Economic activity and social change in the UK, real-time indicators methodology

Methodology for the data collection, aggregation, analysis and presentation for the real-time indicators bulletin.

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1 . Overview of real-time indicators data

Since the beginning of the coronavirus (COVID-19) pandemic in March 2020, we have been providing near real-time indicators relating to the UK economy and society in our [Economic activity and social change in the UK, real-time indicators bulletin](#).

These statistics have been produced quickly in response to developing world events. The Office for Statistics Regulation (OSR), on behalf of the UK Statistics Authority, has reviewed them (explained in their letter headed [Rapid Review of Coronavirus, the UK economy and society, faster indicators](#)) against several important aspects of the [Code of Practice for Statistics](#), and regards them as consistent with the Code's pillars of Trustworthiness, Quality and Value.

The real-time indicators are compiled using a variety of different data sources from four indicator categories:

- Consumer behaviour

- Business and workforce

- Energy and housing

- Transport

Indicators used on a regular basis

Consumer behaviour indicators

- [Automotive fuel spending](#): weekly data from aggregated, anonymised card spending data and road fuel price statistics

- [Direct Debit failure rate and average transaction amount](#): monthly anonymised and aggregated Direct Debit data detailing average Direct Debit transaction amounts and Direct Debit failure rate

- [National retail footfall](#): daily indices of customer activity in retail destinations at a UK level, using data provided by MRI OnLocation

- [Revolut debit card transactions](#): weekly card spend data of debit card users from Revolut, a financial technology company with around 6.8 million users in the UK

- [Transactions at Pret A Manger](#): weekly transactional data comparing in-store transactions against the average level of the first four weeks of 2020

- [UK spending on debit and credit cards](#): weekly and monthly CHAPS payments data from the Bank of England made by credit and debit card payment processors to around 100 major UK retail corporates

Business and workforce indicators

- [Advanced notification of potential redundancies:](#) weekly HR1 forms submitted by employers to the Insolvency Service's Redundancy Payments Service

- [Business Insights and Conditions Survey (BICS)](#): a voluntary fortnightly business survey to deliver real-time information to help assess issues affecting UK businesses and the economy

- [Company incorporations, voluntary dissolutions and compulsory dissolutions](#): weekly Companies House data for company incorporations, voluntary dissolutions, and compulsory dissolution first gazettes in the UK

- [Online job advert estimates](#): weekly online job advert indices covering the UK job market, using data from job advert aggregating website Adzuna

- [Sales and jobs in small businesses](#): monthly data taken from Xero, a global cloud-based accounting software platform with over 1 million small business subscribers in the UK

- [Value Added Tax (VAT)](#): monthly diffusion indices and new VAT reporters using data from HM Revenue and Customs (HMRC) VAT returns

Energy and housing indicators

- [Energy Performance Certificates (EPCs)](#): weekly data of EPCs for new and existing dwellings in England and Wales

- [Renter affordability for new tenancies](#): monthly rent affordability data calculated as the proportion of monthly income spent on rent for new tenancies as provided by Dataloft

- [System Average Price (SAP) of gas](#): daily and preceding seven-day rolling average changes in gas prices, using the SAP of gas from the National Grid

- [System Price of electricity](#): daily and preceding seven-day rolling average changes in electricity prices, using the system price of electricity from Elexon

Transport indicators

- [Shipping indicators](#): daily and weekly shipping data from exactEarth using the UN Global Platform

- [Traffic camera activity](#): daily traffic camera counts data for busyness indices covering parts of the UK

- [UK flight data](#): daily flights data from EUROCONTROL comprising international arrivals and departures to and from the UK (including Crown dependencies) and domestic UK flights, but excluding overflights (flights that pass over UK territory)

New data and indices are included as and when they become available, either on a stand-alone or regular basis as appropriate, with the relevant methodology information listed on this page.

2 . How we measure real-time indicators

This section details how we seasonally adjust various real-time indicators included in the bulletin. Specific methodology of how we measure each indicator, as well as the strengths and limitations of each indicator, are included in the following sections. Links to more detailed methodology pages are provided where available. This document will be updated regularly as new indicators are added to the bulletin, or as methodological changes are made to existing indicators.

Seasonal adjustment overview

Time series can be broken down into three components that have distinct behaviours:

- the seasonal component

- the trend component

- the irregular component

The seasonal component

This is consistent and systematic variation in the series, which is associated with the time of year. This can be either:

- calendar events (for example, repeated events such as bank holidays or religious dates, or one-off events such as coronations or extreme weather events)

- broad changes over different time periods (for example, weekly, monthly, quarterly, or yearly effects)

The trend component

This represents the underlying direction of the series, which includes the long-term behaviour of the series, and mid-term influences.

The irregular component

This represents unpredictable changes and stochastic noise inherently associated with time series that cannot be attributed to the trend or the seasonal component.

