Construction output price indices (OPIs) QMI

Contact:

Release date:
1 October 2018

Next release:
To be announced

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1 . Methodology background

National Statistic	No
Survey name	Construction output prices indices
Frequency	Quarterly
How compiled	Producer Price Indices, Services Producer Price Index and Average Weekly Earnings
Geographic coverage	UK
Last revised	1 October 2018

2 . Important points about Construction Price data

- The Construction Output Price Indices (OPIs) provides our best estimate of inflation within the UK construction industry.
- Index values are produced for every month but are published on a quarterly basis.
- Index values are formed from a weighted ratio of aggregated values on the base period of 2015=100.
- The OPIs estimate costs related to different types of construction projects, and provide aggregated measures for all new work, repair and maintenance and all construction work.
- For all projects, three types of input costs are estimated: materials, plant and labour. A mark-up is applied, which accounts for profit. The result is then used as a proxy for output prices.
- Material costs are estimated using individual Producer Price Indices (PPIs), plant costs are measured using the Services Producer Price Index (SPPI) for construction plant hire and labour costs are measured using the Average Weekly Earnings (AWE) index for construction.
- Revisions are subject to the revisions policies of component series; for routine revisions the series will remain open for a period of five months, in line with PPI, its main component.
- The OPI will also be revised on an annual basis to account for the profit mark-up margin update, introduced as part of the methodological improvements in the July to September 2017 release. It would be expected these changes would take effect in the April to June publication each year, although this may depend on the availability of the data. Alternative sources for profit mark-up data are currently being investigated as a future possibility to improve the timeframe and provide data continuity.

3 . Overview of the output

The Construction Output Prices Indices (OPIs) provide a best estimate of inflation within the UK construction industry. The OPIs are compiled using existing Office for National Statistics (ONS) data sources on a project cost basis.

This approach involves input costs, which are material, labour and plant, weighted together for a selection of types of construction projects, with a mark-up being applied to account for profit by the construction firm. The result is considered a proxy for output prices. The basic concept of producing each output price index is as follows:

$$\begin{matrix} Material\ costs\ (PPI) \\ Labour\ costs\ (AWE) \\ Plant\ costs\ (SPPI) \end{matrix} \times Mark-up\ for\ profit\ margin = Output\ price$$

The ONS took responsibility for publishing these statistics on 1 April 2015. The indices were previously known as the Construction Price and Cost Indices (CPCIs) and were published by the Department for Business, Innovation and Skills (BIS), now known as the Department for Business, Energy and Industrial Strategy (BEIS), before the publication was suspended in December 2014.

As a result of their suspension, the CPCIs were de-designated as National Statistics in December 2014, as detailed in a letter from Ed Humpherson, Director General for Regulation.

The first quarterly publication of the OPIs by the ONS was in June 2015, with indices published back to January 2014. Prior to Quarter 3 (July to Sept) 2017, the methodology that was used to compile the indices was considered to be an interim solution, whilst a longer term methodology was investigated.

In September 2017 an article was published by the ONS that detailed improvements to construction statistics. As a result of these improvements that were implemented in Quarter 3 (July to Sept) 2017, the methodology is no longer considered to be an interim solution. However, the OPIs remain as Experimental Statistics to involve users in their development. We continue to work towards their reaccreditation as National Statistics.

4 . Output quality

This document provides a range of information that describes the quality of the output and details any points that should be noted when using the output.

We have developed Guidelines for Measuring Statistics Quality; these are based upon the five European Statistical System (ESS) quality dimensions. This document addresses these quality dimensions which are:

- relevance
- timeliness and punctuality
- accuracy and reliability
- accessibility and clarity
- coherence and comparability

More information is provided about these quality dimensions in the following sections.

5 . About the output

Relevance

Relevance refers to the degree to which a statistical output meets users' needs in terms of content and coverage.

