An Phríomh-Oifig Staidrimh
Central Statistics Office

WHOLESALE PRICE INDEX

Introduction of Updated Series
Base year 2015 = 100

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CONTENTS

INTRODUCTION OF UPDATED WPI SERIES TO BASE 2015 AS 100

Index Updating and Rebasing

The EU regulation concerning short-term statistical indicators (STS) of economic activities[1] requires that sectoral weights for the Producer Price Index be updated from 2010 to 2015 by early 2018 in order to reflect changes in the structure of the economy. This article introduces the updated Wholesale Price Index (WPI) to base 2015 as 100. It replaces the former Wholesale Price Index series which was introduced in 2013 to base 2010 as 100.

The WPI was revised in October 2020, and this document includes updates relating to changes made during this revision, as well as documenting changes previously made to the calculation of the electricity index.

The same system of price indices used in the Base 2010 as 100 series is continued, namely:

i. Manufacturing Industries Output Price Index (table 1) which contains the overall Manufacturing Industries Output Price Index as well as breakdown by Home and Export Sales.

together with separate series of:

ii. industrial producer price indices classified by NACE[2] + sector (table 2);

iii. wholesale price indices for building and construction materials (table 3);

iv. wholesale price indices for capital goods (table 4);

v. wholesale price indices for energy products purchased by manufacturing industry (table 5).

Tables 1 and 2 present the rebased Producer Price Indices as required by the STS regulation. Tables 3, 4 and 5 have also been rebased to 2015=100 for consistency.

At each re-base of the WPI two sets of retrospective indices are estimated for the WPI series. These indices are published in the following tables.

[1] COUNCIL REGULATION (EC) No 1165/98 of 19 May 1998 concerning short-term statistics (*Official Journal L 1 62, 05/06/1998)* amended in 2005 by Regulation (EC) no 1158/2005 (*Official Journal L 191/1, 22/07/2005)*.

[2] NACE Rev.2 Statistical classification of economic activities in the European Community.

1. *The backdated data for the official series:*

   The data published in the monthly WPI release up to January 2018 is calculated using this series. It has been rescaled to the 2015 as 100 series thereby maintaining the annual and monthly percentage changes officially published for the period January 2015 to January 2018. This series is available on the CSO databank.

2. *The recalculated series:*

   These series have been calculated from January 2015 to February 2018 using the new weights. They are **not** used as the official backdated series as the percentage changes reported differ from those already officially published for the period prior to February 2018. They are useful, however, as they highlight the effect of the new weights on the series when compared to the official backdated series.

Both series are available in StatBank, the main data dissemination service of the Central Statistics Office (CSO), see http://www.cso.ie/en/databases/.

Rescaling calculation: While the official series previously published for the period January 2015 to January 2018 has been rescaled to the 2015 as 100 series, users may wish to rescale other series to allow comparison with the latest data. To rescale a series, first calculate the mean index $\bar{x}$ in the older series over the 12 months in 2015. The scaling factor is then $\frac{100}{\bar{x}}$. The series can be rescaled by multiplying each index by this rescaling factor.

The Wholesale Price Index is compiled by the CSO and is normally issued through the CSO website within 4 weeks of the month to which it relates.

Definition of the WPI

The industrial producer price index for a sector measures, in index form, changes in prices received by Irish manufacturers for goods fully or partially produced in Ireland and sold to the home and export markets by that sector. The other wholesale price index series incorporate imported and home-produced goods sold by manufacturers and wholesale outlets. All constituent series are compiled using a Laspeyres type index formula at the lowest level. In almost all cases, identical items are priced each month so that changes in the cost of this constant basket reflect price changes only.

Uses of WPI

The indices are used by economists and expert users to evaluate and analyse developing price trends and as an indication of inflationary processes in the overall economy. The indices are used within the CSO for deflation purposes (e.g. deflation of the indices of production by National Accounts). The industrial producer price index (Table 2) is used by Eurostat[3] as a measure of short- and medium-term economic activity of the individual Member States of the EU and of the Union as a whole. The indices are also used in contracts by the building and construction industry as a measure of allowable price

[3] Statistical Office of the European Union.

increases or decreases over the term of these contracts (i.e. elements of a contract price can be linked to the relevant index within the WPI).