Seasonal adjustment is the process of identifying and removing the seasonal component from a time series, leaving the trend and irregular components. This provides a more accurate understanding of the true direction and behaviour of a time series, as well as easier and more powerful comparisons between, and within, time series, as movements within a series can be altered or masked by the seasonal component. Further information on seasonal adjustment, and how it is used in the Office for National Statistics, can be found in our Seasonal adjustment methodology article.

Real-time indicator seasonal adjustment process

Within the economic activity and social change in the UK, real-time indicators bulletin, several series are seasonally adjusted, and work is continuing to seasonally adjust more series.

First, a series is tested for seasonality using a variety of methods including:

- Kruskal-Wallis, Friedman, and f significance tests

- autocorrelation and partial autocorrelation tests

- plotting periodograms

Definitions and further information about these tests can be found in the Seasonality Tests section of the JDemetra website.

They are tested for seasonality over any applicable time period, which tend to be the following periods:

Weekly

Seasonality is detected if there is consistent variation associated with the day of the week. Many series show consistent heights during the working week, with decreases at the weekend (or occasionally, the reverse of this).

Monthly

Seasonality is detected if there is consistent variation associated with the day or point within the month. Most series that detail payment and purchases data identify increases at the start and end of the month. This is likely to be because pay day occurs at the end of the month for most people in employment.

Quarterly

Seasonality is detected if there is consistent variation associated with the point within the quarter. Some series that detail business activity show quarterly seasonality, as business trading can change throughout each quarter of the year, consistently.

Yearly

Seasonality is detected if there is consistent variation associated with the point within the year. Specific times of year, such as the lead-up to the winter holiday period and subsequent January decline, affect many of the Real-time indicators presented in the bulletin.

If a series is found to be seasonal and stationary (constant mean and variance throughout series), an additive seasonal adjustment model is implemented. Otherwise, the data are transformed (for example, using a log or logit transformation) to make them stationary, and then the seasonal adjustment process is started. To date, all series have either been stationary initially, or have been after transformation. If a series was not stationary after transformation, a multiplicative model would be used to seasonally adjust the series.

After identifying seasonality, a calendar of suitable calendar effects (regressors) is constructed for the time series. Initially all suitable regressors are included, however, not all regressors are suitable for all series. The full suite of regressors that we currently consider include:

- Bank holidays

- Easter period (dates between, and including, Good Friday to Easter Monday)

- Christmas and Boxing Day (if they do not fall on their associated bank holiday)

- Black Friday

- the final Friday of each month

- the final trading day each month

- the final trading day each quarter

- the Platinum Jubilee of Queen Elizabeth II

- the funeral of Queen Elizabeth II

- the Coronation of King Charles III

- officially classified storms or other major weather events

When a calendar is constructed containing all suitable regressors, the raw, unadjusted series is linearised. Linearisation is the process of "cleaning" the raw series, which is done by identifying and removing the effect of each regressor, as well as identifying and removing the effect of outliers. This returns a clean, linearised series with the only seasonal signal being the broad effects that are associated with different time periods.

After linearisation is completed with a calendar containing all regressors, the strength of each regressor is checked. A new calendar is constructed that only contains the regressors that had a statistically significant effect, and the linearisation process is rerun with the reduced calendar.

After this linearisation, the series can be seasonally adjusted. This is done in a stepwise method from the shortest time period to the longest. For example, if a daily series were found to have substantial weekly and yearly seasonal effects, the series would be seasonally adjusted over a weekly time period first, and then yearly.

For high-frequency data (series that contain daily or weekly data) we use an [ARIMA-based fractional airline decomposition model](#) to seasonally adjust the series. For lower-frequency data (monthly series) we typically use an [X-13 ARIMA-SEATS model](#). Specific model specifications vary from series to series and are selected using traditional model selection techniques.

All modelling is done in R statistical software using the RJDemetra or RJDemetra3 suite of packages, where JDemetra+ is developed by The National Bank of Belgium in partnership with Eurostat. RJDemetra, suitable for seasonally adjusting monthly data, is available on CRAN (The Comprehensive R Archive Network). The RJDemetra3 suite, suitable for daily, weekly, or monthly seasonal adjustment, are available from their [open source GitHub repository](#).

Once a series has been adjusted over all time periods that a significant seasonal effect was detected, any level shift outliers (if identified during the linearisation process) are readded to the seasonally adjusted series. This output is considered seasonally adjusted.

Please note that all seasonally adjusted series undergo review every six months to ensure that the seasonal adjustment method is still suitable, and, if necessary, any changes are made to improve the method. This could include altering the time periods over which a series is seasonally adjusted, as well as adding or removing calendar regressors if the significance of their effect changes, or if new events occur which could affect our published series.

Additionally, note that the suite of indictors we publish in the Real-time indicators bulletin have relatively short time series (less than five years), and most have significant periods during which the data were affected by the COVID-19 pandemic. Ideal conditions for seasonal adjustment would contain five years of unaffected data. As a result, and typically with seasonal adjustment, we expect the accuracy of our seasonally adjusted outputs to improve as more data are added to the raw series.

