

Article

# Research Output: Economic activity, faster indicators, UK: September 2019

This is a timely release of new, faster indicators of economic activity constructed from novel data sources.

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# 1 . Disclaimer

These research outputs are part of the [Faster indicators of UK economic activity](#) project and are not [official statistics](#). The indicators are still in development and not yet fully in production. We are making these data available at an early stage to invite feedback and commentary on their further development.

## 2 . Main points from the latest data

- In today's publication, we are introducing the number of visits to UK ports as an additional measure of traffic in UK ports.
- This release contains for the first time: Value Added Tax (VAT) quarterly diffusion indices for Quarter 3 (July to Sept) 2019 for all industrial sectors; VAT monthly diffusion indices for September 2019 in three industrial sectors; VAT monthly diffusion indices for August 2019 in all other industries and for the total all-industries measure; new VAT reporters and record-type indices for September 2019; and data on shipping and road traffic by port in August 2019.
- The all-industries quarter-on-quarter turnover diffusion index was negative 0.03 in Quarter 3 2019, slightly below its historical average; this means there were slightly more firms reporting a decrease in turnover between Quarter 2 (Apr to June) 2019 and Quarter 3 2019 than the number of firms reporting an increase in turnover between the two periods.
- The quarter-on-quarter turnover diffusion index for the services industry was negative 0.02 in Quarter 3 2019, slightly below its historical average.
- The quarter-on-quarter turnover diffusion indices for agriculture, construction and production were also negative in Quarter 3 2019.
- Initial monthly VAT indicators for September were mostly slightly above or around their historical averages.
- The number of new VAT reporters decreased in September 2019 to its lowest level in two years.
- The average road traffic counts for major roads in England decreased slightly for the two longest vehicle categories, those over 11.66 metres (for example, larger coaches) and those between 6.6 metres and 11.66 metres (for example, buses), in August 2019.
- The number of unique ships visiting important UK ports was broadly unchanged in August 2019, while both the total number of visits and time in port decreased in August 2019.

## 3 . Data analysis

### VAT heatmap and commentary

**Figure 1: The VAT quarter-on-quarter turnover diffusion indices were slightly below their historical averages in 2019 Q3**

UK, Quarter 1 (Jan to Mar) 2008 to Quarter 3 (July to Sept) 2019

The Value Added Tax (VAT) quarter-on-quarter turnover diffusion indices were slightly below their 2008 to 2018 averages (light red) in Quarter 3 (July to Sept) 2019. This was true for the indices covering each of the major industrial sectors (agriculture, construction, production and services) individually and for the index containing firms from all industries.

The quarter-on-a-year ago diffusion indices capturing all-industries together and the construction, production and services industries separately were all around their 2008 to 2018 averages (light grey) in Quarter 3 2019; the measure capturing the agricultural industries was slightly below its historical average.

Initial monthly VAT indicators for September were mostly slightly above (light teal) or around their historical averages. Throughout Quarter 3 2019, there were no indicators that had values considerably above (dark teal) or below (dark red) their long-run averages.

Only three industries have a sufficient number of reporters to be able to compile monthly diffusion indices within a month of the reporting period, which is September 2019 in this release (see the [Quality and methodology section](#) for more information):

- agriculture, forestry and fishing
- construction
- wholesale and retail trade

Monthly diffusion indices for other industries and the all-industries measure, containing many more reporters, are available up to August 2019 in this release. For the retail industry, it should be noted that the official [retail sales figures](#) for September 2019 have already been released.

The month-on-month turnover diffusion indices in September 2019 showed values for the agriculture, forestry and fishing and wholesale and retail trade industries around their historical averages, while the value for construction was slightly above its historical average.

The number of new VAT reporters in September 2019 was around its 2008 to 2018 average. The number of firms filing repayment claims, re-input returns or replacement returns were at similar levels in September 2019 to those they had been in August 2019 relative to their historical averages.

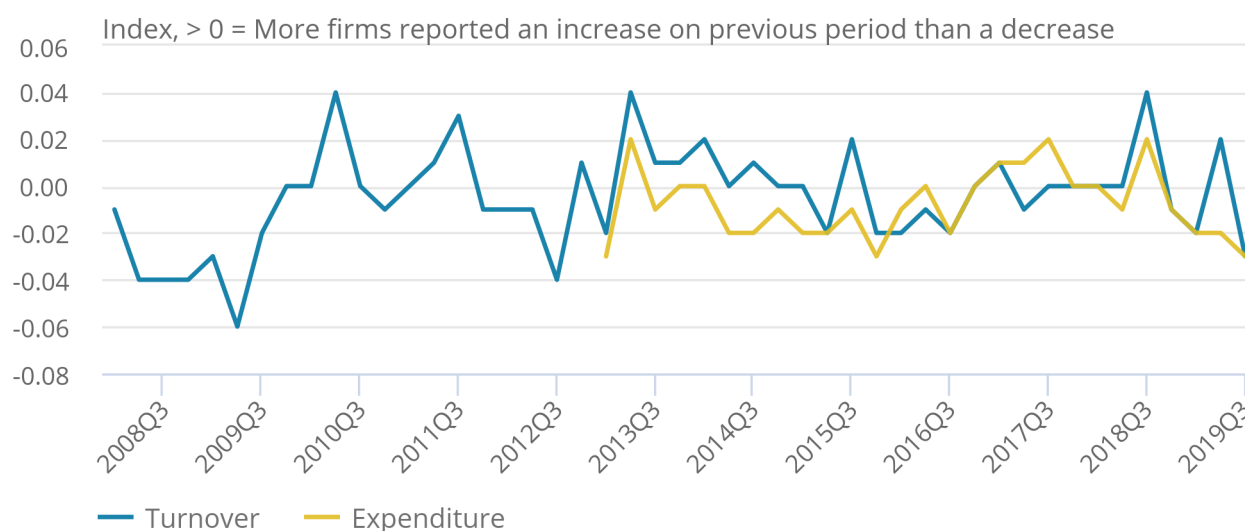
The heatmap is a useful visualisation tool to look across the indicators for a common signal. It can also help in identifying changes in particular indicators, which are worth investigating in more detail, as in Figures 2 to 6.

