Introduction

Results of ONS’s survey of job vacancies were adopted as National Statistics in June 2003 (see pp349-62, Labour Market Trends, July 2003). The Vacancy Survey provides comprehensive estimates of job vacancies across the economy from April 2001. The survey, based on a sample of businesses, asks employers how many vacancies they have in total for which they are actively seeking recruits from outside their organisation. Total estimates are available on a monthly basis, and as three-month rolling averages, which have smaller sampling errors and are therefore more reliable. In addition, data are available by industry and by size of enterprise on a rolling quarterly basis.

The Vacancy Survey data show strong seasonal patterns, with vacancies peaking around September to October and dropping around January each year (see Figure 1). ONS has carried out a methodological review of the data and has concluded that most of the component series are suitable for seasonal adjustment, using the X-12 ARIMA program.

Total vacancies

The total vacancies data are presented on a monthly and a rolling quarterly basis. The rolling quarterly data are more reliable because the sampling errors are smaller. Approximately one quarter of the businesses in the survey (around 1,500) are large enterprises and are included in the survey every month. The remaining 4,500 or so are sampled randomly and are included in the survey every three months.

Although the series are short (spanning just over three and a half years), both the monthly and quarterly series show a strong seasonal pattern and the quality of seasonal adjustment is good.

Before seasonal adjustment, the rolling quarterly data are a direct three-month average of the monthly...
data. The monthly data and the rolling quarterly data are seasonally adjusted separately to give the best possible seasonal adjustment for both series. Therefore, the two series do not correspond exactly after seasonal adjustment. The review considered a number of options for reconciling the two series, but all introduced additional complications and compromised the quality of the seasonal adjustment.

Comparisons using the monthly series
As a result of the three-month rotating nature of much of the sample used in the survey, month-to-month comparisons of the monthly total estimates of vacancies are much more affected by sampling variations than are comparisons with data three months or 12 months ago. (There is a greater overlap between the respective samples.) For this reason, short-term comparisons using the monthly seasonally adjusted series are best made in terms of the change over the latest three months.

Data by size and industry
Data by size of enterprise are available for five size-bands, based on numbers employed, on a rolling quarterly basis. (The size bands are 1-9, 10-49, 50-249, 250-2,499, 2,500+). All five series show a clear seasonal pattern and are suitable for seasonal adjustment.

The methodological review also considered seasonal adjustment of the 19 industry groups for which unadjusted data are published. The results varied, with a few series displaying a strong seasonal pattern, but with many showing limited seasonality or no evidence (yet) of any seasonal pattern. Instead, the data are aggregated into eight broad industrial groups before seasonal
adjustment. These aggregated series tend to show a stronger, more stable seasonal pattern with less irregular variation, therefore improving the quality of the adjustment and reducing the size of revisions caused by new observations. However, two of the broader aggregated series (energy and water; and other services) still display no seasonal pattern and are therefore not seasonally adjusted.

Seasonal adjustment models and settings
The series are seasonally adjusted using X-12 ARIMA. A number of tests were carried out to determine the most suitable models and settings. As the series are short, they cannot be extended with forecasts. The X-12 procedure is therefore used without the ARIMA modelling functionality (see Box 1). Also, there are not yet enough data to determine whether the timing of Easter affects the results.

The series are modelled using an additive model; that is, the time series are conceptualised as the sum of three components: the trend, the seasonal variation and irregular variation. The three components are estimated using an iterative procedure, and the seasonal component is subtracted from the time series (see Box 1). The choice of model and other seasonal adjustment settings will be reviewed when more data are available.

The seasonal adjustment is of an acceptable quality for the monthly and rolling quarterly totals, all size bands and all broad industry groups except for the two industry series which are not adjusted.

Constraining the series
The five vacancies by size series are scaled to sum to the seasonally adjusted (quarterly) total series. The vacancies by industry series are scaled in a similar way, except for the two series that are not seasonally adjusted, which are excluded from the scaling. The remaining six industry series are scaled to the Vacancy Survey total minus energy and water and other services. The results by size and industry are therefore consistent with the seasonally adjusted quarterly totals. The scaling does not have any significant distorting effects on any of the series.

Revisions policy
Each month, the unadjusted data are revised back three months to take account of late information on vacancies or amendments to previous returns in the survey. Similarly, each month the seasonally adjusted data will also be revised back three months. In addition, the data point for the corresponding month or quarter a year ago will also be revised. This is because the series are short, and new data points can significantly change the estimate of the seasonal factors, affecting the seasonally adjusted figure for a year ago.

Recent results and trends
Figures 1 and 2 show the unadjusted and seasonally adjusted totals

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**Figure 3**
Three-month average number of job vacancies by broad industrial group; United Kingdom; April-June 2001 to July-September 2004, seasonally adjusted

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Source: Vacancy Survey

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(monthly estimates and three-month rolling averages). Figures 3 and 4 show the results by size and industry. The results show an increasing trend in vacancies since mid-2003. The increase has been strongest in the finance and business services sector, but there have also been recent increases in education, health and public administration, hotels and restaurants, and manufacturing. The increases have been most pronounced for the largest companies, employing over 2,500 people, for which there has been a rising trend for much of the period since the end of 2001. The smallest businesses have shown a decline in vacancies in the period since April-June 2001 but a rising trend since mid-2003.

Available series
The seasonally adjusted series are available starting from April-June 2001. The total seasonally adjusted series and the series by broad industry group are now being published in the monthly labour market statistics First Release (Tables 21 and 22). All the results will be included in Tables G.1 to G.4 in the Tables section of Labour Market Trends from December 2004. All the available data from the survey, both seasonally adjusted and unadjusted, are also available on the National Statistics website.

Further information
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Box 1
Seasonal adjustment using X-12
Seasonal adjustment is the process of identifying and removing the seasonal component from a series leaving the trend and irregular components. The Vacancy Survey series are seasonally adjusted using X-12 ARIMA. In future, this program will be used across ONS as a replacement for X-11 ARIMA, as it is more powerful and has many additional capabilities. It is now being introduced for some new series, where practical.

The program splits the series into trend, seasonal, and irregular components. If the series is modelled additively, summing the three parts gives the unadjusted data. If it is modelled multiplicatively, the raw data is the product of the three components. The seasonal component cannot be found without knowing the trend component, yet the trend component cannot be found without knowing the seasonal component. Thus, the X-12 ARIMA performs a series of iterations, obtaining a better estimate for the trend and seasonality with each one.

The ARIMA functionality can be used with series of five years or more. The program fits an autoregressive integrated moving average model to the data, using forecasts for one year ahead to improve the estimation of the seasonal factors at the end of the series. As the Vacancy Survey series span only three and a half years, there are not enough data to fit an ARIMA model. Therefore, the basic X-12 method is used, which calculates the seasonal factors based entirely on the existing data.