New Construction Output Series
Analysis of improvements and their impact
Quarter 1 2010

Note: This document was produced to coincide with the publication of the current price series on 18th June 2010. It has been updated to explain the production of the sector outputs and the constant price and the constant price, seasonally adjusted series. Note also that the current price estimates have been updated to reflect additional information received since 18th June 2010.

1. Summary

A large number of improvements have been made to the Output in the Construction Industry publication, following the initial user consultation on requirements and the development of the agreed changes. It is important to understand the impact of the improvements so that the real growth between Q4 2009 and Q1 2010 can be measured.

This article details the changes which have been applied and explains the impact of these to the production of a continuous series. The impact of the new method on Q4 2009 estimates resulted in an increase of 1.9% in the level of output for that quarter.

2. Introduction

Planned changes to Construction Statistics were outlined in a public consultation document, published on the ONS website in January 2009. Following comments from interested parties, a public consultation report was published in June 2009. Click here to access both documents.

The first publication of Construction Output on the new basis was intimated in the last quarterly statistical bulletin of Output in the Construction Industry on 5th March 2010. This article explains the changes arising from the development of the survey and how resulting discontinuities have been treated. This will demonstrate how a revised estimate of Quarter 4 2009 was determined, allowing a continuous current price series for Output in the Construction Industry for January, February and March 2010 to be produced.

3. High level changes

The sampling frame for the current surveys was the Builder's Address File (BAF). The BAF was unique to the computer system (CISTATS) which supported construction surveys. The BAF was replaced by the Inter Departmental Business Register (IDBR) which is used for all ONS business surveys. The IDBR offers wider coverage than the BAF and also has the benefit of including PAYE only businesses. The IDBR is also structured according to the Industrial Classification SIC 2007.

Included in the BAF were Local Authority Direct Labour Organisations (DLOs). DLOs are no longer included in the output survey. The output from DLOs has been reducing over the years and contributes less than 2% to the overall construction output. Furthermore, the existing output results include an estimate of output for those businesses that are not on the BAF – known as unrecorded output. This unrecorded output estimate no longer form part of the output results, in common with other ONS business survey publications. However, its impact has been offset somewhat by the inclusion of PAYE only businesses in the IDBR. Businesses classified to Divisions 41-

43 of industrial classification SIC (2007) are eligible for selection for the construction surveys.

The survey has changed from quarterly to monthly to satisfy the needs of National Accounts, Eurostat and other users. Changes have also been made to the sample design and to the methodology used to calculate output estimates.

Table 1 provides a summary of the main changes.

Table 1 – Main changes to Construction Output figures

Survey	Source of discontinuities
Output and Employment	Periodicity – quarterly to monthly
	Questionnaire redesign, including new questions on sector breakdown
	Sampling frame – use of IDBR instead of BAF
	Sample design
	Weighting – use of turnover rather than employment as auxiliary variable
	Use of Winsorisation for identifying and weighting outliers
	Removal of unrecorded output
	Cessation of collection of output from DLOs
	New deflators to calculate constant price series

4. Detailed changes - Construction Output

Details of the changes being introduced are described in the article, "Development of Construction Statistics", which was published in the March 2010 edition of the Economic and Labour Market review. Click here to access the article.

4.1 Coverage

The existing estimates were produced using the builders' address file (BAF) as the sampling frame. The frame was updated by a census, using the Annual Inquiry. Under the new design, the Inter-Departmental Business Register (IDBR) is being used to draw the sample. From 2010, the selection is based on industrial classification SIC 2007, rather than SIC 2003. The new classification has introduced a few minor changes to the definition of the construction industry. For example, manufacture of builders' carpentry and joinery of metal has moved from 'manufacturing' to 'construction' and the construction of waterways, which was in 'other business services' has also moved to 'construction'. The impact of these moves is small, being in the order of 0.2% of construction turnover. However, the one major change, the inclusion of SIC 41.1 (property developers) will not be taken forward at this time, due to previous difficulties in surveying that industry. The figures for Construction SIC 2007 for output exclude this section of the classification.

The IDBR includes approximately 230,000 construction units, compared with approximately 200,000 units in the BAF. (The IDBR includes PAYE only units which were not included in the BAF). The IDBR is updated by means of a survey rather than a census.

The historically published estimates have included an allowance for construction work carried out by businesses below the VAT threshold. With the inclusion of PAYE companies, this allowance has been removed from Q1 2010 estimates.

Direct Labour Organisations (DLOs) no longer form part of the construction output estimates. DLOs are government departments, local authorities, new towns and national industries in the transport sector engaged in building and civil engineering work. Removing DLOs from the output figures will move the published estimate towards a measure of the output of companies classified as construction companies and away from a measure of the work carried out on construction.

