ARTICLE

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Labour Force Survey: Interim reweighting and annual review of seasonal adjustment, 2009

SUMMARY

On 11 November 2009 ONS published revised Labour Force Survey (LFS) aggregate estimates in the *Labour Market Statistical Bulletin* to take account of the latest available official population estimates and the results of the annual review of the seasonal adjustment of the LFS estimates. This article describes the new and revised LFS estimates and the time period affected. An outline of the reasons for making the revisions and of the basic methodology is also provided. This is supported by tables illustrating the total population estimates for the UK by age group and is then followed by a summary of how the revisions have impacted on the headline labour market indicators, that is the measures of UK employment, unemployment economic inactivity and average actual weekly hours as derived from the LFS. A summary of the revisions by Government Office Region (GOR) is also provided.

Key Points

- The LFS aggregate estimates in the *Labour Market Statistical Bulletin* have been kept consistent with the latest official population estimates and have been revised to reflect the changes to the seasonal adjustment for the period open to revision, that is June–August 2007 onwards.
- The resultant revisions to the headline labour market indicators do not significantly alter the overall picture portrayed over the last two years.

Introduction

On 11 November 2009 revised Labour Force Survey (LFS) estimates, that is, the aggregates in the *Labour Market Statistical Bulletin*, were published to take into account the latest population data and the results of the annual review of the seasonal adjustment of the estimates. The LFS data sets used for detailed analysis, known as LFS microdata, are not affected. They continue to be weighted to the population estimates published in the autumn of 2007, as described in the reweighting article published in May 2008¹. See below for the definition of LFS aggregates and microdata.

On 27 August 2009 ONS published the 2008 mid-year population estimates for the UK. These were followed by the 2008-based National Population Projections for the UK on 21 October, which provided new estimates for mid-2009 onwards. These new and revised estimates have been

incorporated into the calculation of the population figures that have been used to reweight the LFS aggregate estimates.

Defining the LFS aggregate estimates and microdata

The LFS “aggregate estimates” in the UK and regional *Labour Market Statistical Bulletins* are key labour market indicators, for example the levels and rates of employment, unemployment and economic inactivity. They are derived initially from the LFS ‘microdata’ and are calculated for any period of three consecutive months. These are referred to as three month rolling averages, that is averages for January to March, February to April etc. The aggregate estimates are seasonally adjusted.

LFS ‘microdata’ are quarterly data sets containing all survey questions. They are made publicly available as databases to enable external users to access and produce their own analyses. They enable more detailed analysis but are published for calendar quarters only (Quarter 1 refers to January to March, Q2 refers to April to June etc), and are not seasonally adjusted.

Background to the LFS

The LFS is a continuous UK household sample survey, which collects information from approximately 50,000 households each quarter (around 110,000 people of all ages). Since these responses reflect only a sample (approximately 1 in 500) of the total population, they are weighted on the basis of subnational population totals by

age and sex to give estimates for the entire UK household population.

In order to remain consistent with the LFS sample the population estimates as published are adjusted to exclude those outside the coverage of the LFS. Consequently people in communal establishments, apart from those living in National Health Service accommodation and students living in halls of residence who have a UK-resident parent, are excluded from the LFS household population estimates. A fuller description of the history of the LFS and its methodology can be found in the Labour Force Survey User Guide Volume One².

The LFS household population estimates are derived from the annual mid-year population estimates (MYEs) and latest projections based on those MYEs. These are updated annually and thus the LFS aggregate estimates can be revised on a similar basis - see interim reweighting below. Reweighting of the survey microdata to the revised population estimates is a resource-intensive exercise and, historically, has been carried out less frequently than annually. The last full reweighting exercise was carried out in 2007-08 and the results were published on 14 May 2008.

Interim reweighting

Since 2003 the LFS aggregate estimates have been 'interim reweighted' every year. Interim-reweighting applies adjustments to the aggregate results to reflect how the latest available LFS household population estimates compare with those used for weighting the microdata. This amounts to an approximation of the effect that a full reweighting of the microdata would have.

The interim reweighting ensures that the time series of the LFS aggregates is kept closely in line with the latest population estimates, thus reflecting a more accurate picture of the UK labour market.

A consequence of interim reweighting of the LFS aggregates every year is that they become inconsistent with the quarterly LFS microdata that are reweighted less often. Since the last interim reweighting in October 2008 this has applied to all quarterly microdata back to and including April-June 2006. The latest interim reweighting has added to this inconsistency for all quarterly datasets from July-September 2007.