The Construction Output Price Indices (OPIs) are produced using existing data sources, all of which are National Statistics. The OPIs measure changes in the total cost of different types of construction projects, a project cost approach. Projects are split into two main categories: new work and repair and maintenance.

Within new work we provide a measure of costs for the following types of work:

- housing
- infrastructure
- public (other than housing)
- private industrial
- private commercial

Within repair and maintenance, we provide a measure of costs for the following types of work:

- housing repair and maintenance
- non-housing repair and maintenance

Alongside these individual measures of inflation, we also provide three aggregated measures of inflation within the UK construction industry: new work, repair and maintenance and all construction. Information on how these are delivered are represented in section five.

The OPI series were rebased in Quarter 3 (July to Sept) 2017 and are now operating to a base year of 2015=100. Prior to this the series were using a base year of 2005=100.

Stage 3 and Stage 4 (high-level) weights are updated annually, usually in February after data for the previous calendar year is available, using values for construction output taken from the Office for National Statistics (ONS) Output in the Construction Industry release. Stage 1 and Stage 2 (low-level) weights have been constant since the first ONS publication. There are currently no plans to update these weights. For more information regarding weights see section five.

The OPIs are Experimental Statistics to involve users in their development. Guidance on using indices in indexation clauses is also available.

Timeliness and punctuality

Timeliness and punctuality describes the time between the date of publication and the date to which the data refers, and the time between the actual publication and the planned publication of a statistic.

The OPIs are monthly index values that are published on a quarterly basis. Publication is approximately six weeks after end of the quarterly period. Quarter 4 (Oct to Dec) data is published in the second or third week of February.

For the up-to-date release schedule and related releases, please see the Office for National Statistics (ONS) release calendar.

Accuracy and reliability

Accuracy and reliability is how close the estimated value in the output is to the true result. The accuracy and reliability of the OPIs is dependent on that of the source data. For more information please see the QMIs for the respective sources:

- Producer Price Index (PPI) Quality and Methodology Information
- Services Producer Price Index (SPPI) Quality and Methodology Information
- Average Weekly Earnings (AWE) Quality and Methodology Information

Revisions within the OPI series are also dependent on the revisions policies associated with their component series. For routine revisions, such as inclusion of late respondent data the OPIs will be open to revisions for a period of five months, in line with the Producer Price Indices (PPI), its main component.

Accessibility and clarity

Accessibility and clarity is the ease with which users can access data, and the quality and sufficiency of metadata illustrations and accompanying advice.

Our recommended format for accessible content is a combination of HTML web pages for narrative, charts and graphs, with data being provided in usable formats such as CSV and Excel. Our website also offers users the option to download the narrative in PDF format. In some instances, other software may be used, or may be available on request. Available formats for content published on our website but not produced by us, or referenced on our website but stored elsewhere, may vary. For further information please refer to the contact details at the beginning of this document.

- For information regarding conditions of access to data, please refer to our terms and conditions (for data on the website) and guidance on accessibility.
- In addition to this Quality and Methodology Information, basic quality information relevant to each release is available in the Quality and methodology section of the relevant statistical bulletin.

Coherence and comparability

Coherence and comparability is the degree to which data derived from different sources or methods, but that refers to the same topic, is similar, and the degree to which data can be compared over time and domain, for example, geographic level.

As discussed in section two of this QMI, the OPIs have been produced by the ONS after publication responsibility was transferred from the Department for Business, Energy and Industrial strategy (BEIS). The construction price and cost indices (CPCIs) remain available to users who wish to extend the series. Guidance on how to link the series is available in the other information section of this document.

The OPIs are reflective of the UK construction industry as a whole and regional data is not currently available.

6 . How the output is created

To measure price change for all new work and repair and maintenance projects, price changes for three categories of inputs are measured: materials (split into new builds and repairs and maintenance), plants and labour. These are weighted together and a profit margin applied. Each of these steps is explained in more detail below.