4.2 Change in the sample design

The existing sample design stratified businesses into 14 narrow employment bands, with a sample size of 12,000 per quarter, where businesses with registered employment over 35 were always selected. The new approach stratifies businesses into 4 broader employment bands and SIC 2007, resulting in 57 strata, and a sample size of 8,000 per month. Employment bands were selected to align with the standards used on other ONS business surveys. Under the new design, businesses with registered employment of greater than 100 will always be selected. The new approach will ensure better industry coverage with the introduction of SIC to the design, which will compensate partly for the reduction in the sample size.

4.3 Methodology changes

Two methodological changes were applied to output estimation; A new outlier methodology (Winsorisation) and a new auxiliary variable, turnover, replacing employment.

Winsorisation is a technique for reducing the effect of outlying observations on survey estimation. This process automates the treatment of outliers and is consistent with standard ONS methodology on other business surveys.

Analysis has shown that the use of turnover as the auxiliary variable produces a better correlation to the value of output than the use of employment as the auxiliary variable.

4.4 Questionnaire Design

The questionnaire design also had a bearing on the results. From January 2010, new work has been broken down into a number of categories. Previously, this would have been collected as a single total figure.

The new questionnaire design was tested on a sample of construction businesses over a period of 9 months to ensure the questionnaire would produce accurate responses.

5. Impact of changes on results

The discontinuity analysis that follows addresses the impact of the changes to the overall total of output in the construction industry. It is important to note that the impact of each change is not additive as the impact of each change cannot be isolated.

To evaluate the impact of changing the sampling frame and sample design, analysis was carried out on the sampled cells, comparing the overlap between BAF and IDBR (common universe) and an estimate was obtained for the non-overlapping part of IDBR, including for PAYE only businesses.

To estimate the impact of changing the auxiliary variable, estimates of total value of output, less the value of unrecorded output, were calculated for each quarter in 2009 using the current design, frame and methodology, and comparing the difference when applying the existing and new weights. Results showed that the overall estimate of output, less the value of unrecorded output and other post-system adjustments, increased between 1.3% and 2.1%, simply by this change in auxiliary.

The Winsorisation of outliers identifies only a small handful of cases, which would cause the overall estimate to increase. Outliering using the previous method identified a far larger number of cases. A sensitivity analysis was conducted to assess the effect of changing the Winsorisation parameter (L value) upon the overall estimate of total value of output. L values were derived under the current design from 2007-08 sample data. It was concluded that the minimum L value was the most appropriate to use.

Further work was then carried out to carry out Winsorisation at component level. (i.e. separately for each question asked). Applying Winsorisation at the component level and deriving the total value would lead to a small bias in the estimate of total value (0.4 to 1.2%), whereas Winsorising only the total value would lead to a bias in some of the components (up to 5.6% in one question). As a result of this analysis, outliers have been treated at question level. The combined effect of the sampling frame and design changes, together with the impact of Winsorisation, increased the output estimates, net of the unrecorded output value and other post-system adjustments, by between 3.0% and 5.7%.

The revised Q4 estimates, allowing for the change of sampling frame (excluding the addition of PAYE only businesses), the change in auxiliary variable, the change of outlier methodology and the removal of systems adjustments, including unrecorded output, is shown in table 2.

Table 2 – Impact of methodology excluding PAYE adjustments

	Total New Work	**Total R & M**	**Total**
Published Q4 09	£13,760m	£12,522m	£26,282m
Value, less systems adjustments; particularly unrecorded output	£14,151m	£11,469m	£25,620m
Q4 09 revised with link	£14,835m	£11,621m	£26,456m

An approximate estimate of the contribution of PAYE only units from the IDBR was calculated to complete the overall estimate of discontinuity. We noted the growths of the non PAYE units and assumed that the PAYE only units of the same employment size had the same growths to determine the contribution of PAYE only units for Quarter 4 2009. This allowed the production of an approximate estimate of £0.336 billion (1.25%).

The impact of these changes on the overall estimates is shown in table 3.

Table 3 – Impact of changes including PAYE adjustments

	Total New Work	Total R & M	Total
Q4 09 revised with link	£14,835m	£11,621m	£26,456m
PAYE total for Q4	£68m	£268m	£336m
Total revised Q4	**£14,903m**	**£11,889m**	**£26,792m**
% Difference over published	8.3%	-5.0%	1.9%

The increase/reduction in new work/R&M compared to published estimates for Q4 2009 is accounted for by the fact that in the published results, an estimate is made for unrecorded output (accounts for approx. 13% of total output) which is weighted 65/35 in favour of R&M.