Previous WPI Updatings

Since its introduction in 1938 the WPI has been updated several times:

(i) Index with base October 1938 as 100

The monthly General Wholesale Price Index was introduced in the Irish Trade Journal and Statistical Bulletin in June 1946 and was the first official index of wholesale prices compiled for the State. Weights for commodities were based on their exchange value (i.e. sales value) during 1936. Difficulties were experienced in establishing a base period due to abnormal production patterns during the 1939 to 1945 war years. Approximately 1,050 price quotations were used in all. Data was collected for both home-produced and imported goods and indices were classified by 9 commodity groups.

(ii) Index with base 1953 as 100

The second series was introduced in the March 1955 issue of the Irish Trade Journal and Statistical Bulletin. It was compiled for each month beginning with January 1954. The weights were based on 1950 Census of Industrial Production[4], external trade and agricultural output data. Approximately 2,380 price quotations were collected in all and indices were calculated and published for 12 commodity groups. As opposed to the 'exchange' principle previously used, an 'Economic Flow' principle was then adopted in the development of weights and commodity groups. Under this system transactions between members of the same sector were ignored – i.e. only transactions external to the sector were used in the index calculation.

(iii) Index with base 1975 as 100

A major canvassing operation preceded the introduction of the third wholesale price index series which was introduced in the March 1978 issue of the Irish Statistical Bulletin. The number of price quotations had increased to 3,300 and the number of sectors for which indices were published was expanded from 12 to 24. A number of major changes were made to the structure of the index. The NACE 70 classification system was adopted and the main thrust of data collection was now the collection of output prices for Irish Manufacturers. The published data focused more on the 'Output of Manufacturing Industry' as opposed to the General Wholesale Price Index (although this index was retained). New tables for Building and Construction Materials and Capital Goods Price Indices were introduced. Much of the formatting and methodology introduced in this series has been retained up to the current series.

(iv) Index with base 1985 as 100

The fourth series was introduced in September 1989. Weights for industrial producer price indices were based on 1985 Census of Industrial Production[4] figures. Canvassing to improve coverage was again a major feature of the updating programme and at this point in excess of 4,000 price quotations were being collected. The methodology and format of the 1975=100 series were retained. By this time a new table for Energy Products Purchased by Manufacturing Industry had been introduced.

[4] The Census of Industrial Production is a detailed annual survey which records a range of data re the activity of manufacturers in Ireland.

(v) Index with base 1995 as 100

This series was introduced in March 2002 with the publication of the January 2002 index. This series incorporated a number of technical changes as well as an updating of weights, sample of companies surveyed and products priced. The coding for the producer price indices was updated from NACE 70 to NACE Rev.1. The EU Prodcom[5] coding system was introduced for commodity groupings. The weights were updated to 1995 levels from several sources, notably the 1995 Census of Industrial Production, 1995 Prodcom Inquiry and National Accounts data.

(vi) Index with base 2000 as 100

This series was introduced in March 2003 with the publication of the January 2003 index. This series incorporated a number of technical changes as well as an updating of weights, sample of companies surveyed and products priced. The coding for the producer price indices was updated from NACE Rev.1 to NACE Rev.1.1. The weights were updated to 2000 levels from several sources, notably the 2000 Census of Industrial Production, 2000 Prodcom Inquiry and National Accounts data.

(vii) Index with base 2005 as 100

This series was introduced in June 2010 with the publication of the April 2010 index. This series incorporated a number of technical changes as well as an updating of weights, sample of companies surveyed and products priced. The coding for the producer price indices was updated from NACE Rev.1.1 to NACE Rev.2. The weights were updated to 2005 levels from a number of sources, notably the 2005 Census of Industrial Production, 2005 Prodcom Inquiry and National Accounts data.