LFS household population estimates

The official population estimates published in August and September 2009 indicate

that the previously published population projection for mid-2008 was broadly in line with the 2008 MYE for people aged 16 and over, with a difference of 0.1 per cent. The variation is greater within some age groups than others: the number of people aged over state pension age had been underestimated by 0.3 per cent and the number of 18-24 year olds had been overstated by 0.4 per cent. The difference between the latest and previous projections for mid-2009 is negligible for the total population aged 16 and over, with some relatively larger revisions in the age groups affected by the 2008 MYE revision.

Table 1 compares the new LFS household population estimates by age group with those previously used.

The population estimates used for this latest interim reweighting have been derived from estimates produced at local authority level. Totals for the English GORs, Wales, Scotland and Northern Ireland are derived by aggregating the local authority estimates. Previous interim reweighting exercises have been based on estimates derived at the level of the GOR.

Using this new approach for interim reweighting, a more accurate estimate of the private household population is applied as changes to the age structures of local authorities over time are then reflected at national level. In addition the population estimates used for the interim reweighting are entirely consistent with those which will be used for the next full reweighting of the LFS microdata.

The largest revision introduced by this change is in Scotland for women aged 16 and over, for whom the population has been revised up by more than 1 per cent.

There were no revisions to the MYEs prior to 2008; therefore the LFS aggregates are open to revision for the period June-August 2007 onwards.

Revisions to LFS aggregates

The revisions due to interim reweighting of the seasonally adjusted aggregates include revisions arising purely from the updated seasonal adjustment. This is partly because previously published LFS aggregate estimates are not routinely revised, in accordance with the published revisions policy for Labour Market Statistics³. This means they each reflect the seasonal adjustment of the time series that existed at the time they were first published. The LFS aggregates are interim reweighted prior to being seasonally adjusted and then a fully revised time series is brought into the seasonal adjustment process. Consequently the seasonally adjusted estimates for all periods open to revision reflect the most up-to-date estimation of the seasonal factors, trends and irregular components as required.

As such, the implementation of the annual review of the seasonal adjustment of the LFS has coincided with the interim reweighting of the LFS aggregates. The remainder of this article will jointly examine the impact of the interim reweighting and the review of the seasonal adjustment on the headline aggregates by labour market status.

Generally, since the population revisions are included in both the numerator and denominator for the rate calculations, the revisions to the rates are very small, that is less than 0.1 of a percentage point and, in many cases, zero. Consequently the comparisons in this article focus on the levels rather than rates.

Table 2 compares the headline LFS aggregates before and after interim reweighting and the review and re-estimation of the seasonal adjustment.

Table 3 shows the revisions for the main LFS aggregates by age group. The relative sizes of the revisions tend to reflect the population revisions by age group as shown in Table 1.

Table 1
New and previous LFS household population estimates, by age band

United Kingdom					Thousands, except where indicated			
Age band	May-July 2008				May-July 2009			
	New	Previous	Revision	% revision	New	Previous	Revision	% revision
16+	49,070	49,039	31	0.1	49,450	49,449	1	-
16-59/64	37,727	37,731	-4	-	37,916	37,935	-19	-0.1
16-17	1,589	1,591	-1	-	1,555	1,552	3	0.2
18-24	5,721	5,744	-23	-0.4	5,803	5,819	-15	-0.3
25-34	7,820	7,805	14	0.2	7,929	7,945	-16	-0.2
35-49	13,430	13,438	-8	-0.1	13,406	13,403	3	-
50-59/64	9,166	9,152	14	0.2	9,223	9,217	6	0.1
60/65+	11,343	11,308	35	0.3	11,534	11,514	20	0.2

Source: Office for National Statistics

Table 2
Revisions to headline LFS aggregates, May to July 2009

United Kingdom		Thousands, except where indicated		
	New	Previous	Revision	Revision as a %
People aged 16+				
Economically active	31,344	31,361	-18	-0.1
In employment	28,874	28,891	-17	-0.1
Unemployed	2,470	2,470	-1	-
Economically inactive	18,106	18,088	18	0.1
Working age people¹				
Economically active	29,926	29,950	-24	-0.1
In employment	27,489	27,513	-23	-0.1
Unemployed	2,436	2,437	-1	-
Economically inactive	7,991	7,986	5	0.1