3 . Consumer behaviour indicators

Automotive fuel spending insights

Estimated quantity of automotive fuel demand per average transaction is an indicator used to isolate real demand after adjusting for growth in fuel prices. This indicator captures how consumer demand for fuel changes in response to rising fuel prices per visit at pumps over time.

Average UK retail pump prices for petrol and diesel is an indicator compiled from six automotive fuel retailers (DESNZ).

The data are presented as year-on-year growth to reduce the impacts of seasonality in card spending data. As Official Statistics in development, these data are subject to revisions as our methodology and systems are refined. These data are not adjusted for seasonality.

Information on the methodology, strengths and limitations of these data are available in our Behavioural impact of rising automotive fuel prices on UK consumers QMI.

Direct Debit failure rate and average transaction amount

The aggregated and anonymised dataset is made available to us by Pay.UK and Vocalink. They operate and provide the infrastructure for the UK's retail interbank systems, through which over 4 billion transactions are processed annually.

Both the average Direct Debit transaction amount and Direct Debit failure rate are presented. They are grouped into five categories:

- energy (electricity and gas)

- water

- fitness facilities

- mortgages

- loans

Transactions attributed to these categories are determined by keyword association or associated Standard Industrial Classifications (SIC) 2007 codes. Additionally, overall totals are presented for both average Direct Debit transaction amount and Direct Debit failure rate. These include, but are not limited to, the five categories listed above.

Average Direct Debit transaction amount is the mean monetary value (pounds sterling) of a transaction calculated as the following:

$$Average\ Direct\ Debit\ transaction\ amount = \frac{\sum (Transaction\ value)}{n_{transactions}}$$

All average Direct Debit transaction values are also presented indexed to the average Direct Debit transaction value of 2023. Direct Debit failure rate is the proportion of attempted Direct Debit transactions that fail because of insufficient funds, calculated as the following:

$$Direct\ Debit\ failure\ rate = \frac{n_{failed\ transactions}}{n_{failed\ transactions} + n_{successful\ transactions}}$$

For each of the five listed categories, these calculations are done using the number of transactions, and their values, within each category.

We also present seasonally adjusted series of both the Direct Debit failure rate and average transaction amount (which is indexed to the average seasonally adjusted Direct Debit transaction value of 2023). Both are seasonally adjusted using an X-13 ARIMA-SEATS model, using R and the RJDemetra package.

Additional information on the indicator can be found in our [Direct Debits data reveal fresh economic insights blog post](#).

National retail footfall

MRI OnLocation's footfall data are captured via a network of automated counters located in high streets, shopping centres and retail parks across the UK. The counters employ technology that identifies humans within a defined "zone" and logs each human as a number in a file. The counters operate 24 hours a day, seven days a week, and data are captured continuously. The technology is highly accurate and able to identify individual humans even where there are very large volumes of people.

MRI OnLocation's counters record the volume of activity entering a retail park or shopping centre, or within a town centre. It is not recording footfall into stores, but into retail destinations.

Year-on-year footfall estimates compare the same day rather than date; for example, Tuesday 30 June 2020 is compared with Tuesday 2 July 2019 (2019 was two days ahead of 2020 because of the leap year). However, there are no adjustments for bank holidays. For example, as the date of Easter changes each year, the data will be comparing Easter Sunday in 2019 with a Sunday in 2020 that is not Easter.

MRI OnLocation's footfall data include footfall within three main types of retail destination - high streets, shopping centres and retail parks. It does not include footfall in leisure and sports venues, conference venues, transport interchanges, motorway service stations, art galleries, museums and historic monuments.

Definitions

Overall footfall

The overall footfall is the sum of the average footfall in each destination type (high streets, retail parks, and shopping centres) weighted by their respective footfall volumes.

Shopping centre

A shopping centre is a space, fully owned and managed by a single landlord, which can be fully or partially enclosed, or completely open but does not form part of the public highway. A shopping centre is distinguished from a retail park by a smaller unit size.

High street

High street refers to a town centre rather than a shopping centre (defined previously). It is the central part or main business and commercial area of a town, comprising the high street, which is the traditional site for most shops, banks, and other businesses.

Retail park or shopping park

A retail park or shopping park is a space wholly owned and managed by a single landlord, solely comprising retail warehouse units, and generally comprising a minimum of 30,000 square feet of retail space. Retail parks have a minority of units occupied by traditional high street non-food retailers, while in a shopping park most units are occupied by high street non-food retailers.

Additionally, overall footfall is defined as the sum of the average footfall in each destination type (high streets, retail parks and shopping centres), weighted by their respective footfall volumes.

Revolut debit card transactions

Revolut is a financial technology company with around 6.8 million users within the UK financial payment sector. This granular and timely data source provides insight into the spending patterns of UK consumers that complements the broader overview provided by the CHAPS-based indicator of UK spending on credit and debit cards.

Revolut data are presented on a per-account basis to account for Revolut's high user-growth over time, so that comparisons can be made on a like-for-like basis over a longer time series. Revolut customers tend to be younger and more metropolitan than the average UK consumer, so spending may not be representative of the overall UK macroeconomic situation.