(viii) Index with base 2010 as 100

This series was introduced in October 2013 with the publication of the September 2013 index. This series incorporated a number of technical changes as well as an updating of weights, sample of companies surveyed and products priced. The weights were updated to 2010 levels from a number of sources, notably the 2010 Census of Industrial Production, 2010 Prodcom Inquiry and National Accounts data.

Monthly Pricing Procedures

Price quotations are collected in a monthly inquiry. The methods of data collection are postal survey, email, phone and the CSO's Secure Deposit Box response system. The updated system is currently based on approximately 7,000 monthly price quotations provided by a panel of some 1,300 respondent firms. The CSO wishes to express appreciation to all respondents for their co-operation. The price quotations relating to individual concerns are treated as strictly confidential and are not divulged in an identifiable form by the CSO to any other Government Department or outside body.

Each month customised survey forms are sent to respondent firms. These incorporate the detailed specifications of the representative selection of products to be priced. Actual transaction prices are sought.

The price sought is the price invoiced to customers for an item on the 15th day of the month (i.e. mid-month):

- excluding delivery charges itemised on the invoice separately;
- before discounts or surcharges are applied (standard discounts or surcharges are to be indicated);
- before the addition of direct subsidies;

[5] Prodcom (Production sold/Commission work done) is an annual survey, published by the CSO, recording the value of output/work done by industrial firms.

- exclusive of VAT (except for private vehicles used in the Capital Goods indices);
- inclusive of excise duties.

Pricing procedures are strictly based on the principle that identical items must be priced by respondents on each occasion (i.e. matched basket approach). If discontinuities occur, such as an item becoming unavailable, respondents are asked to price a suitable replacement product. Generally, the price of a new product is excluded from the index calculations until two consecutive monthly quotations are obtained for the substitute. Where replacement products are excluded from the month's calculations the price trend for all other products in that product group is taken as the price trend for the product excluded. Indirectly, by doing this, a valuation is put on any quality change. This is known as an indirect or implicit method of quality adjustment.

For certain products in sectors that have a high impact on the overall index, an alternative method of quality adjustment is used. In these cases, product specifications from old and new products are compared to estimate the proportion of the price change that is due to differences in quality between the two products. This proportion of the price change is then excluded from the price index calculation, allowing a quality adjusted price change between the new and replacement products to be included in the index.

Index Calculation

The WPI indices are compiled using a variant of the fixed weighted Laspeyres index formula. The Laspeyres Price index is defined as:

$$P_L^{0:t} = \sum w_i^0 \left(\frac{p_i^t}{p_i^0}\right), \qquad \sum w_i^0 = 1$$

At the lowest level of the WPI, the sum Σ is over all products in the lowest level aggregate. The value p_i^t refers to the price of product i at time t, while and p_i^0 is the price of product i in the price reference period. In the 2015 as 100 series, the price reference period is December 2014. The weights w_i^0 are the revenue shares for individual products in the weight reference period. While the objective is the calculation of a Laspeyres index, where the price and weight reference periods are the same, in practice the index takes the form of a Young index (see below). In a Young index, the weight reference period may be different from the price reference period due to time lags in data availability.

Note that the formula above and the other index formulae in this document result in a value between 0 and 1. These values are multiplied by 100 to give an index between 0 and 100 for inclusion in the WPI release.

Elementary Aggregation - Direct and Chain Indices

The Laspeyres formula above is a direct index i.e. it compares prices in the current period to those in the reference period. The direct index calculation requires the same sample to be used during the current and reference period. In practice, products and respondents are dropped from the index over time and new products and respondents introduced. Using a direct index reduces the data available for the index to the subsample which is present in both the current and reference time periods.

An alternative to a direct index is a chain index. In a chain index, each link in the chain is calculated by comparing the prices in the current period to those in the previous period. While sample changes over the full length of the series can be large, only a small number of products or respondents will change between two subsequent time periods. Using a chain index minimises the reduction in usable data due to sample changes.