Materials – new work

An aggregate of relevant individual Producer Price Indices (PPIs) is used to measure changes in material costs for new work projects. PPIs measure changes in the price received by UK companies for goods they have produced that are sold within the UK. The selection of PPIs used is based on the data ONS submits to Eurostat as part of the European Price Comparison Programme used to calculate the Purchasing Power Parities (PPPs).

The objective of the PPPs is to compare the purchasers' prices actually paid for a basket of comparable goods and services between countries. Included in this basket are buildings and civil engineering works, and as part of the European Price Comparison Programme, the UK must submit prices to Eurostat for a selection of projects on an annual basis. The approach taken is for experts in each country to provide a price for a selection of "fictitious but representative" projects.

The projects are intended to be representative of UK construction. The projects for which the UK is asked to return prices to Eurostat as part of the PPPs are: detached house; "Nordic"-style housing development (a single-family home consisting of one and a half storey); apartment; factory building; new office building; asphalt road; and a bridge. The representative projects chosen for use in the construction output price indices for each type of work, selected as they are considered to be most reflective of the type of work undertaken in each category, are shown in Table 1. These input costs are also reflected within repair and maintenance projects, albeit plant is significantly less weighted compared with the new work projects.

Table 1: Representative projects selected for each type of new work, UK

Type of work	Bill of quantity
Housing	Detached house and apartment
Infrastructure	Roads and bridges
Public other	New office building
Private industrial	Factory building
Private commercial	New office building

Source: Office for National Statistics

Bills of quantities

The cost of each project is determined using Bills of Quantities (BoQs). Each BoQ provides details of the quantities of different materials needed for each project type, with materials typically grouped into nine "material categories" (for example "concrete" or "earthworks"). These categories are the same for each of the BoQs and are listed in Table 2.

Table 2: Weighting structure of materials categories for Private Industrial, UK

Category	Estimated cost (£)	Weight
Earthwork	89,296	3.8
Concrete	374,222	16
Masonry	76,474	3.3
Joinery and metal work	1,004,946	42.9
Finishings	44,086	1.9
Sanitary fittings	135,618	5.8
Heating and ventilation	314,076	13.4
Electrical installations	275,899	11.8
Drainage	28,917	1.2
Total	2,343,534	100

Source: Office for National Statistics

Indices are compiled for materials for each of the representative projects using a selection of PPIs. These PPIs are aggregated into a single index for materials using values in the BoQs that are submitted to Eurostat, as part of the European Price Comparison Programme. The overall index for all material costs is then created by weighting the material categories by their relative estimated cost in the whole project. Table 2 provides an example of this weighting for a factory building used for Private Industrial new work. It is worth noting, however, that the values that are submitted in the BoQs represent the total “work cost” so include the costs associated with the materials and plant required to use the materials within the construction project. The expenditure weights for each materials category is updated annually.

Materials – repairs and maintenance

The approach taken to measure input costs of repair and maintenance work differs from new work and also between housing and non-housing repair and maintenance.

The housing categories of materials that are used for housing repairs and maintenance are shown in Table 3. Since there are no BoQs for repairs and maintenance, materials have been selected using information collected from the Annual Purchases Survey, which collects data on business’ expenditure on energy, services, goods and materials that are used up or transformed by the business activity.

Table 3: Materials used in housing repair and maintenance, UK

Material	Weight
Plastic products	20.97
Fabricated metal products	20.46
Cement, plaster and concrete	11.75
Wood products	11.14
Furniture	10.09
Electrical equipment	9.9
Glass, porcelain and ceramic products	4.61
Textiles	3.97
Paints, varnishes, printing ink and mastics	3.34
Mining and quarrying products	2.67
Other basic metals and casting	1.11
Total	100

Source: Office for National Statistics

The same index is used for both private and public housing repair and maintenance as we are unable to split the services element of this work to account for differences in the amount charged for private and public clients. However, it is likely assured that repair and maintenance prices will move in a similar way for both private and public housing.