**Figure 2: The all-industry quarter-on-quarter turnover and expenditure diffusion indices were both negative 0.03 in Quarter 3 2019**

Quarter-on-quarter diffusion indices, seasonally adjusted, current prices, all industrial sectors, UK, Quarter 1 (Jan to Mar) 2008 to Quarter 3 (July to Sept) 2019

**Figure 2: The all-industry quarter-on-quarter turnover and expenditure diffusion indices were both negative 0.03 in Quarter 3 2019**

Quarter-on-quarter diffusion indices, seasonally adjusted, current prices, all industrial sectors, UK, Quarter 1 (Jan to Mar) 2008 to Quarter 3 (July to Sept) 2019



Source: HM Revenue and Customs – Value Added Tax returns

Figure 2 puts the latest all-industry quarter-on-quarter turnover and expenditure diffusion indices into a historical context.

The level of the all-industry quarter-on-quarter turnover diffusion index was negative 0.03 in Quarter 3 2019, its lowest level since Quarter 3 2012. The level of negative 0.03 means there were slightly more firms reporting a decrease in turnover between Quarter 2 (Apr to June) 2019 and Quarter 3 2019 than the number of firms reporting an increase in turnover between the two periods.

Looking back to 2012, the path of the all-industry quarter-on-quarter turnover diffusion index may have been impacted by a series of [special events](#) that took place that year, including the London Olympics and extra bank holidays for the Diamond Jubilee.

The all-industry quarter-on-quarter expenditure diffusion index was negative 0.03 in Quarter 3 2019, having been negative 0.02 in the first two quarters of 2019. VAT quarter-on-quarter expenditure indicators are available since 2013. Negative 0.03 is the lowest level the all-industry index has recorded, with it being recorded in Quarter 1 (Jan to Mar) 2013, Quarter 4 (Oct to Dec) 2015 and the latest quarter. VAT expenditure data include intermediate consumption, investment in capital assets and inventories.

Around 250,000 firms contribute towards the Quarter 3 2019 all-industry turnover and expenditure diffusion indices. Considerably more firms contribute towards the quarterly diffusion indices than the monthly diffusion indices, as the majority of firms submit their VAT returns quarterly. The monthly diffusion indices only include firms submitting their VAT returns monthly, while the quarterly diffusion indices also consider firms submitting quarterly VAT returns.

The monthly and quarterly diffusion indices can exhibit different trends as only a subset of firms contribute towards the monthly diffusion indices. Quarterly returns are allocated to the calendar quarter in which two or more of the months lie. For example, a quarterly return covering the period June 2019 to August 2019 will be allocated to Quarter 3 2019.

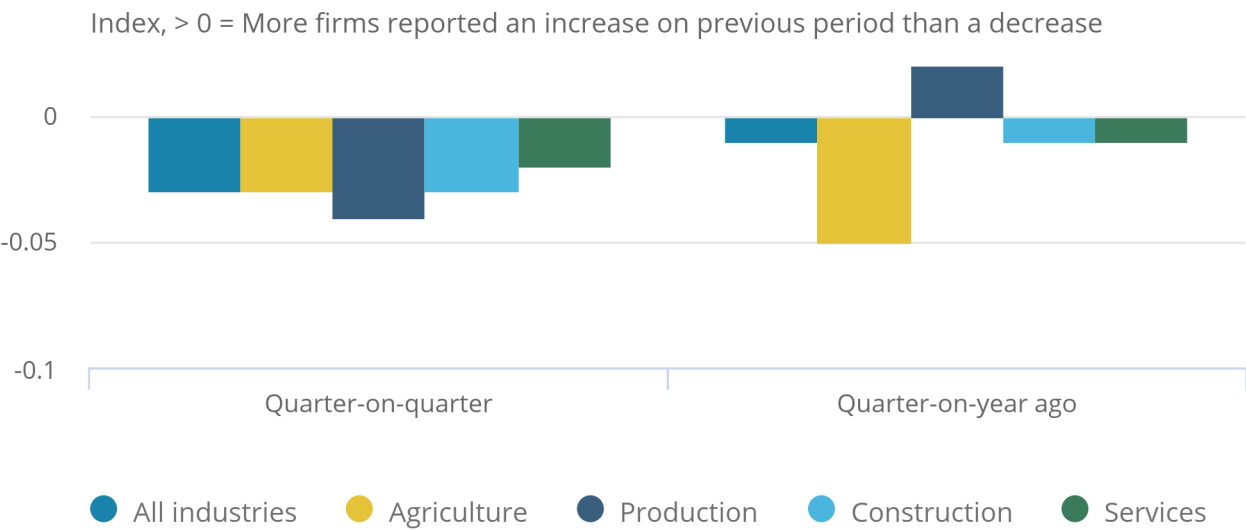
More details on the frequency of VAT returns and the methodology behind the indices can be found in [Faster indicators of UK economic activity: Value Added Tax returns](#). The number of firms contributing towards each of the diffusion indices is published in the [Economic activity, faster indicators, UK dataset](#).

**Figure 3: The VAT quarter-on-quarter turnover diffusion indices were slightly negative for each major industrial sector in Quarter 3 2019**

Turnover diffusion indices for Quarter 3 (July to Sept) 2019, quarter-on-quarter seasonally adjusted and quarter-on-a-year ago non-seasonally adjusted, current prices, UK

Figure 3: The VAT quarter-on-quarter turnover diffusion indices were slightly negative for each major industrial sector in Quarter 3 2019

Turnover diffusion indices for Quarter 3 (July to Sept) 2019, quarter-on-quarter seasonally adjusted and quarter-on-a-year ago non-seasonally adjusted, current prices, UK



Source: Office for National Statistics – Faster indicators

Figure 3 shows the values of the quarterly turnover diffusion indices for each major industrial sector (agriculture, construction, production and services) in Quarter 3 2019.

The quarter-on-quarter turnover index in Quarter 3 2019 was slightly negative in each major industrial grouping, with the production index the lowest at negative 0.04 and the services index the highest at negative 0.02. This means that in all four major industrial groupings there were slightly more firms reporting a decrease in turnover between Quarter 2 2019 and Quarter 3 2019 than the number of firms reporting an increase in turnover between the quarters. More granular industrial breakdowns are available in the [Economic activity, faster indicators, UK dataset](#).