The chain links are chained together to obtain a long-term index by updating the quantities used to weight the price relatives each month as shown below. In the first month, the chain index calculation is the same as the direct index:

$$P_L^{0:1} = \sum w_i^0 \left(\frac{p_i^1}{p_i^0}\right)$$

For each unit i, the calculation $w_i^0 \left(\frac{p_i^1}{p_i^0}\right)$ gives an "updated value" for i, i.e. its weight in the reference period updated by the price relative $\frac{p_i^1}{p_i^0}$ or the price change between period 1 and period 0. Denoting these updated values as w_i^1, the price index for the second month is calculated as:

$$P_L^{0:2} = \sum w_i^1 \left(\frac{p_i^2}{p_i^1}\right)$$

Again, the updated values $w_i^2 = w_i^1 \left(\frac{p_i^2}{p_i^1}\right)$ are used to weight the price relatives in the subsequent month:

$$P_L^{0:3} = \sum w_i^2 \left(\frac{p_i^3}{p_i^2}\right)$$

And in general, the price index at time t is given by:

$$P_L^{0:t} = \sum w_i^{t-1} \left(\frac{p_i^t}{p_i^{t-1}}\right), \qquad w_i^{t-1} = w_i^{t-2} \left(\frac{p_i^{t-1}}{p_i^{t-2}}\right)$$

Where the sample remains the same, the chain index equals the direct index. For example, at time t=3:

$$P_L^{0:3} = \sum w_i^2 \left(\frac{p_i^3}{p_i^2}\right) = \sum w_i^1 \left(\frac{p_i^2}{p_i^1}\right) \left(\frac{p_i^3}{p_i^2}\right) = \sum w_i^0 \left(\frac{p_i^1}{p_i^0}\right) \left(\frac{p_i^2}{p_i^1}\right) \left(\frac{p_i^3}{p_i^2}\right) = \sum w_i^0 \left(\frac{p_i^t}{p_i^0}\right)$$

Elementary and Higher-Level Aggregates

To compile the WPI indices, first the price indices of the lowest level elementary aggregates are calculated. Then weighted averages of these elementary price indices are used to obtain higher-level indices. The calculations are done in several stages reflecting the hierarchical structure of the WPI.

In practice the method of compilation of the indices means that base period commodity values are progressively updated each month and the price indices are derived by dividing the aggregate current monthly value by the corresponding base period value.

(i) Each elementary aggregate is a product group for a single respondent. Elementary price indices are calculated for these elementary aggregates. The relative proportions of sales of products within a product group are used to weight the products where possible. If this information is not available, the products are assumed to have equal refence period weights. The elementary price index is a chained month-to-month Laspeyres index as described above. Only products which have prices in both the current and previous month are included in the calculation.

(ii) The elementary aggregates are used to calculate price indices at the product group level. A weighted average of the price indices of different respondents within each product group is calculated where the weights are the share of sales recorded by each respondent in that product group. These weights are estimated from responses to CSO surveys. This weighted average calculation is a Young index. The general formula for a Young index is:

$$P_Y^{0:t} = \sum w_i^b I_i^{0:t}, \qquad \sum w_i^b = 1$$

Here, $P_Y^{0:t}$ is the product group index for time t, the sum Σ is over all respondents within a product group, $I_i^{0:t}$ is the elementary price index for respondent i in the product group, and w_i^b is the weight of the respondent in the product group in period b, which typically precedes the reference period 0. In the WPI, a chained Young index is used instead of a direct index, for the same reasons as described above for the Laspeyres index. The chained version of the Young index, which is equivalent to the direct Young index where the sample remains the same, is given by:

$$P_Y^{0:t} = \sum w_i^b I_i^{0:t-1} I_i^{t-1:t}, \qquad \sum w_i^b = 1$$

$I_i^{0:t-1}$ is the elementary price index for respondent i in the product group in the previous period, while $I_i^{t-1:t}$ is the month-on-month index comparing the current to the previous period. This month-on-month index is the ratio of the elementary indices for period t and t - 1.

(iii) A weighted average of month-on-month product group price indices within a NACE group (3-digit NACE) is used to calculate NACE group price indices. The calculation is a chained Young index as detailed the previous step, where the indices $I_i^{t-1:t}$ are the month-on-month product group price indices. The weights w_i^b are the relative proportions of each product group within the corresponding NACE group.