Non-housing repair and maintenance uses a similar approach to that of housing repair and maintenance. However, since the materials used for non-housing will be different, the list of PPIs selected has been amended to better represent non-housing materials.

To do this, the materials that are considered to be most representative of repair and maintenance work have been combined separately for an office, a factory and for infrastructure, and then combined into an overall index for materials.

This list of materials is similar to those used for housing repair and maintenance, but excludes wallpaper, particle boards and central heating radiators, and includes:

- tiles, flagstones and bricks of cement, concrete and artificial stone (instead of ceramic and clay as in the housing list)
- aggregates (gravel, sand, stone, granules, chippings and powder, pebbles, bituminous mixtures based on natural and artificial stone, articles of asphalt)
- glass (surface ground, polished, mirrors and insulating units)
- ceramic sanitary wares
- articles of cement, concrete, plaster or artificial stone and prefabricated structural components for buildings or civil engineering
- paints and varnishes (acrylic and polyester based)
- metals (tubes, pipes, hollow profiles and related fittings, metal structures and parts of structures, grills, netting, fencing, aluminium bars, rods and profiles)
- tubes, pipes, hoses and fittings

Labour

The seasonally adjusted Average Weekly Earnings index (AWE) for construction excluding bonuses is used to measure changes in the price of labour in all new work projects. AWE measures money paid to employees in Great Britain in return for work done, before tax and other deductions from pay. The estimates do not include earnings of self-employed people and are not just a measure of pay settlements since they also reflect compositional changes within the workforce. Since the AWE is not available at a more detailed level than all construction, the same index is used to represent labour costs for each of the sub-indices produced.

For housing repair and maintenance, a combination of the CPI for “services for the regular repair of dwelling” is used to measure changes in labour costs.

The CPI for “services for the regular repair of the dwelling” is compiled from the hourly rate for plumbers, electricians, carpenters and decorators and therefore measures the price paid by consumers when hiring trades people to carry out repairs and maintenance on their homes. This index does not include the price paid for builders which is why it is used for repairs and maintenance only and not for new work.

