Development team is proposing a set of principles as set out in section 2, that should be used to assess the suitability of UVIs as the preferred method as part of routine evaluation of national accounts deflator choices. NSCASE should consider advice on whether UVI's are appropriate to use in some cases and what conditions should be set on their use.

Appendix 1

Figure 2: Method Overview

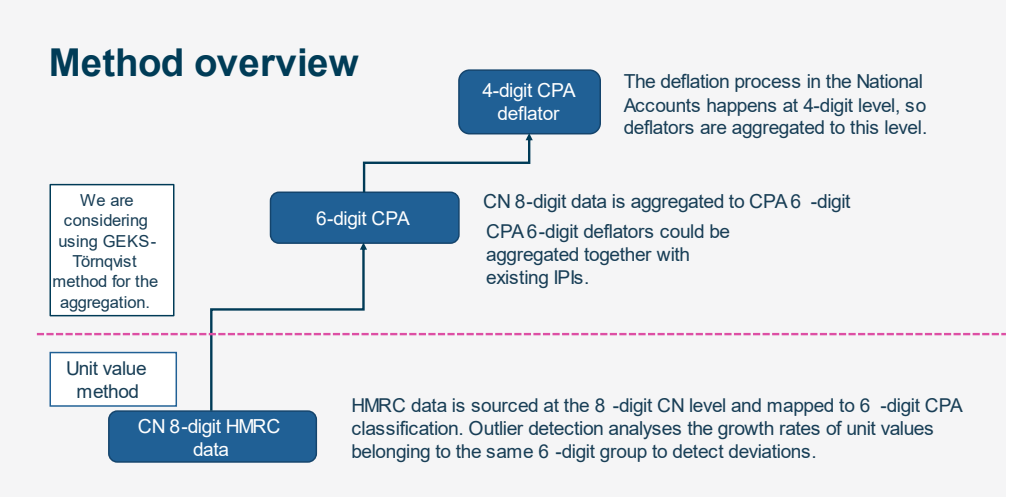
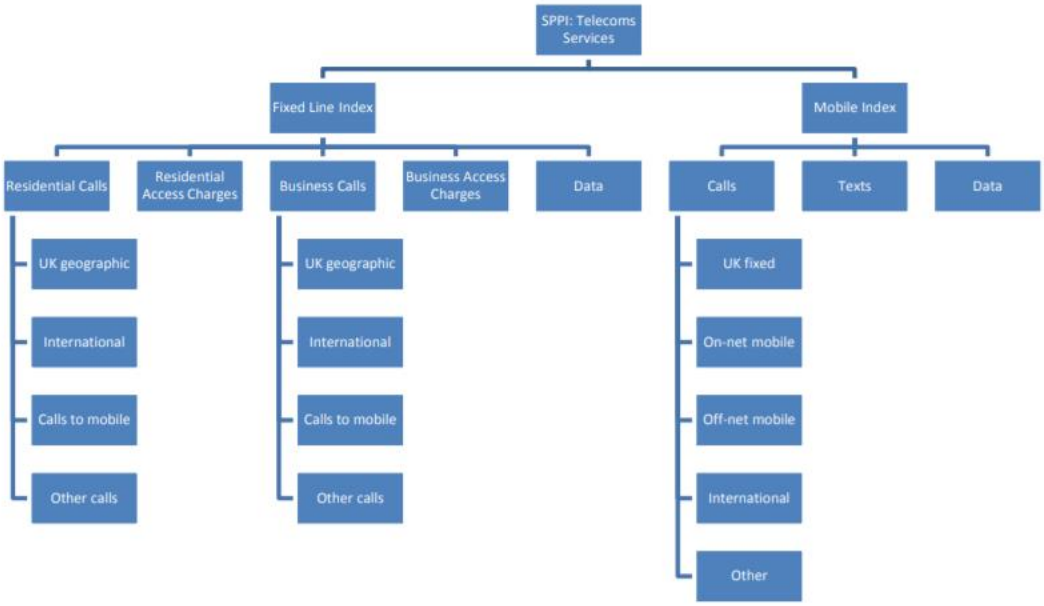


Figure 2 shows a high-level overview of the UVI method. The UVIs are calculated at the granular CN8 level from the HMRC data after which they are aggregated using a more sophisticated index method such as GEKS-T. HMRC records data when goods cross the UK border. The volume data in the HMRC dataset measures mass in kilograms (without packaging) for imports and exports to the UK. It is worth noting that the HMRC dataset is already in use at ONS. It is one of the main data sources used to compile the trade in goods current price estimates and therefore, the UVIs derived from this data are conceptually a good match with current price data as they have the same coverage and timing of transactions.

Future work could also investigate adjusting PPIs for semi-manufactured products with import deflators derived from the HMRC dataset.

Appendix 3

The unit price method is used for the new telecoms deflator. Unit prices are calculated for the lowest level components shown in the figure below. These unit prices are then aggregated up the aggregation tree using turnover weights.



Appendix 4

BLS has conducted research into the use of unit value indices (UVIs) in the compilation of import and export price indices. One of the drivers for this research has been the reduction in the quality of survey-based price indices due to difficulties with survey responses. This research has looked to utilise official administrative data sources to blend UVIs for homogenous products with directly collected data. The US is already using this blended approach for imports of crude petroleum and exports of grain.

The paper lists the following benefits to using UVIs:

- Administrative data sources have a representative coverage and their use removes issues with non-response.
- Use of administrative data could expand the number of detailed indices due to the availability of granular data.

The results show that 27 out of 123 UVIs derived from administrative data were rated “good”, 32 were rated “undecided” and 64 were rated “poor”. In terms of US trade statistics, 27.6% of 2015 goods exports could be deflated using “good” UVIs. If these 27 UVIs were used as deflators between 2012-2017, the top-level US export price index would increase the value of exports of all merchandise goods by 2.6 percentage points at the end of 2017. US is intending on continuing this research to further improve these experimental UVIs.

Full paper:

Fast, Don, Fleck, Susan E. and Smith, Dominic A.. "Unit Value Indexes for Exports – New Developments Using Administrative Trade Data" Journal of Official Statistics, vol.38, no.1, 2022, pp.83-106. https://sciendo.com/article/10.2478/jos-2022-0005