(iv) A weighted average of month-on-month NACE group price indices within a NACE division (2-digit NACE) is used to calculate NACE division price indices. The calculation is a chained Young index as detailed previously, where the indices $I_i^{t-1:t}$ are the month-on-month NACE group price indices. The weights used are the relative proportions of each NACE group within the corresponding NACE division.

(v) Other higher-level aggregates are calculated as weighted averages of NACE group price indices using the same method. Again, the calculation is a chained Young index, where the indices $I_i^{t-1:t}$ are the month-on-month NACE group price indices. The weights used are sums of the corresponding weights from the lower levels of aggregation.

(vi) Certain indices are calculated on a net sector basis. This means that sales from one industry in a sector to another industry in the same sector are excluded from the weighting calculations. This is to prevent double counting of price changes as products flow through different production processes.

(vii) To get the final Base Year Indices at NACE group, NACE division and other levels of aggregation, the base period indices are rescaled by dividing by the mean of the corresponding 12 monthly indices during 2015.

The WPI compilation process is illustrated by the chart in Appendix 1.

TABLES IN THE RELEASE

Industrial Producer Prices

Producer price indices are presented in Table 2 for major industrial sectors defined in terms of local units[6] and classified on the basis of the statistical classification of economic activities within the European Community (NACE Rev.2).

The three-digit NACE sectoral weights used in Table 2 in the current series are based on gross output figures as reported in the 2015 Census of Industrial Production.

Price indices are published for most two-digit NACE groupings with additional breakdown provided for various food products. At the three-digit NACE level these sectoral indices approximate closely to price indices for the commodities characteristic of these sectors since the compilations are based on local units for price reporting and weighting purposes. If, for example, a company is classified to a NACE group for the manufacturing of textiles and a substantial part of the company output is also cardboard boxes then prices for those items are also collected and used in the compilation of the index for textiles.

As stated in the *Index Calculation* section above, it is possible to derive indices at higher levels from combinations of two- and three-digit NACE sector indices. In this way overall producer price indices are derived and published in Table 2 for:

(i) Total transportable goods industries
(NACE Sectors 05-33 i.e. Manufacturing industries plus Mining and Quarrying)

(ii) Food, drink and tobacco
(2-digit NACE Sectors 10,11 and 12)

(iii) Manufacturing industries excluding food
(NACE Sectors 11-33)

(iv) Manufacturing industries excluding food, drink and tobacco
(NACE Sectors 13-33)

(v) Manufacturing industries (home sales)
(NACE Sectors 10-33)

(vi) Manufacturing industries (export sales)
(NACE Sectors 10-33)

(vii) Total manufacturing industries
(NACE Sectors 10-33)

Industrial producer prices relate to the output of industrial local units, including both home sales and exports. Domestic and export sales are separately distinguished in the monthly price inquiry to ensure that quotations are obtained for comparable products and transactions.

[6] A local unit is defined as an enterprise or part thereof situated in a geographically identified place. The different geographical locations in which an enterprise conducts industrial activities are treated as separate local units.

Some industrial sectors are still excluded (see Appendix 2) from this series, either due to lack of coverage or due to the small size of some sectors. A number of two-digit NACE groupings indices which are used in the calculation of the overall index are not published individually as publication may breach the confidentiality of a return. These two-digit groups are also listed in Appendix 2

Building and Construction Materials

Price indices are presented in Table 3 for all building and construction materials combined and 11 separate categories of materials. Home produced and imported commodities are covered. The weightings are based on a dedicated survey of all trades undertaken by the CSO in 1998. This survey requested a breakdown of materials used by building, civil engineering and other trade firms. All firms with more than 20 employees and a sample of those with less than 20 employees were surveyed.

For each of the commodity headings the monthly price relatives are derived as the simple arithmetic average of the monthly relatives for the constituent varieties surveyed. An average of these commodity price relatives is taken to provide the published price indices using the Laspeyres index as outlined above.