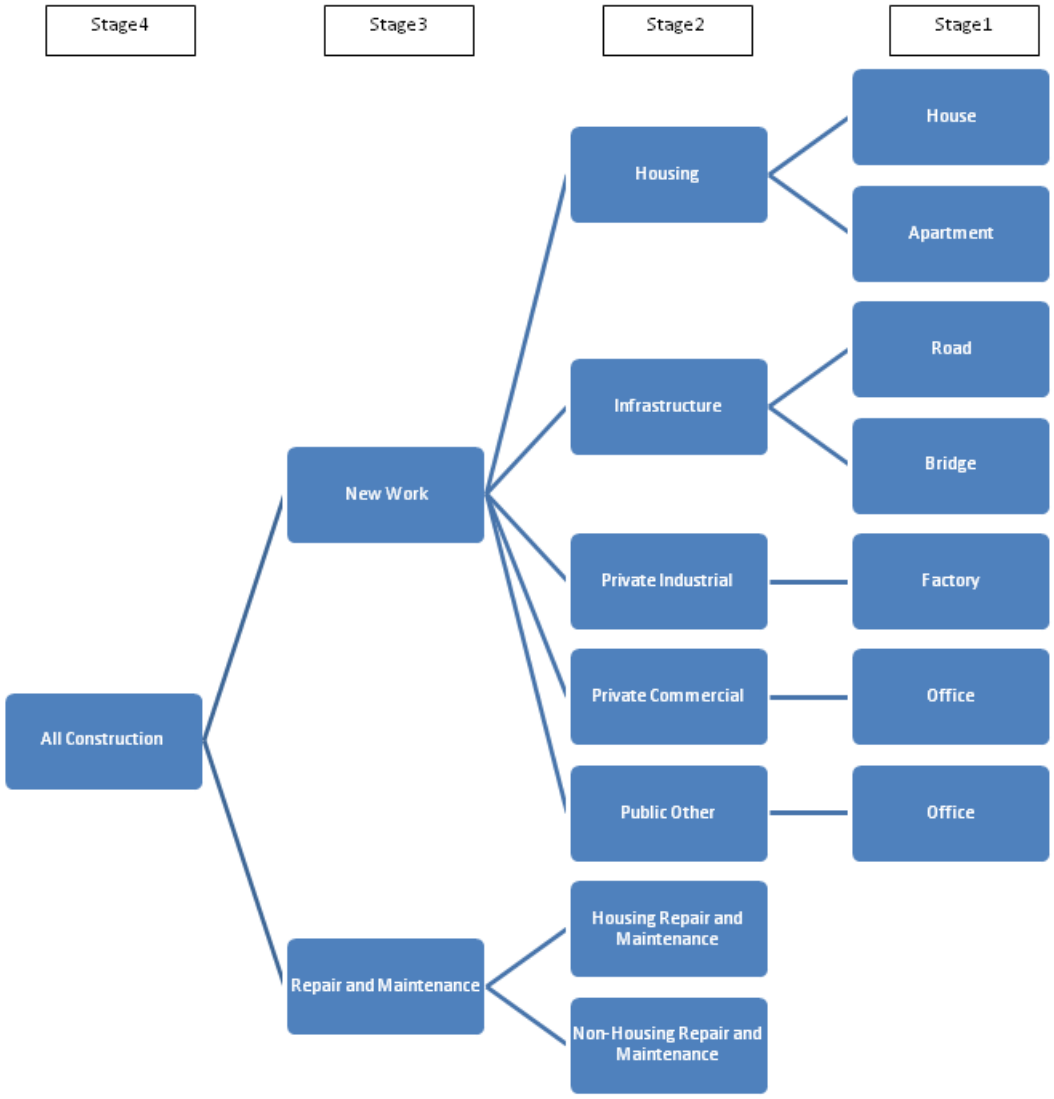
Plant

The Services Producer Price Index (SPPI) for construction plant hire is used to measure changes in the price of plant used in construction. This index measures changes in the price received by UK plant hire companies when providing plant without an operator to other UK companies and government. It includes items such as cranes, earth-moving equipment and site accommodation and, since it is compiled on a quarterly basis, interpolation is used to produce estimates on a monthly basis. Similarly to labour, the SPPI for construction plant hire is not available for specific construction work types so the same index is used for each of the sub-indices produced. Plant costs are measured using the same index for new work and repair and maintenance.

Weights

Weights are applied to account for the varying balance of material, labour and plant costs related to each individual project. The overall index structure used to compile the top-level index for all construction can be seen in Figure 1. The weights for stage 3 and 4 are updated annually, whilst stage 1 and 2 weights remain constant.

Figure 1: Construction Output Price Indices (OPIs) structure



Source: Office for National Statistics

Stage 1 – Labour, materials and plant weights

Data used to weight the individual labour, materials and plant components for a construction business comes from the Annual Business Survey (ABS) seen in Table 4. Information from the monthly construction survey is used to calculate the sector split of all construction work.

Table 4: Labour, materials and plant weights question from ABS

Component	Annual Business Survey Question
Labour	Total employment costs
Materials	Goods and materials used in the running of your business (including raw materials, stationery, components and consumables)
Plant	Amounts payable for hiring, leasing or renting plant, machinery and vehicles

Source: Office for National Statistics

To calculate the labour, material and plant weights for the housing indices, the median cost is calculated from the labour, material and plant ratios of businesses that focus on housing work. The same process is repeated for the other sectors. The median measurement is used, rather than a weighted mean, because there is already a potential bias towards large companies in making this calculation. The calculation requires data from both the annual and monthly survey for the same year, and it is only the largest companies that are fully enumerated in both surveys.

The resulting labour, material and plant weights are displayed in Table 5, for the 2015 reference year.