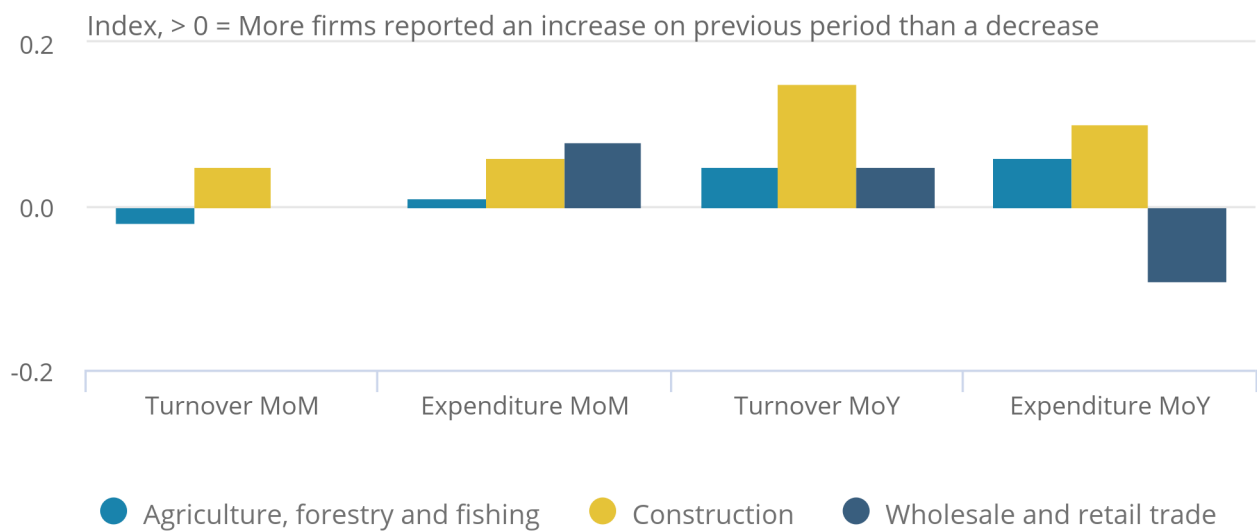
The quarter-on-a-year ago turnover index for agriculture was negative 0.05 in Quarter 3 2019, meaning more agriculture firms reported a decrease in turnover between Quarter 3 2018 and Quarter 3 2019 than reported an increase in turnover between these quarters. In contrast, the quarter-on-a-year ago turnover index for production was 0.02 in Quarter 3 2019, meaning slightly more production firms reported an increase in turnover between Quarter 3 2018 and Quarter 3 2019 than reported a decrease in turnover between these quarters.

**Figure 4: The month-on-month turnover diffusion index was mixed for the three available industrial sectors in September 2019**

Turnover and expenditure diffusion indices for September 2019, month-on-month seasonally adjusted, month-on-a-year ago non-seasonally adjusted, current prices, UK

Figure 4: The month-on-month turnover diffusion index was mixed for the three available industrial sectors in September 2019

Turnover and expenditure diffusion indices for September 2019, month-on-month seasonally adjusted, month-on-a-year ago non-seasonally adjusted, current prices, UK



Source: HM Revenue and Customs – Value Added Tax returns

Notes:

- 1. MoM – Month-on-month
- 2. MoY – Month-on-a-year ago

Figure 4 shows the latest monthly diffusion indices for September 2019 for the three available industrial sectors. These are:

- agriculture, forestry and fishing
- construction
- wholesale and retail trade

The month-on-month turnover diffusion index for construction was 0.05 in September 2019, seasonally adjusted. This means that more construction firms reported an increase in turnover between August 2019 and September 2019 than reported a decrease in turnover between the two periods. The month-on-month turnover diffusion index for agriculture, forestry and fishing was negative 0.02 in September 2019 and was 0.00 for wholesale and retail trade.

The month-on-a-year ago turnover diffusion indices were positive for all three available industrial sectors in September 2019, with the construction industry recording the highest level of the three sectors at 0.15. This means more construction firms reported turnover increasing between September 2018 and September 2019 than reported turnover decreasing between these periods.

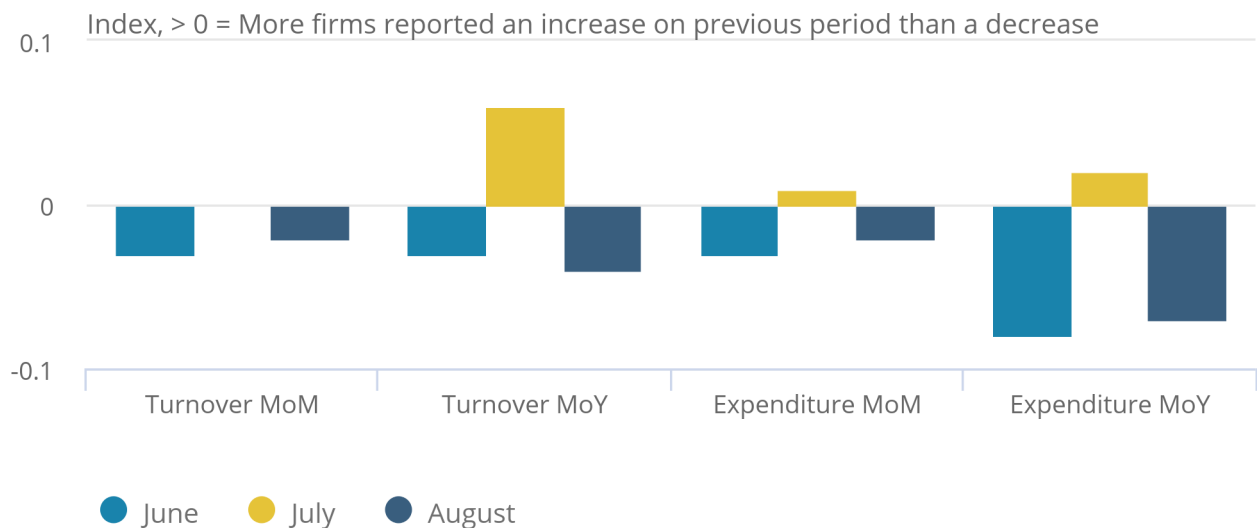
The month-on-month expenditure diffusion indices were positive for all three available industrial sectors in September 2019. VAT expenditure data include intermediate consumption, investment in capital assets and inventories. The month-on-a-year ago expenditure diffusion indices were positive in September 2019 in the agriculture and the construction industry. In contrast, the month-on-a-year ago expenditure diffusion index for the wholesale and retail trade industrial sector was negative 0.09 in September 2019.