The indices presented in Table 3 provide only a general indication of price trends in the Building and Construction materials sector. Actual transaction prices are collected for materials purchased by construction and civil engineering firms. The price indices reflect an 'average' over a mixture of products from many companies throughout the country. They also reflect prices for both long-term and short-term contracts and for high and low volume civil engineering works. It should be noted that long-term, high-volume, fixed contracts for major works might dilute, in the short-term, the impact of emerging price changes on the index. Furthermore, industry sources have confirmed that price increases notified by companies may not always be achieved in practice following negotiations. Much depends on the prevailing market conditions. Therefore, changes over the short-term in the indices derived from these transaction prices will not always coincide with price changes notified by companies

Capital Goods

Table 4 presents price indices for capital goods. As in the former series a distinction is made between:

(i) Transportable capital goods;
(ii) Building and Construction.

Indices for Transportable capital goods are separately presented for three sectors, namely Agriculture, Industry and all other activity. For the industrial sector, separate indices are also provided for private vehicles and commercial vehicles. Equivalent indices for other specific capital goods items cannot be satisfactorily compiled since they have a high import content and it is generally not possible to price a sufficient number of identical products on a regular basis because of the infrequent and unique nature of most transactions.

The Building and construction capital index is derived by combining a special hourly wage rate index for employees in the building and construction sector with the price index for Building and construction materials in Table 3.

Energy Purchased by Manufacturing Industry

Table 5 presents wholesale price indices for electricity and petroleum fuels purchased by manufacturing industry. Wholesale prices for the bulk supply of different categories of petroleum fuels are obtained from the major fuel suppliers.

Since the introduction of the Single Electricity Market, the wholesale price of electricity is comprised of a number of components:

- the Single Market Price or SMP (the energy component of the price)
- Capacity Charges.
- Imperfection Charges = the costs of deviations between the market schedule and dispatch, uninstructed imbalances, etc.
- Market Operator Charges

Up until December 2018, the electricity index for this series (2015=100) is based on the above data which is sourced from the Single Electricity Market Operator's (SEMO) website http://www.sem-o.com. The Day Ahead price is used as the wholesale electricity price, since it accounts for over 90% of the market and is the most accurate representation of the wholesale energy price. It should be noted that the remaining electricity charges which make up the retail price such as, Transmission, Distribution, the CER's levy and other supply company charges are not included.

SEMO launched a new market on October 1st 2018 and this required changes to the calculation of the CSO's electricity index. From January 2019 onwards, only the Day Ahead Single Market Price was used in the index, and the Pass Through costs for Generation (i.e. Capacity Payments, Market Operators Costs and Imperfection Changes) were not included.

The overall index is compiled using weights based on the costs of different types of fuels purchased by industrial establishments.