Note:

1 Men aged 16 to 64 and women aged 16 to 59.

Source: Office for National Statistics

Table 3
Revisions to main seasonally adjusted LFS aggregates by age group, May to July 2009

United Kingdom		Thousands		
Age group	Economically active	In employment	Unemployed	Economically inactive
16-17	-1	0	-1	4
18-24	-15	-15	0	0
25-34	-11	-11	0	-5
35-49	3	2	1	0
50-59/64	0	0	-1	6
60/65+	7	6	0	13

Source: Office for National Statistics

Unemployment estimates

The revisions to the unemployment series are primarily the result of the updated seasonal adjustment of the periods open to revision. This is a consequence of the revisions policy for the LFS estimates. After first publication of the estimates,

the policy is to defer revisions for up to one year. As new data points improve the estimation of past seasonal adjustment factors, deferring revisions can have a cumulative effect. The recession has exacerbated this effect: as none of the new information has been used to update

previously published seasonally adjusted estimates until now, the revisions are larger than normal. The cause of the revisions is best explained by the seasonal adjustment process itself, which is based on a simple three-stage process as follows:

1. estimate the trend
2. remove the trend
3. estimate the seasonal factor

and is carried out using the X-12-ARIMA statistical tool. This tool uses moving averages to estimate the trend and the seasonal factors, and unless the series is artificially extended, these moving averages will be asymmetric at the start and end of the series. Research has shown that revisions are reduced by projecting and backcasting the series, using an ARIMA model, prior to stage 1 of the process. However, as the projections are based on the past, during the first part of the recession they consistently underestimated the sharp increase in unemployment. This in turn led to: an underestimate of the trend (stage 1); an overestimate of the detrended series (stage 2); and an overestimate of the seasonal factors (stage 3). As real data have replaced each ARIMA forecast: the trend has increased; so the detrended series has decreased; and the seasonal factors have decreased. As a decreased seasonal factor means an increased seasonally adjusted data point, this explains the positive revisions seen during the period July-September 2008 to February-April 2009, as shown in **Figure 1**.

Figure 1
Unemployment for people aged 16+, before and after interim reweighting

Source: Office for National Statistics

Figure 2

Employment for people aged 16+, before and after interim reweighting

Source: Office for National Statistics

Figure 3

Average hours worked, before and after interim reweighting

Source: Office for National Statistics

Employment estimates

Like the unemployment estimates, the estimates of the level of employment for people aged 16 and over also show the largest revisions during the period of most rapid change. The revisions to the employment estimates are the opposite of those seen for the unemployment estimates. For employment the seasonal factors have increased for the period August-October 2008 to February-April 2009 with the result that the seasonally adjusted estimates have been revised down, as shown in **Figure 2**.

Average hours worked

Some minor changes to the seasonal adjustment method have been

implemented for the series in Table 7 of the *Labour Market Statistical Bulletin*, that is, the average actual weekly hours of work. These statistics measure the number of hours actually worked by respondents during the week surveyed. They are affected directly by changes in the number of hours individuals work, in particular those caused by time off due to holidays. A number of 'calendar effects' related to holiday periods can cause distortions to the seasonal adjustment of the actual hours worked series, these are:

1. **Late May bank holiday** - which falls in either the May or June survey period.
2. **August bank holiday** - which falls in

either the August or September survey period.

3. **Easter** - which usually falls in either March or April, and sometimes affects the May survey period.
4. **Christmas** - which falls in either the December or January survey period, or sometimes straddles both.

LFS historical data are used to model the impact of the calendar effects. Adjustments are then derived from that analysis and are used to remove the calendar effects during the seasonal adjustment process. Following the 2009 seasonal adjustment review these adjustments have been updated.

Another calendar effect can result from the shifting of the survey reference

Figure 4
Revisions to LFS household population aged 16+, by Government Office Region, May to July 2009

Source: Office for National Statistics

Table 4
Revisions to main seasonally adjusted LFS aggregates by GOR, May to July 2009¹

United Kingdom				Thousands
GOR	Economically active 16+	In employment 16+	Unemployed 16+	Economically inactive (16–59/64)
North East	5	3	2	2
North West	-9	-8	-1	-4
Yorkshire and The Humber	-14	-12	-2	-1
East Midlands	-11	-11	-1	-4
West Midlands	3	3	0	-1
East	2	5	-3	0
London	34	30	5	10
South East	-7	-6	0	7
South West	-31	-29	-2	-3
Wales	-3	-3	0	-2
Scotland	12	10	2	2
Northern Ireland	2	1	1	-1

Note:

1 The economic activity categories correspond with the headline aggregates as published in Table 18 of the Labour Market Statistical Bulletin.