Table 5: Weights used to combine the labour, materials and plant components for the new work and repair and maintenance indices, UK

%

Index	Labour	Materials	Plant
Housing	44.3	50.2	5.5
Infrastructure	47.5	40.4	12.1
Other Work	54.5	39.9	5.7
Housing R&M	60.6	35.8	3.6
Non Housing R&M	24.8	69	6.2

Source: Office for National Statistics

Stage 2 weights

For new work, two representative projects have been used for both housing and infrastructure. The resulting indices having been weighted together using weights estimated from data provided by Barbour ABI. The weights are fixed and are as follows:

Housing –

- Detached house (65%) and Apartment building (35%)
- Infrastructure – Road (90%) and Bridge (10%)

Stage 3 and 4 weights

To produce the all new work, all repair and maintenance and all construction indices weights, data is aggregated using values for construction output taken from the ONS's Output in the Construction Industry release. Weights are updated annually as data becomes available. Weights can be viewed in Table 6.

Table 6: Weights used to compile indices for all new work, all repair and maintenance and all construction, 2017, UK

Component	Weight into stage 3 (parts per 1,000)	Stage 3 index	Weight into stage 4 (parts per 1,000)	Stage 4 index
Housing	357	New work	655	All construction
Private industrial	46			
Private commercial	299			
Public other	113			
Infrastructure	185			
Housing repair and maintenance	528	Repair and maintenance	345	
Non-housing repair and maintenance	472			

Source: Office for National Statistics

Mark-up for profit margin

As announced in the Construction development: Impact of improvements to construction statistics article in September 2017, a mark-up method was introduced in collaboration with Dr Xuxin Mao of the University College London (UCL). The mark-up addressed a limitation of the old methodology which assumed that input costs move in the same way as output prices. This meant that previously we were measuring the margins of construction businesses a zero constantly throughout time.

Gross profit was chosen as the most appropriate profit measure to base the mark-up on. This is because it is tailored only towards direct costs of goods sold and not indirect fixed costs such as rent and insurance, which are included in an alternative such as operating profit. According to economic theory, firms set a mark-up given labour, capital and intermediate inputs, with a view to maximise profits. The mark-up is the difference between the price that the firm charges and its marginal cost, that is, the cost of producing an additional unit of output. As marginal costs are not affected by changes in fixed costs, the gross profit measure is the “cleanest” measure of profits.

The Fame dataset, from Bureau van Dijk, has been used to access the financial information of Construction businesses. A criterion was defined to identify appropriate businesses, leading to the selection of 715 currently active firms, from which the mean average for turnover and gross profit has been calculated. The mark-up is then produced using the following formula:

$$M = \frac{AVG\ Gross\ Profit}{(AVG\ Turnover - AVG\ Gross\ Profit)}$$

The resulting annual mark-up figures are displayed in Table 7.

Table 7: Annual mark-up figures, based on gross profit

Year	Mark-up (%)
2011	13.779
2012	12.968
2013	12.422
2014	10.962
2015	10.856
2016	11.524