The Revolut spending by sector series are comprised of aggregated and mutually exclusive Merchant Category Codes, which are business attributes that classify businesses dependent upon their primary business category:

- "retail spending" includes clothing, department, mixed retail, services, and household stores

- "food and drink" includes supermarkets, convenience and other food providers

- "entertainment" includes membership clubs, cinemas, ticketed events, sports, galleries, and tourist attractions

- "pubs, restaurants, and fast food" includes pubs, nightclubs, restaurants, and fast food

- "travel" includes airlines, hotels and motoring

- "automotive fuel" includes service stations and automated fuel dispensers

Users should note that card spending over time is pushed upwards by the impacts of both inflation on value of transactions and cash-to-card conversion where there is a shift away from cash spending towards card spending within the financial payment ecosystem. We make no adjustments for these considerations. "Betting" expenditure can be erratic and is omitted from the data as its inclusion would lead to volatility in the spending category "entertainment" that affects user interpretation.

These data are not currently adjusted for seasonality.

The monthly series is generated by taking the unweighted mean of the seven-day average for each day of the month. Where data are indexed, they are indexed to the 2023 average of that series.

Information on the methodology, strengths and limitations of these data are available in our [Using Revolut cardholder data to derive real-time indicators of consumer spending QMI](#).

Transactions at Pret A Manger

These data give indexed values from 10 regions and transport locations: Scotland, Yorkshire, Manchester, Regional Towns, London (Suburban, London; West End, London; City Worker, London; Airports, London; Stations and Regional Stations). The index shows total weekly till transactions at Pret A Manger stores as a proportion of the company's average weekly level in the first four weeks of 2020, between 3 January 2020 and 30 January 2020. These data are delivered weekly from Friday to Thursday in a week-ending format.

The Pret A Manger index is used in the real-time indicators bulletin as a proxy of consumer spending, high street footfall and passenger movement around the UK. The index offers no national figure, and because of the backward-looking structure of the index, new Pret A Manger stores are omitted. Finally, the "Yorkshire" region is comprised of four stores, meaning it is considerably more volatile than other regions.

Definitions:

London: City Worker

Pret A Manger stores in the Square Mile and Canary Wharf.

London: West End

Pret A Manger stores in popular retail areas within Central London.

London: Suburbs

Pret A Manger stores within the City of London, but outside Zones 1 and 2; predominantly in residential areas of London.

London: Stations

Pret A Manger stores in three large train stations in London.

London: Airports

Pret A Manger stores in four major airports in London.

Regional Towns:

Pret A Manger stores in towns not listed in the index.

Regional Stations:

Pret A Manger stores in stations in towns not listed in the index.

UK spending on debit and credit cards

The Bank of England identifies regular daily CHAPS payments from merchant acquirers to approximately 100 "large" retail corporates within its transactional data. A large retailer is defined for this purpose as one with a minimum of £5 million card purchase proceeds received through CHAPS in 2020. The large retailers are each mapped to one of 15 different retail sectors (comparable with the Office for National Statistics (ONS) Consumer Trends series), based on their primary business.

These 15 retail sectors have, in turn, been mapped to four consumption category series:

- "staples" refers to companies that sell essential goods that households need to purchase, such as food and utilities

- "work-related" refers to companies providing public transport or selling petrol

- "delayable" refers to companies selling goods whose purchase could be delayed, such as clothing or furnishings

- "social" refers to spending on travel and eating out

Each sector in the series has been weighted according to its (relative) share of annual UK household consumption in Quarter 4 (Oct to Dec) 2019. Users should note that the "work-related" and "social" CHAPS series have been withdrawn in 2024 because of sample population issues. We will continue publishing the aggregate, staple and delayable series while we are undertaking a review of the component series and will provide an update in due course, and the "work-related" and "social" CHAPS series will remain in the dataset. Please note that the "work-related" and "social" categories still contribute to the "aggregate" series.

A monthly CHAPS index is also produced. The monthly data time series is calculated by the ONS, rather than being an additional series that is produced and validated by the Bank of England.

Users should note that daily payment data are the sum of card transactions processed up to the previous working day, so there is a slight time lag when compared with real-life events on the chart.

We also present seasonally adjusted series for both the daily and monthly series. Because the daily series consists of 7-day rolling averages, each Thursday is taken from each week as the representative day for that week, and the series are adjusted in the manner of weekly series. The weekly seasonal adjustment uses an ARIMA-SEATS fractional airline decomposition model, using the RJDemetra3 suite of packages in the R statistical software. While the seasonal adjustment of the monthly series uses an X13 ARIMA-SEATS model, using the RJDemetra package, also within R.

More information, including the mapping of the retail sectors to the four consumption category series and the weighting into the total spending on credit and debit cards series, is available on the Bank of England's CHAPS Faster Indicators methodology article.