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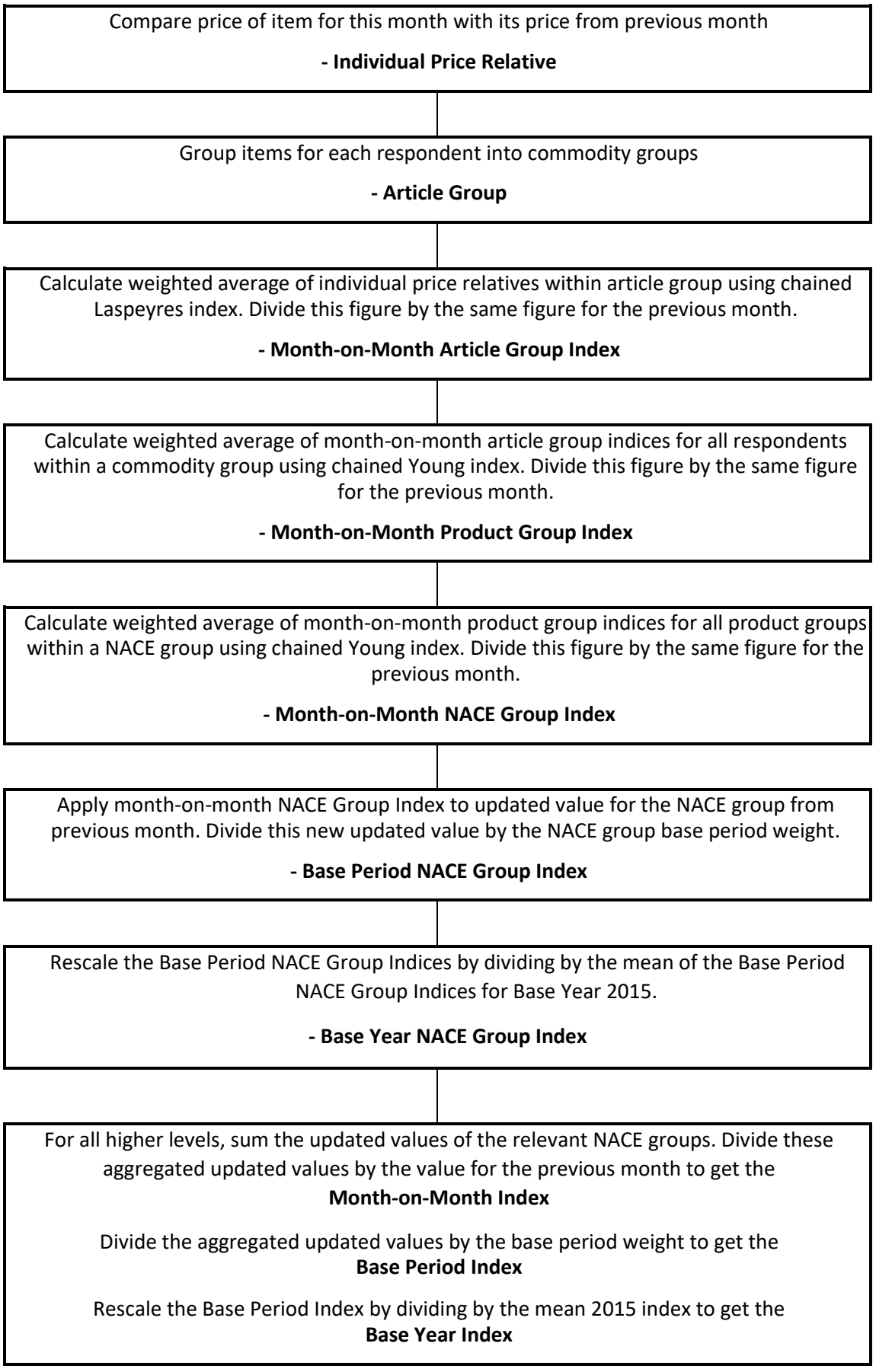
APPENDIX 1 CALCULATION PROCESS FOR WHOLESALE PRICE INDEX



APPENDIX 2 INDUSTRIAL SECTORS

Table A: Industrial Sectors Excluded From Table 2

NACE Code	Industrial Sector
051	Mining of hard coal
052	Mining of lignite
071	Mining of iron ores
091	Support activities for petroleum and natural gas extraction
099	Support activities for other mining and quarrying
142	Manufacture of articles of fur
191	Manufacture of coke oven products
202	Manufacture of pesticides and other agrochemical products
253	Manufacture of steam generators, except central heating hot water boilers
254	Manufacture of weapons and ammunition
255	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
302	Manufacture of railway locomotives and rolling stock
303	Manufacture of air and spacecraft and related machinery
304	Manufacture of military fighting vehicles
309	Manufacture of transport equipment n.e.c.
322	Manufacture of musical instruments
352	Manufacture of gas; distribution of gaseous fuels through mains
353	Steam and air conditioning supply
360	Water collection, treatment and supply
370	Sewerage
381	Waste collection
382	Waste treatment and disposal
383	Materials recovery
390	Remediation activities and other waste management services

Table B: Industrial Sectors Calculated But Not Published

NACE Code	Industrial Sector
12	Tobacco Products
19	Coke and refined Petroleum Products
21	Basic pharmaceutical products and pharmaceutical preparations
26	Computer, electronic and optical products
28	Machinery and Equipment n.e.c.
32	Other manufacturing including medical and dental Instruments and supplies
33	Repair and installation of machinery and equipment