**Figure 5: The month-on-month turnover diffusion index for all industries combined was slightly negative in August 2019**

Turnover and expenditure diffusion indices for all industrial sectors for June to August 2019, month-on-month seasonally adjusted, month-on-a-year ago non-seasonally adjusted, current prices, UK

Figure 5: The month-on-month turnover diffusion index for all industries combined was slightly negative in August 2019

Turnover and expenditure diffusion indices for all industrial sectors for June to August 2019, month-on-month seasonally adjusted, month-on-a-year ago non-seasonally adjusted, current prices, UK



Source: HM Revenue and Customs – Value Added Tax returns

Notes:

- 1. MoM – Month-on-month
- 2. MoY – Month-on-a-year ago

Figure 5 shows the latest monthly diffusion indices for June to August 2019 for all industries combined.

The month-on-month turnover diffusion index for all industries combined was negative 0.02 in August 2019, having been 0.00 in July 2019. At negative 0.02 in August 2019, this means that slightly more firms reported a decrease in turnover between July 2019 and August 2019 than reported an increase in turnover between the two periods.

Analysis published in [Faster indicators of UK economic activity: Value Added Tax returns](#) showed that monthly reporters are more likely to be firms making repayment claims, which are often from certain industries. While firms from all industries can contribute towards these indices, these biases mean that the industry distribution of firms in these “all-industries” indices is not equal to that in the economy.



Although these monthly all-industry diffusion measures are only available a month after the agriculture, forestry and fishing; construction; and wholesale and retail trade measures, they have far more firms contributing to them. Firms are continually reporting data for a reporting period, so more firms can be included in the indices that are constructed a month later. For example, the all-industry month-on-month turnover diffusion index has 36,010 firms contributing towards it in August 2019 in comparison with the individual industry month-on-month turnover diffusion indices for September 2019, where:

- 130 firms contribute towards the agriculture, forestry and fishing index
- 60 firms contribute towards the construction index
- 80 firms contribute towards the wholesale and retail trade index

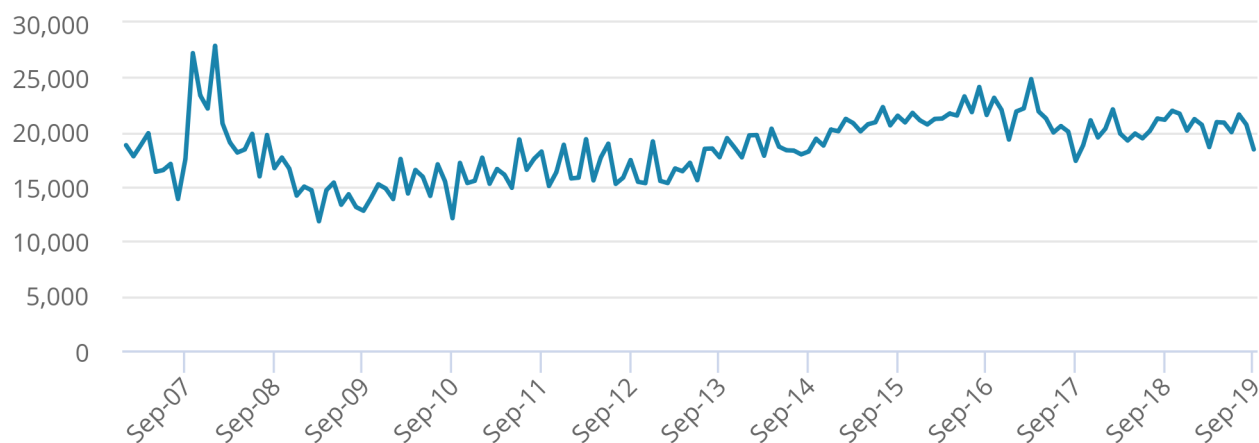
Monthly data to the end of August 2019 are available for other industries in the [Economic activity, faster indicators, UK dataset](#). Each firm contributing to the indices has the same weight regardless of turnover, size or industry.

**Figure 6: The number of new VAT reporters decreased in September 2019 to its lowest level in two years**

Number of new VAT reporters, seasonally adjusted, all industries, UK, January 2007 to September 2019

### Figure 6: The number of new VAT reporters decreased in September 2019 to its lowest level in two years

Number of new VAT reporters, seasonally adjusted, all industries, UK, January 2007 to September 2019



Source: HM Revenue and Customs – Value Added Tax returns

Figure 6 shows the number of new VAT reference numbers appearing in the VAT returns data, seasonally adjusted. In September 2019, the number of new reporters fell by 11.0% to 18,400. This is its lowest level since September 2017, although the level is considerably above the series low of 11,820 in March 2009.