4 . Business and workforce indicators

Advanced notification of potential redundancies

HR1 forms are used by employers to notify the Insolvency Service's Redundancy Payments Service of potential redundancies. They are only required when firms wish to make 20 or more redundancies. This indicator presents the number of intended redundancies from filed HR1 forms.

HR1 form submissions can include contractual changes, changes to pensions, or employees being transferred to new sites. As we are only concerned with permanent dismissals, we apply an automated cleaning process to remove cases that are not permanent dismissals. Firstly, all cases with fewer than 20 proposed dismissals are excluded from the data as HR1 forms should only be submitted if the employer intends to make 20 or more dismissals. Secondly, a case is excluded if the reason for the dismissals includes any of the following words: pension, contractual, terms and conditions, transfer, move, or TUPE (Transfer of Undertakings (Protection of Employment)).

Users should note that where data are indexed, they are indexed to the 2023 average of that series. Additional information on the methodology used for this indicator, along with the associated strengths and limitations, are available in our [Developing an indicator of potential redundancies using Insolvency Service data methodology](#).

Business Insights and Conditions Survey (BICS)

The Business Insights and Conditions Survey (BICS) is voluntary, and responses are qualitative. This means that data should be treated with caution as results reflect the characteristics of those who responded and not necessarily the wider business population.

The survey was initially designed to give an indication of the impact of coronavirus (COVID-19) on businesses and a timelier estimate than other surveys. It has now evolved to ask a wide range of timely and policy questions.

More information on the strengths and limitations of the BICS data are available in the [Business Insights and Conditions Survey (BICS) Quality and Methodology Information](#).

Company incorporations, voluntary dissolutions and compulsory dissolutions

Weekly indicators of company creations and closures are based on data from [Companies House](#), working in collaboration with the Office for National Statistics (ONS). These include weekly series of the number of company incorporations (creations), voluntary dissolutions (one type of closure) and compulsory dissolution first gazettes (a second type of closure) per working day in that week, along with a quarterly back series to Quarter 1 (Jan to Mar) 2019.

The indicator is high frequency and timely, and provides the only weekly data on company creations and closures available for the UK. It is published six days after the reference period, but these data are subject to revision and are not entirely consistent with quarterly official statistics publications from Companies House.

More detailed information on data source, methodology, quality, the strengths and limitations of the weekly indicators of company incorporations, voluntary dissolutions and compulsory dissolution first gazettes is available in our [Weekly indicators of company creations and closures from Companies House methodology: August 2020](#).

Online job advert estimates

These estimates cover the UK job market and are created based on job adverts provided by Adzuna. These data include information on several million entries live from February 2018 broken down by job category and by region, based on the information included in the job advert.

The Adzuna categories do not correspond to Standard Industrial Classification (SIC) categories, so these values are not directly comparable with the Office for National Statistics' (ONS) Vacancy Survey.

More information on the methodology used to compile these estimates, and their strengths and limitations, is available in our [Using Adzuna data to derive an indicator of weekly vacancies: Experimental Statistics methodology](#).

Sales and jobs in small businesses

Data on sales and jobs in small businesses are taken from Xero, a global cloud-based accounting software platform with over 1 million small business subscribers in the UK.

Sales are measured based on the face value of invoices issued by firms within each month (including via apps attached to the Xero account). Subscriber base changes are accounted for by measuring sales growth in one specific month using the sample of firms that also operated in the previous year.

Jobs are measured by the number of unique employees of a business who are issued a payslip in a month. One individual is counted as one "payslip" in a particular month, if they worked at least one hour in that specific month. The sample of small businesses is restricted based on the employment size band, and erroneous payslips or those identified for non-wage purposes are excluded. Percentage change in payslips is calculated using the weighted average of within-firm year-on-year growth in jobs. The calculation accounts for subscriber changes and shutdowns. Users should note that this measure did not capture employees who were on furlough, for a whole month or longer, during the coronavirus (COVID-19) pandemic.

This definition of sales and jobs does not align with definitions of official estimates of turnover and employment.

Small businesses are defined by Xero as organisations with fewer than 20 employees.

The source data are publicly available through the Xero Small Business Insights programme.

Value Added Tax (VAT)

VAT indicators are split into two sections: diffusion indices and reporting behaviours.

Diffusion indices

Diffusion indices show changes in business turnover (the total value of all sales and other outputs excluding VAT) and expenditure (the total value of purchases and all other inputs excluding VAT) month-on-month. The growth rates are analysed as month-on-month a year ago, and month-on-month non-seasonally adjusted (NSA) and seasonally adjusted (SA).

To summarise, for all VAT returns values where we can find a match in both reference periods, we apply:

$$Diffusion\ index = \frac{Number\ growing\ -\ Number\ declining}{Total}$$

The diffusion index is therefore bound between 1 and negative 1.

VAT returns where both returns are zero, or implausible information is submitted, are discarded.