Source: Office for National Statistics

periods by one or two days each year, called the 'phase shift' effect. For example, the survey period for January to March 2008 covered the period 24 December to 23 March, whereas that for the previous year covered 25 December to 24 March. This is because questions in the LFS refer to respondents' situation in the previous week, covering the period Monday to Sunday inclusive. Every six years or so, a one-week survey break is needed to bring the survey calendar back into line with the real calendar; this last occurred in October 2008.

Since spring 2008 the 'phase shift' effect has been applicable for two of the actual hours worked series contained in Table 7,

that is women working part-time and all people working part-time. The latest review has concluded that the phase shift effect is also applicable to the women's series for all workers and an appropriate adjustment has therefore been made.

The impact of the revised seasonal adjustment settings and of the updated seasonal adjustment factors for the average actual weekly hours for all workers is illustrated in **Figure 3**. As can be seen most of the revisions to the previously published statistics are very small and are no bigger than 0.1 hours and are similar to the pattern of the revisions to the employment series. The revised average hours estimates have had an effect on the estimates of total weekly

hours worked, also shown in Table 7 of the *Statistical Bulletin*. The revisions to the series follow those of the average weekly hours and the employment series.

Redundancy estimates

As part of the seasonal adjustment review all series are assessed for seasonality, in essence, whether they demonstrate effects associated with the time of year. In the past, estimates of the redundancy level for men were regarded as seasonal, whereas those for women were regarded as non-seasonal. Consequently the series for men has been seasonally adjusted in the standard manner whilst that for women has not. Total redundancies are derived from the sum of these series and so were regarded as seasonally adjusted.

The latest review has concluded that the redundancies series for men no longer displays any statistically significant seasonality and so should not be seasonally adjusted. Consequently the redundancies total is no longer a seasonally adjusted total either. The impact of these changes is not significant since, in the past, seasonally adjusted estimates were usually very similar to the non-seasonally adjusted estimates.

The redundancy rates included in Table 23 are the ratio of the redundancy level to the seasonally adjusted number of employees in the previous quarter. The rates continue to be regarded as seasonally adjusted.

Revisions by Government Office Region (GOR)

Figure 4 shows the revisions to the May–July 2009 LFS household population estimates for people aged 16 and over, broken down by Government Office Region.

The largest revision was an upward revision of 55,000 for London. The largest downward revision was for the South West at -33,000. In percentage terms the revisions to the LFS household population for people aged 16 and over for all regions were less than 1 per cent.

Table 4 shows the revisions for the main LFS aggregates by region, as found in Table 18 of the *Labour Market Statistical Bulletin*. As for the age group breakdown, the revisions to the results generally reflect quite closely the revisions to the estimates of the LFS household population.

Conclusion

The LFS aggregate estimates for key labour market indicators have been interim

reweighted to bring them into line with the latest official population estimates. There are no significant changes to the statistical story.

The full set of interim-reweighted aggregates is included in the *Labour Market Statistical Bulletin* and supplementary tables, as published on 11 November 2009.

ONS aims to ensure that the LFS estimates continue to be kept in line with the latest population estimates. In the shorter term, the current plan is that fully reweighted LFS microdata will be released early in 2010, either with the publication

of quarter 4 2009 results in February 2010 or with the quarter 1 2010 results in May 2010. The precise timing is dependent on the progress made with the development of a new set of system tools for carrying out the reweighting process. The LFS aggregates in the *Labour Market Statistical Bulletin* will then be brought exactly into line with the LFS microdata. The revisions to the aggregates at that point are expected to be negligible. In the longer term, it is envisaged that the full reweighting of the LFS microdata will be carried out every year, thus avoiding the need for any interim-reweighting of the aggregate

estimates. Details of these longer term plans will be announced in due course.

Notes

1. www.statistics.gov.uk/cci/article.asp?id=2011
2. www.statistics.gov.uk/downloads/theme_labour/Vol1-Final-2009.pdf
3. www.statistics.gov.uk/about/Methodology_by_theme/downloads/LM_revisionspolicy.pdf

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