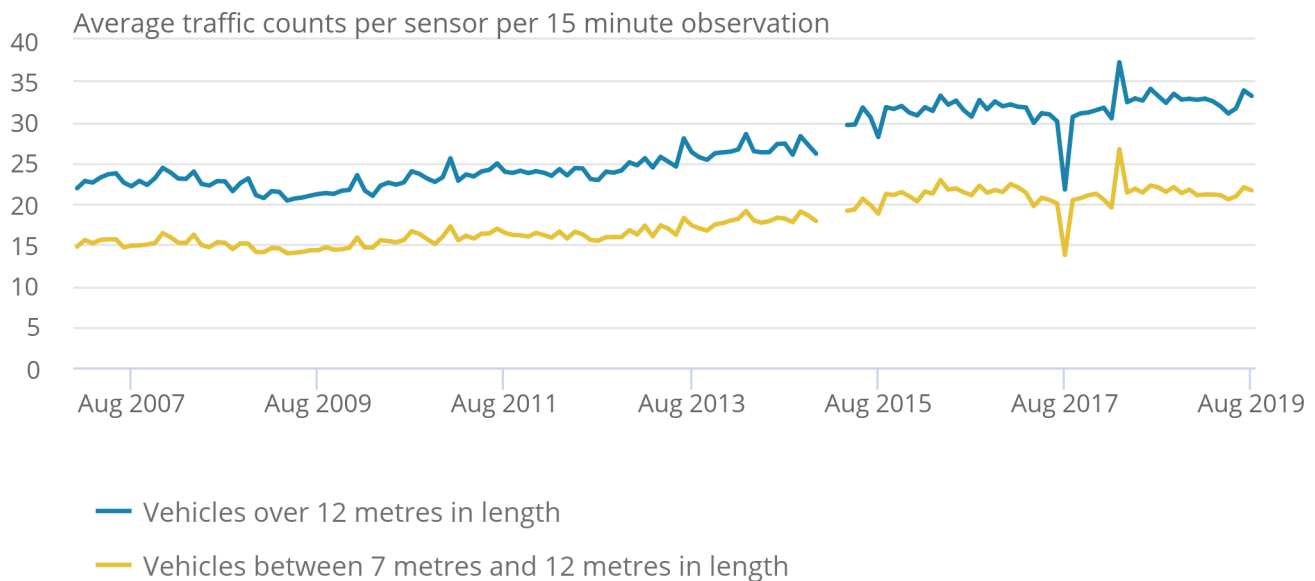
## Road traffic commentary

**Figure 7: The average number of large vehicles passing sensors in major roads in England fell slightly in August 2019**

Road traffic counts by vehicle length, seasonally adjusted, English strategic road network, January 2007 to August 2019

### Figure 7: The average number of large vehicles passing sensors in major roads in England fell slightly in August 2019

Road traffic counts by vehicle length, seasonally adjusted, English strategic road network, January 2007 to August 2019



Source: Highways England – Road traffic sensor data

#### Notes:

1. Data are for vehicles over 11.66 metres in length and between 6.6 metres and 11.66 metres in length.
2. The extreme values in August 2017 and March 2018 are the result of a large fall in the number of working sensors in those months. They should be interpreted with care.

In August 2019, the average traffic counts for major roads in England decreased slightly for the two longest vehicle categories: those over 11.66 metres and those between 6.6 metres and 11.66 metres. The number of vehicles over 11.66 metres in length fell by 2.0% and the number of vehicles between 6.6 metres and 11.66 metres in length decreased by 1.7%. Meanwhile, the average road traffic counts for other vehicle categories increased in August 2019.

We expect larger vehicles (those over 6.6 metres in length, such as lorries) to be more closely related to the movement of goods than smaller vehicles (such as cars), and this is what was found in [Faster indicators of UK economic activity: road traffic data for England](#).

## Shipping commentary

The shipping indicators are non-seasonally adjusted, making any monthly changes harder to interpret. The shipping indicators are available from August 2016 in the [Economic activity, faster indicators, UK dataset](#), but a change in the data provider and methodology means only the data since October 2018 are comparable with the latest data. See Shipping indicators in [Quality and methodology](#) for more details.

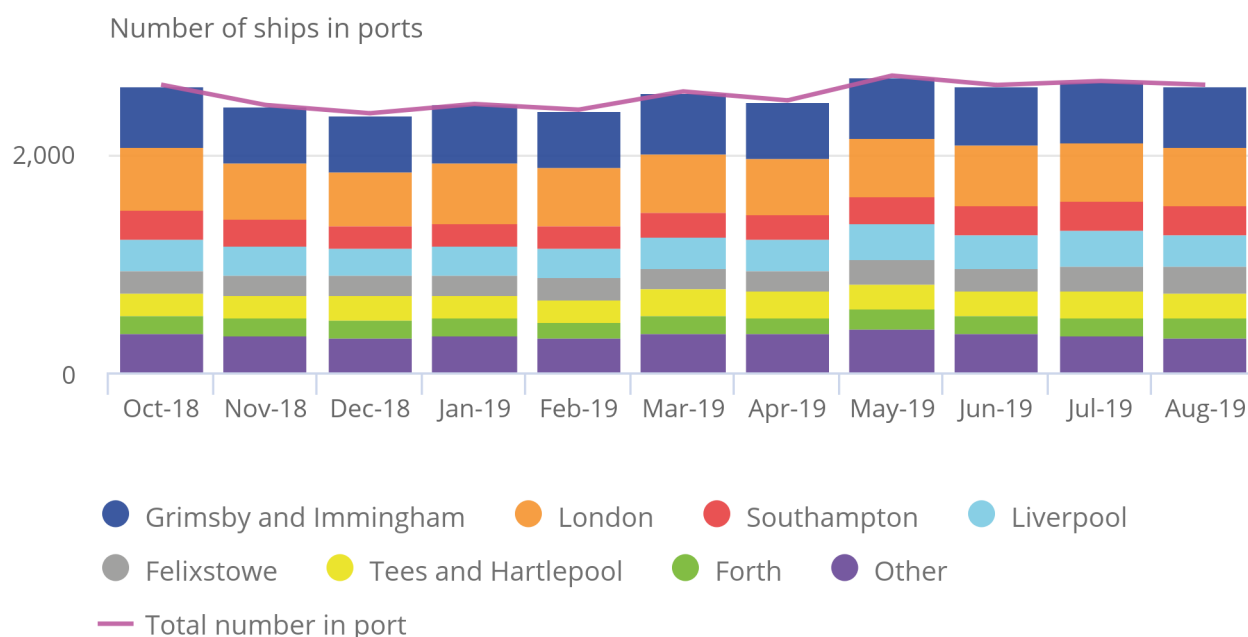
As discussed in [Faster indicators of UK economic activity: shipping](#), we expect the shipping indicators to be related to the import and export of goods. The relationship with imports and exports, and caveats, are presented in more detail in that release.

### Figure 8: The number of unique ships visiting UK ports was broadly unchanged in August 2019

Number of unique ships in ports, non-seasonally adjusted, UK, October 2018 to August 2019

#### Figure 8: The number of unique ships visiting UK ports was broadly unchanged in August 2019

Number of unique ships in ports, non-seasonally adjusted, UK, October 2018 to August 2019



Source: ORBCOMM

Notes:

1. "Other" includes: Dover, Belfast, Holyhead, Larne, Milford Haven and Warrenpoint.