To bind the SA values between 1 and negative 1, and prevent implausible SA values in April to June 2020, we apply a modified logit transform, as follows:

$$Index_{priorSA} = \ln\left(\frac{Index_{NSA^{+1}}}{1 - Index_{NSA}}\right)$$

We then seasonally adjust using the X-13ARIMA-SEATS method. To produce the final SA value, we untransform as follows:

$$Index_{SA} = \frac{\left(e^{Index_{Post\ SA}}\right) - 1}{\left(e^{Index_{Post\ SA}}\right) + 1}$$

These transformations have minimal impact on the series prior to 2020.

We have used the standard deviations of the seasonally adjusted series to calculate upper and lower 95% confidence limits. These are presented in the bulletin to help users identify statistically significant results in the diffusion indices.

Weighted diffusion indices

The total diffusion index is a sum of the individual sector diffusion indices, which are weighted by the proportion they contribute to total GDP. Weighting the individual industry indices prevents a single industry from contributing disproportionately, or skewing, the average reported change of the total diffusion index.

The seasonally adjusted diffusion index of each industry is multiplied by that industry's weight (the industry contribution to GDP), and divided by the sum of all industry weights (total GDP):

$$Index_{weighted} = \frac{Index * GDP\ Contribution}{Total\ GDP}$$

This calculation is done for each of the four industries, which are then summed to calculate the total diffusion index. Because it is comprised of multiple sub-categories, this is also done within the "services" industry category.

Industries are weighted based on the Blue Book values of Gross Value Added industry weight time series dataset. The Blue Book, and therefore the industry weightings, are updated annually.

Flash estimates

These estimates include VAT reporters received in the first seven days after the reporting period. Given that there are normally five working days in the first seven days of the month, the data content is relatively consistent month to month. This cut-off date was chosen to increase timeliness, but it was also the earliest date that the main economic sectors provided a sufficiently accurate indicator of economic performance.

For more information on how the reporting periods are derived, see VAT reporting periods in Section 2 of our VAT methodology article.

Reporting behaviours

Reporting behaviours cover counts of all VAT reporters, regardless of reporting period or record type. These are broken down by section and grouped into sections based on the VAT unit's primary Standard Industrial Classification (SIC).

The stated month is when the return was received by HM Revenue and Customs (HMRC), not the reporting period.

New reporters are counts of VAT reporters that have not previously submitted a VAT return, broken down by section.

Record type is all VAT reporters, broken down by whether the business is paying tax, reclaiming tax, re-inputting to pay or reclaim tax (correcting a mistake prior to submitting the return), or submitting a replacement to pay or reclaim tax (correcting a mistake after submitting the return).

After this, we seasonally adjust using an additive decomposition under the X-13ARIMA-SEATS method.

Accuracy of diffusion indices

Here we consider the revisions between the monthly VAT indices for M1 (data available at the end of the reporting period), day seven (data received up to seven days after the reporting period) and M2 (data received up to one month after the reporting period). This gives confidence as to the consistency of different publication vintages.

Revisions between different vintages of diffusion indices have a standard deviation of less than 0.05 in the four industries (agriculture, production, construction, and services) between day seven and M2 estimates. Industries with fewer responders tend to show a larger expected revision. There is a small tendency to revise upwards for monthly turnover and a larger tendency to revise downwards in the monthly expenditure indices.

Comparison of VAT flash (day 7) estimates with month 1 and month 2 estimates
Revisions between day 7, month 1 and month 2 VAT diffusion indices, revisions between average indices and standard deviations

Monthly	Month 1 - Month 2, average revision	Month 1 - Month 2, standard deviation	Day 7 - Month 2, average revision	Day 7 - Month 2, standard deviation
Total Turnover (SA)	not available	not available	0	0.02
Agriculture Turnover (SA)	0.01	0.07	0	0.02
Production Turnover (SA)	not available	not available	0.01	0.04
Construction Turnover (SA)	0	0.1	0.01	0.03
Services Turnover (SA)	not available	not available	0	0.03
Total Expenditure (SA)	not available	not available	-0.01	0.01
Agriculture Expenditure (SA)	-0.02	0.06	-0.02	0.02
Production Expenditure (SA)	not available	not available	0	0.04
Construction Expenditure (SA)	not available	not available	-0.01	0.03
Services Expenditure (SA)	0	0.1	0	0.02

Source: HMRC Value Added Tax returns

More quality and methodology information is available in our [Faster indicators of UK economic activity: Value Added Tax returns article](#).

5 . Energy and housing indicators

Energy Performance Certificates

An Energy Performance Certificate (EPC) contains information on the energy efficiency of a property and is a requirement when a property is built, sold or rented in England and Wales. New buildings or conversions of existing buildings require an EPC once construction has been completed. To note, an EPC is valid for 10 years and can be reused as many times as required during this period. Therefore, where a property holds a valid EPC and is sold or let, it will not require a new EPC and will not appear in the data.

These data are based on the number of total EPCs lodged on the register held by the Department for Levelling Up, Housing and Communities (DLUHC). In accordance with regulations, DLUHC cannot alter data that, after an assessment, has been lodged on the register. Please note, the EPC figures used in our real-time indicators release will include cancelled or not for issue reports and multiple reports on a single Unique Property Reference Number, so individual buildings may have more than one certificate.