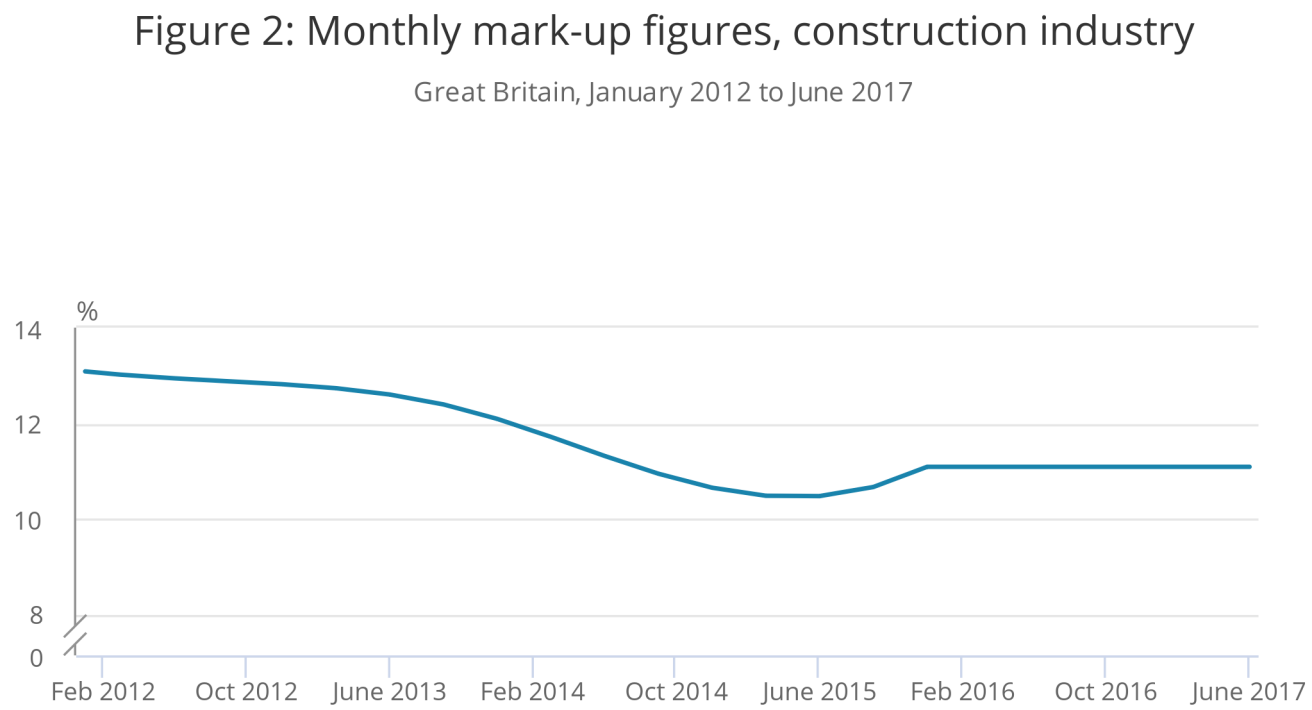
Source: Office for National Statistics

The non-parametric cubic spline approach is then used to fit a smooth curve between points on the annual series to calculate a quarterly series, taking into account movements in the mark-up in neighbouring periods. Linear interpolation is subsequently used to calculate a monthly mark-up figure.

This transformation is shown in Figure 2, in the form of the resulting monthly mark-up values. A constant mark-up is currently used from the end of 2015 onwards, with a view to updating the values once sufficient information is available. A forecasting approach has been considered as part of this work and will continue to be investigated as a future possibility.

Figure 2: Monthly mark-up figures, construction industry

Great Britain, January 2012 to June 2017



Source: Office for National Statistics

Other information

Linking to a previous series

Users wishing to link the BIS CPCIs (prior to 2014) and our new construction OPIs (from 2014 onwards) to create longer-running time series, have many options. One approach would be to use a linking factor based on a common time period.

To do this, select the nearest equivalent index published in the OPI (2005=100) series and then calculate a linking factor as follows:

For example, users who are using the BIS (2005=100) indices in long-term contracts and wish to extend the series beyond Quarter 2 (Apr to June) 2014 (the last quarter for which CPCI data are available), the following approach would be suitable.

$$\frac{Index\ Value\ for\ BIS\ 2005\ \ 100\ series,\ Quarter\ 1\ (Jan\ to\ Mar)\ 2014}{Index\ Value\ for\ ONS\ 2005\ =\ 100\ series,\ March\ 2014\ for\ nearest\ equivalent\ index} = Linking\ factor$$

Then multiply the Office for National Statistics (ONS) (2005=100) index values beyond March 2014 by this linking factor to extend the BIS (2005=100) time series.

The same principle can be used to extend the ONS (2005=100) series, which was published for the last time in the August 2017 release, to the 2015=100 series, which will be published from Quarter 3 (July to Sept) 2017 onwards.