The number of unique ships visiting important UK ports in August 2019 was similar to July 2019.

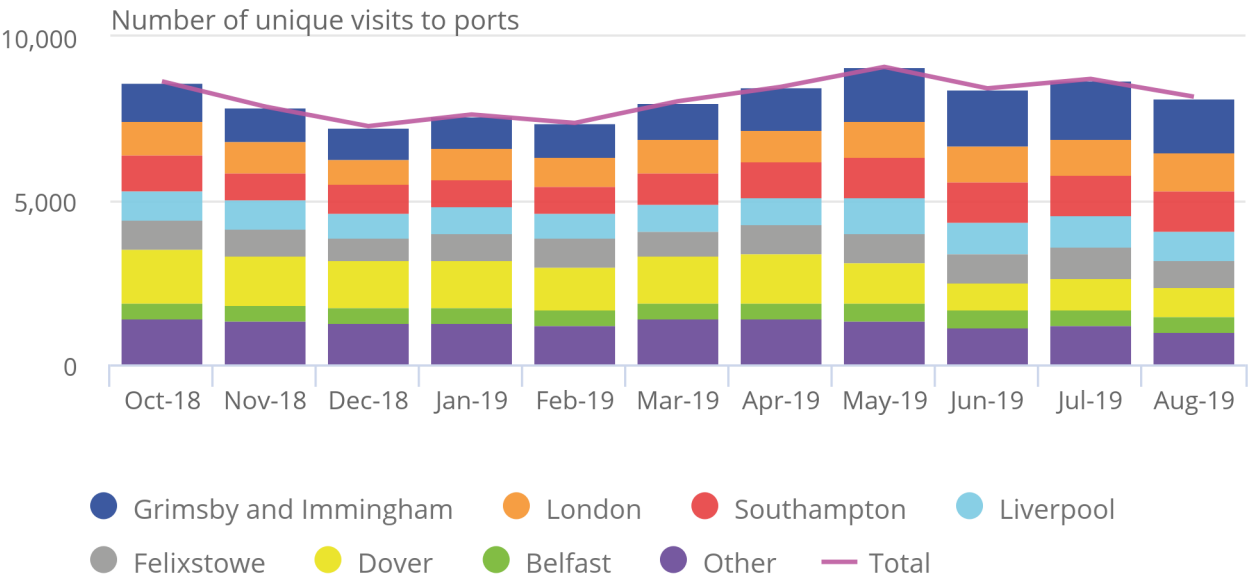
In today’s publication, we are introducing the number of visits to UK ports as an additional measure of traffic in UK ports. This is distinct from the number of unique ships visiting UK ports. The number of visits indicator is expected to be higher than the number of unique ships indicator as the former will capture visits by ships that make multiple trips to a port in a given time period. This is particularly relevant for ports such as Dover where there is a regular passage of ferries and cross-channel ships. It is also expected that the number of visits indicator will contain more noise owing to the presence of small craft. More details on this new indicator can be found in the [Quality and methodology section](#).

Figure 9: The number of visits to UK ports fell in August 2019

Number of visits to ports, non-seasonally adjusted, UK, October 2018 to August 2019

Figure 9: The number of visits to UK ports fell in August 2019

Number of visits to ports, non-seasonally adjusted, UK, October 2018 to August 2019



Source: ORBCOMM

Notes:

1. “Other” includes: Forth, Holyhead, Larne, Milford Haven, Tees and Hartlepool, and Warrenpoint.

Looking back to the start of this year, the number of visits to important UK ports increased for three successive months from February to May 2019 before declining in June 2019. More recently, the number of visits to important UK ports fell 6.2% in August 2019 compared with July 2019. This represents the lowest number of visits since March 2019.

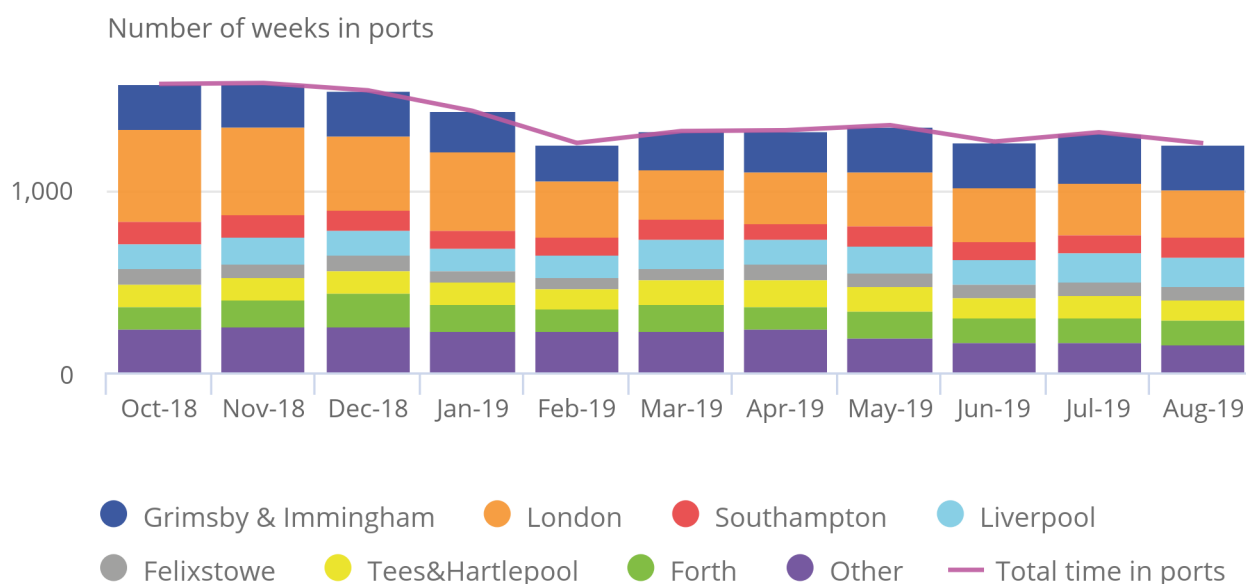
Looking at specific ports, Grimsby and Immingham, Southampton, and London were the ports with the highest number of visits in August 2019. This is broadly consistent with previous months. The biggest contributors to the overall decline in visits were falls in visits at Grimsby and Immingham and Felixstowe.