These administrative data are subject to continuing quality investigation and improvement. They have been released because they have been judged to be of immediate value to interested parties and to encourage user feedback.

The weekly data will differ from daily and monthly figures published on the [Landmark Information website](#) because of overlaps of weekly figures (that is, Week 27 includes five days in July as well as days in June).

Further technical information on data quality and technical notes are available in the [Energy Performance of Buildings Certificates quarterly statistics collection on GOV.UK](#).

A consolidated [glossary of all the terms related to Energy Performance of Buildings Certificates is available on GOV.UK](#).

Renter affordability for new tenancies

Data are provided by [Dataloft](#), a housing market economics consultancy that covers approximately 40% of all private rentals in the UK. This is based on Census 2021 estimates of private rental dwelling stock, and assumptions of tenancy length. The data presented are an affordability ratio, calculated as a proportion of new renters' income that is spent on rent. If the affordability ratio increases, it reflects a worsening affordability as tenants are having to spend a higher proportion of their income on rent.

This is only calculated using new tenancies, from approximately 30,000 new tenancies and 50,000 new tenants each month. Income is defined as adjusted person-level gross incomes, as stated by renters, and is calculated based on each individual renter (not households). The data from each month is presented in the Real-time Indicator bulletin in the following month.

These figures exclude guarantors, and tenants with a stated annual income lower than £10,000 or higher than £500,000. Additionally, these figures are not consistent with those in our [Private rental affordability bulletin](#). This is because they are calculated with different data coverage and using different methods, and may not be representative of the UK market as a whole. For example, the Office for National Statistics (ONS) data produce estimates using both new and existing lets, whereas Dataloft estimates are for new lets only. Caution is advised when inferring trends in the rental market, as these estimates reflect affordability at snapshots in time.

System average price (SAP) of gas

Data are collected from [Data Item Explorer from the National Grid](#). The daily SAP determines the futures price and is therefore used to indicate supply constraints and demand pressures. For this statistical bulletin, the actual day value (p/ kWh) and the preceding seven-day rolling average (p/ kWh) of these values are reported. These data are accessed weekly, in a Monday-to-Sunday format.

Data are recorded on a Sunday and are published in the Real-time Indicators bulletin the following Thursday. These data can be subject to extreme within-day trading prices, which can lead to skewing of actual traded prices. While these data reflect spot prices on the day, traders can opt for future contracts where the buyer and the seller agree the market-determined price for gas for a future date. Other markets also exist for wholesale gas trading in Great Britain. Despite this, the scope of SAP is sufficient to provide a representation of supply constraints and demand pressures in the gas industry.

System price of electricity

Data for the system price of electricity are collected from the [Elexon data portal](#). The system price of electricity is used to settle the difference between the contracted generation or consumption of electricity, and the actual amount of electricity that was generated or consumed. Where companies have generated more, or less, electricity than the quantity of electricity that customers consume, the difference is balanced by the National Grid Transmission System, which buys or sells electricity equal to the difference. The system price of electricity reflects the cost incurred by the National Grid in this process. More information about the system price of electricity and how prices are calculated can be found on the [Elexon website](#).

The system price of electricity is calculated at a half-hourly interval, which we average over a 24-hour period to calculate the daily average (p/ kWh). This is then averaged over a shifting seven-day period, to calculate the preceding seven-day rolling average (p/ kWh). Data are recorded on a Sunday and are published in the Real-time Indicators bulletin the following Thursday Prices may change after initial reporting because of a submission, or resubmission, of data by the National Grid.

Additionally, the fluctuations in electricity prices presented here do not directly affect consumer bills. This is because Ofgem takes wholesale price into consideration when determining the cost of energy. Ofgem publishes the official UK wholesale price on a monthly basis, which is available on the [Ofgem website](#).

6 . Transport indicators

Shipping indicators

These weekly and daily real-time shipping indicators detail the estimated shipping activity across the UK at several major ports. Ships are recorded entering one of the monitored ports, and are classified as either a "cargo and tanker ship" or "other". These values are summed for each port, and as a total across the UK. Users should also note that values for individual ports lower than six are supressed to prevent secondary disclosure of individual vessels. More quality and methodology information is available in [Faster indicators of UK economic activity: more timely and relevant shipping indicators](#).

We also present weekday adjusted and trend values for the UK-wide totals. The weekday adjusted and trend estimates are generated using a version of the seasonal adjustment method TRAMO-SEATS modified to deal with higher-frequency time series. This method is available using the RJDemetra3 suite of packages. Users should note that, unlike some of our other indicators, the seasonally adjusted shipping series are only adjusted over a weekly basis. This removes the effect of the day-of-the-week, however, the seasonal effects of other time periods (such as across a month or year) or calendar events (such as storms or holidays) remain in the series. As a result, we consider these series to be weekday adjusted as opposed to seasonally adjusted.