The impact of the questionnaire re-design was also investigated. There was no evidence, particularly from the common sample, of any impact on total output. However, there does appear to be a questionnaire impact on the breakdown between new work and repair and maintenance for which a further adjustment has been made.

The percentage of repair and maintenance as a proportion of total output over the period Q1 2008 to Q4 2009 was analysed to see if there was any significant historical changes. The average during this period was 43.9%, compared with 44.8% in quarter 4 2009. This is significantly different from the 36.3% experienced in Q1 2010.

Analysis of the responses received in Q1 2010 by size band was carried out and it was noted that there was a difference in percentages in the lower size bands. The reason for this change can be attributed to the questionnaire design which now asks for five new work questions as opposed to one in the previous design. An adjustment has therefore been made to the Q4 2009 amended figures to take account of this effect, based on the observed breakdown of estimates contributed by small businesses. The impact of this is shown in table 4.

Table 4 – Impact of questionnaire effect and final comparison

	Total New Work	Total R&M	Total Output
Amended Q4	£14,903m	£11,889m	£26,792m
Questionnaire effect adjustment	£1,404m	-£1,404m	£0
Grand total	**£16,307m**	**£10,485m**	**£26,792m**
Q1 collected	**£16,481m**	**£9,732m**	**£26,212m**
Difference	**1.1%**	**-7.0%**	**-2.2%**

As a result of all the changes introduced, we estimate an increase in the overall estimate for Q4 2009 of 1.9%. The estimated change of total output at current prices between Q4 2009 and Q1 2010 is -2.2%.

6. Sector outputs of New Work

Up to the end of 2009, sector outputs of total new work were modelled using data from the New Orders in the Construction Industry survey. From 2010 onwards, these sector outputs are being obtained directly from the Output in the Construction Industry survey.

In order to produce new Q4 2009 sector outputs for the purpose of providing a link to the Q1 2010 sector output, the following principle was used:

- A Q1 2010 estimate of sector outputs was produced using the previous modelled method using New Orders.
- These outputs were compared to those obtained directly from the survey
- An estimate of Q4 2009 sector outputs was calculated using the following assumption:

$$Q4\ 2009_{survey} = (Q1\ 2010_{survey} / Q1\ 2010_{modelled}) \times Q4\ 2009_{modelled}$$

The back series was created using the principle of maintaining growths at the total new work level.

From 2010, we have included a question regarding the value of repair and maintenance for infrastructure. This would have been included in the public and private non-housing repair and maintenance sectors previously. From the data available, it is not possible to back cast the value of the new infrastructure repair and maintenance sector. As a result, there will be a break in the series for public and private non-housing repair and maintenance.

7. Constant Price (KP) Series

Each of the sector current price series was deflated to produce constant price (2005 base) using a new set of deflators, which were chosen following discussion with the Department for Business, Innovation and Skills (BIS) and the Building Cost Information Service (BCIS), within the Royal Institution of Chartered Surveyors (RICS). These deflators were chosen, following analysis of the available indices which would best represent the sectors of the construction industry which are included in the output publication.

8. Constant Price Seasonally Adjusted (KPSA) series

The KPSA estimates were produced by processing the KP series at the sector level (from 1955) through the software package, X12 Arima. A full review was undertaken of the model and parameters. The new factors have been applied to the whole of the back series. Sub totals and totals were derived, being the sums of individual sector KPSA estimates (indirect method).

9. Quality Summary

It is the intention to publish summary quality and basic quality reports for construction output estimates. Work is ongoing to establish robust systems for producing basic quality data for all published estimates. Table 5 shows these data for Quarter 1 2010.

Table 5 – Basic Quality Data for Q1 2010 Construction Output

	TOTAL			Response rate*
	Output (£000s)	Std Error (£000s)	CV	
Mar 2010	£10,340,832	£145,343	1.41	89.9%
Feb 2010	£8,664,426	£124,412	1.44	88.2%
Jan 2010	£7,207,130	£102,648	1.42	88.9%

* by turnover

10. Revisions

The published figures have revised the levels of output prior to Q4 2009 to reflect the changes introduced.

- For the current price (CP) and KP back series, the growths have been preserved at total work level. There are, therefore, small differences between the KP and CP levels for 2005.
- More detailed sectoral values have been constrained to the total value. This has resulted in revisions to the back series, which are small at the aggregate level of total new work and total repair and maintenance, but are larger at the more detailed sector breakdowns.
- The KPSA growths at the total work level have been changed as a result of applying the new seasonal factors. Annual KPSA estimates have not been constrained to equal annual KP estimates.

The back series has been published to 1955 on this basis.

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