## Figure 10: Time-in-port decreased in August 2019

Total time spent by ships in ports (time-in-port), non-seasonally adjusted, UK, October 2018 to August 2019

### Figure 10: Time-in-port decreased in August 2019

Total time spent by ships in ports (time-in-port), non-seasonally adjusted, UK, October 2018 to August 2019



Source: ORBCOMM

#### Notes:

1. "Other" includes: Dover, Belfast, Holyhead, Larne, Milford Haven and Warrenpoint.

The total time ships spent in important UK ports fell by 4.5% in August 2019 compared with the previous month and is the lowest since comparable data are available.

## 4 . What are these data?

This release is part of the [Faster indicators of UK economic activity project](#), led by the [Data Science Campus](#). The project is delivering new, faster indicators of economic activity constructed from novel data sources. These indicators are available up to one month in advance of official estimates of gross domestic product (GDP). The release includes indicators constructed from three datasets.

Indicators from HM Revenue and Customs (HMRC) Value Added Tax (VAT) returns:

- monthly diffusion indicators from turnover reported on VAT returns, January 2008 to September 2019
- quarterly diffusion indicators from turnover reported on VAT returns, January 2008 to September 2019
- monthly diffusion indicators from expenditure reported on VAT returns, January 2013 to September 2019
- quarterly diffusion indicators from expenditure reported on VAT returns, January 2013 to September 2019
- VAT reporting types and new VAT reporters, January 2007 to September 2019

Road traffic sensor data for England from Highways England:

- monthly average road traffic counts for major roads in England and English port areas, January 2007 to August 2019
- monthly average road speeds for major roads in England and English port areas, January 2007 to August 2019

Shipping indicators from Automated Identification Systems (AIS):

- monthly counts of the time spent in UK ports from August 2016 to August 2019
- monthly counts of unique ships in UK ports from August 2016 to August 2019
- monthly counts of visits to UK ports from October 2018 to August 2019

We are not attempting to forecast or predict GDP or other headline economic statistics here, and the indicators should not be interpreted in this way. Rather, by exploring big, closer-to-real-time datasets of activity likely to have an impact on the economy, we provide an early picture of a range of activities that supplement official economic statistics and may aid economic and monetary policymakers and analysts in interpreting the economic situation.

Although some of the indicators we have developed track GDP and other economic statistics relatively well over some periods, there is sufficient difference that none should be used to predict GDP on their own. Rather, they should be considered early warning indicators providing timely insight into real activities in the economy, and their potential impact on headline GDP should be interpreted carefully. However, it may be that these indicators have the power to improve the performance of nowcasting or forecasting models, as components of these models.

A full description of the data, methodology and economic analysis, describing the time series, can be found in [Faster indicators of UK economic activity](#) and associated articles.

## 5 . Quality and methodology

### VAT indicators

## Data source

The Value Added Tax (VAT) indicators are constructed from the VAT returns reported to HM Revenue and Customs (HMRC) by all VAT-registered firms. Details on who reports, the timing of reporting, and differences between the approach used for these indicators and the use of VAT returns in [official statistics](#) can be found in [Faster indicators of UK economic activity: Value Added Tax returns](#).

## Constructing the VAT diffusion indices

To construct the VAT diffusion index, all the firms that are in both the time period of interest (time,  $t$ ) and the comparison period (for example, the previous month for month-on-month indices) are selected. Firms with values of zero in both periods are excluded. The index for each time period ( $t$ ) is then constructed using the following formula:

$$VAT\ diffusion\ index_t = \frac{Number\ growing_t - Number\ declining_t}{Number\ growing_t + Number\ declining_t + Number\ unchanged_t}$$

Note that each firm is given equal weight. We do not adjust for the size of firms' activity.

The formula ensures the indices fall in the interval [negative one to one], inclusive. If all firms report an increase in the latest period relative to the base period, the index would be one. If all firms report a decline, the index would be negative one. If an equal number of firms grow and decline, the index would be zero.

## Quality

There are four main quality considerations for the VAT indicators.

Although the number of firms included in the indicator is over 250,000 on average for the all-industry quarterly diffusion indicators, the monthly diffusion indicators contain fewer than 100 firms in some periods. The [number of firms contributing to each indicator](#) are included in the dataset.

Monthly reporters, used in the monthly diffusion indices, are not representative of the balance of firms across the economy, particularly those reporting in month one (within a month). The agriculture, forestry and fishing; construction; and wholesale and retail trade industries dominate the monthly returns in month one. More generally, it is possible that firms that report early may have different characteristics from firms that report later, even in the same industry.

Changes to tax and collection policies and the data checks performed by HMRC may have an impact on the indices that are not related to the underlying economic climate.

The expenditure measure captures all expenditure that must be reported to HMRC for VAT purposes. This means that it is the sum of intermediate consumption, investment in capital assets and inventories. Care should be taken in interpreting which of these elements any changes should be attributed to.

## Avoiding the identification of individual firms

Splitting the data by industry occasionally results in only a small number of firms left in the indices. In cases where fewer than 15 firms have reported in a particular component or industry, we suppress the entire series. In the event where only a single series is removed, we also remove the next smallest to prevent any derivation of the suppressed series from the total.

Figures are also rounded, to prevent possible inference of exact values. The diffusion index and percentage of new reporters are rounded to 2 decimal places, and the number of firms for any measure is rounded to the nearest 10.

It should be noted that for some indicators, although they meet these disclosure thresholds, the number of firms contributing can still be low, for instance, below 100 firms. So caution is needed in interpreting the data.

## Road traffic indicators

### Data source

Average counts and average speed data for traffic on English motorways and major A-roads were obtained from [Highways England's TRIS dataset](#), which lists the roads covered. Traffic flow is measured by induction loop and radar sensors. The data can be split by four categories of vehicle length as follows:

- less than 5.2 metres (for example, cars and motorcycles)
- 5.2 metres to 6.6 metres (for example, panel vans and minibuses)
- 6.6 metres to 11.66 metres (for example, rigid lorries and buses)
- greater than 11.66 metres (for example, larger rigid lorries and coaches and articulated lorries)

### Constructing the road traffic indicators

To construct the road traffic indicators for ports in England included in the dataset, we first take the geographic location of each port using the address and visual inspection. Then, we find all sensors and road sections that start or end within a 10-kilometre radius of this point. Since the data often have gaps in the sensor outputs, we use all sensors or road sections within 10 kilometres of each port in constructing the indicators.