Users should note that there was a comprehensive overhaul of our data collection and processing systems, resulting in a level shift across the entire time series when the data were rereleased in November 2023. While the overarching trends observed in the dataset have largely remained consistent with previous releases, we strongly advise against drawing direct comparisons between data from releases after November 2023 and before June 2023.

Traffic camera activity

Traffic cameras are a widely and publicly available data source allowing transport professionals and the public to assess traffic flow in different parts of the country via the internet. The UK has thousands of publicly accessible traffic cameras, with providers ranging from national agencies to local authorities.

The images that traffic cameras produce are publicly available, low resolution, and do not permit people or vehicles to be individually identified. They allow for the construction of counts of objects (such as pedestrians or cars) that capture the levels of activity at different times of day throughout the entire week.

The regional coverage provided within the data is constrained by the intermittent availability of the traffic camera feeds providing the data. The cameras are clustered in towns and cities, with the data consistently available in London and the North East. The lower concentration of traffic cameras in less urban areas results in a lack of representation for rural areas. Currently we do not produce any series for Wales or Scotland.

Accuracy depends on external factors. Accuracy of detecting different object types depends on many factors outside our control. The positioning of cameras can make it difficult to detect certain object types, for example, and the image quality depends on weather and technology.

Counts are always underestimated. Sensors placed on roads can be used to count every vehicle passing by the sensor, but traffic cameras only provide images at regular intervals and depend on the accuracy of the machine-learning model for counting objects. Therefore, this source is more suited for estimating trends rather than absolute numbers.

The weekday-adjusted and trend estimates are generated using a version of the seasonal adjustment method TRAMO-SEATS modified to deal with higher frequency time series. This method is available using the RJDemetra3 suite of packages. Users should note that, unlike some of our other indicators, the seasonally adjusted traffic camera activity series are only adjusted over a weekly basis. This removes the effect of the day-of-the-week, however, the seasonal effects of other time periods (such as across a month or year) or calendar events (such as holidays) remain in the series. As a result, we consider these series to be weekday adjusted as opposed to seasonally adjusted.

More methodology information on the compilation of these time series is available in our Data Science Campus blog.

UK flight data

These data are daily flight figures from the European Organisation for the Safety of Air Navigation (EUROCONTROL). Daily flight numbers for the UK alongside other countries are available in EUROCONTROL's dashboard. EUROCONTROL is a pan-European, civil-military organisation dedicated to supporting European aviation. Its Aviation Intelligence and Performance Review Unit provides independent collection and validation of air navigation services performance-related data and intelligence gathering.

The flights data include international arrivals and departures to and from the UK (including crown dependencies) and domestic UK flights, but exclude overflights (flights that pass over UK territory). They capture all flight movements that operate under Instrument Flight Rules (IFR), where the pilot uses instruments in the flight deck to control, guide and adjust the plane. This includes commercial flights carrying passengers and cargo, as well as non-commercial flights such as private and military flights.

Data from EUROCONTROL do not include information on the volume of passengers or cargo carried on UK flights. Especially in the context of the coronavirus (COVID-19) pandemic, flights might not be operating at full capacity and therefore trends in passengers and cargo will differ from trends in flights presented here.

7 . Related links

Economic activity and social change in the UK, real-time indicators
Bulletin | Released weekly
Early data and analysis for UK economy and society. Includes activity and change in business, spending, travel and jobs using rapid-response surveys, novel data sources and methods.

Using Adzuna data to derive an indicator of weekly vacancies: Experimental Statistics
Methodology | Last updated on 14 June 2021
Methodology information for online job advert indices covering the UK job market. These are data created as part of the latest real-time indicators release.

Weekly indicators of company creations and closures from Companies House methodology
Methodology | Last revised 16 September 2021
Methodology information on the weekly indicators of UK company incorporations and voluntary dissolutions using data from Companies House.

Business insights and impact on the UK economy
Bulletin | Released fortnightly
The impact of challenges facing the economy and other events on UK businesses. Based on responses from the voluntary fortnightly business survey (BICS) to deliver real-time information and help assess issues affecting UK businesses and economy, including financial performance, workforce, trade, and business resilience.

Public opinions and social trends, Great Britain
Bulletin | Released fortnightly
Social insights on daily life and events, including impacts on health and well-being, the cost of living, and goods shortages from the Opinions and Lifestyle Survey (OPN).

Faster indicators of UK economic activity: more timely and relevant shipping indicators
Blog | Released on 19 November 2019
Background and methodology information for the weekly and daily shipping data. These are data created as part of the latest real-time indicators release.

Faster indicators of UK economic activity: Value Added Tax returns
Blog | Released on 18 March 2019
Background and methodology information for the Value Added Tax (VAT) diffusion indices and new VAT reporters. These are data created as part of the latest real-time indicators release.

8 . Cite this methodology

Office for National Statistics (ONS), released 2 April 2024, ONS website, methodology, Economic activity and social change in the UK, real-time indicators methodology