Further details can be found in [Faster indicators of UK economic activity: road traffic for England](#). The data for each port are available in the [accompanying dataset](#).

### Quality

For the road traffic indicators, there are three main issues that need to be considered when interpreting the data.

Individual sensors can drop out unexpectedly, for example, because of road works or faults. The missing data can cause gaps in the time series and affect the average values. For example, if sensors drop out in an area of high traffic counts, the overall average will fall, making it difficult to interpret the time series. The total number of counts for each area is included in the dataset.

There was a change to the data collection methodology in 2015, which causes a step change and a gap in the time series. From January 2007 to December 2014, traffic counts and average speed were monitored for road sections (that is, between two junctions) at 15-minute intervals. From April 2015 onwards, traffic counts and average speeds were collected for individual sensors, also at 15-minute intervals.

There may be biases in the positioning of the sensors, which could be preferentially deployed to areas of heavy traffic and, in recent years, to road sections requiring active traffic management.



# Shipping indicators

## Data source

The shipping indicators are computed from Automated Identification Systems (AIS) data, which are available from various data providers.

For the period of July 2016 to August 2018, we have used a dataset provided by the Maritime and Coastguard Agency (MCA). Since October 2018, we have used data provided by ORBCOMM. The ORBCOMM data are gathered using satellites to track the position and movement of ships. The new dataset allows us to update the indicators more quickly and gives us access to global shipping information.

However, the change to the data source has resulted in a step change between the end of the MCA time series and the beginning of the ORBCOMM time series. As we currently have no overlapping period for the two data sources, we cannot carry out a full comparison between the two datasets.

The early indications are that different data collection methodology (terrestrial compared with satellite) results in different distributions for the captured message types and consequently a discrepancy in the datasets. Therefore, the time series representing the August 2016 to July 2018 period and the time series since October 2018 should not be compared.

## Constructing the shipping indicators

After initial filtering that removes the messages from ships that do not move more than a predefined threshold distance over a rolling period of six months, the rectangular geo masks, defined in [Faster indicators of UK economic activity: shipping](#), are used to mark the messages as originating from a list of UK ports. Then, through appropriate grouping and aggregation operations, the values of the “time-in-port”, “number of unique ships” and “number of visits” indicators are computed for each port.

In particular, the “time-in-port” indicator is computed for each specific port by summing all the periods between messages originating from within the port. The “number of unique ships” indicator is computed by counting the number of unique Maritime Mobile Service Identity (MMSI) observations that have originated within the port area in the particular period. For the “number of visits” indicator, a visit to a specific port area is defined by a ship entering the boundary of a port after being outside of this area for at least 1 hour and staying for at least 15 minutes within the port boundary. Owing to the inherent noise in the location signal, ships close to the port boundary may suddenly cross into a port, when in reality this is just noise in their position data. This is why the 15-minute threshold is enforced upon any visit. We apply similar logic to the 1-hour threshold, assuming that a ship has to be away from the port for at least 1 hour before it returns for it to have concluded some meaningful journey. The thresholds of 15 minutes and 1 hour are defined using heuristics and aim to capture a broad spectrum of visit purposes. However, more data-driven approaches to estimating these thresholds can be researched in further work. Once a marker for a visit is created in the data using the aforementioned conditions, these are then counted for a given time period and constitute the “number of visits” indicator.

The UK’s 10 largest ports by cargo in 2017, as reported by the Department for Transport in [Port freight annual statistics: 2017 final figure](#)s, are included throughout the dataset. These 10 ports cover around 70% of total UK port freight (2017).

The indicators from October 2018 also contain three further ports: Holyhead, Warrenpoint and Larne. Although these three ports are a small fraction of the total for the shipping indicators, this will also contribute to discrepancies between the pre-August 2018 time series and that from October 2018. The data for each port are available in the [accompanying dataset](#).

For each indicator, the value for all ports is the sum of the values for each individual port.

## Quality

A large number of corrupted messages have to be removed from the raw AIS data. Additionally, a high proportion of the MMSI identifiers report single or inconsistent messages. These must be removed before any sensible aggregations are possible. Also, some ships, like pilot vessels, spend most of their time in port.

Removing all of these messages is based on the presumption that active ships must travel a certain distance over a certain period of time. The specific filter rule that is used in computing the indicators is that ships must move by more than 0.5 degrees in a combination of latitude and longitude over a period of six months.

Different AIS data providers use different methods for AIS data collection. This inconsistency results in different properties of the data distributions and noise patterns in the datasets, which makes them incompatible. For this reason, the time series representing the August 2016 to July 2018 period and the time series since October 2018 should not be compared.

Gaps in the data represent a significant problem for accurate aggregations. As the number of received messages should be relatively constant, monitoring the number of incoming messages in each period is used to detect and identify gaps in the data.

## Avoiding the identification of individual ships

The three shipping indicators are based on monthly aggregates. As many ships visit the ports over the month, it is considered that no individual ship data are disclosed through the indicators.

## Seasonal adjustment

Seasonal adjustment for the VAT indicators was performed using the software X-13ARIMA-SEATS. The method of seasonal adjustment used is the X-11 algorithm. The parameters used in the March 2019 publication were fixed for this release.

The monthly road traffic series were seasonally adjusted using the standard JDemetra+ seasonal adjustment package, with default settings. In JDemetra+, missing values are treated as outliers while X-13ARIMA-SEATS does not handle missing observations.

This methodology and the new data have led to small changes in the seasonally adjusted series relative to the previous publication.

## Further details

Full details of the data, quality, methodology and economic analyses can be found in [Faster indicators of UK economic activity](#) and associated articles.

## 6 . Feedback

We welcome feedback and comments on these indicators, including on presentation, further development or other data sources to investigate. Feedback can be sent by email to [Faster.Indicators@ons.gov.uk](mailto:Faster.Indicators@ons.gov.uk).