Office for National Statistics

Article

Research Output: Economic activity, faster indicators, UK: May 2019

Timely release of new, faster, indicators of economic activity constructed from novel data sources.

Contact:
Dr Louisa Nolan
Faster.Indicators@ons.gov.uk
+ 44 (0) 1633 456908

Release date:
24 June 2019

Next release:
22 July 2019

Table of contents

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 comment on their further development.

2 . Main points from the latest data

- This release contains for the first time Value Added Tax (VAT) diffusion indices for May 2019 in three industrial sectors; VAT diffusion indices for April 2019 in all other industries and for the total all-industries measure; new VAT reporters and record type indices for May 2019; data on shipping and road traffic in April 2019.
- The month-on-month VAT turnover diffusion indices in May 2019 were positive and slightly above their historical averages in both the agriculture and construction industrial sectors; in both these industries, the number of firms who had higher turnover in May 2019 than April 2019 was greater than the number of firms who had lower turnover.
- Other initial VAT indicators for May 2019 were also generally around or above historical average levels.
- The month-on-month VAT turnover diffusion index for all industries for April 2019 was slightly negative.
- Average traffic counts for England were broadly stable for the largest vehicles in April 2019.
- In April 2019, the number of ships visiting key UK ports was similar to March 2019, as was the time ships spent in those ports. The shipping indicators are non-seasonally adjusted.

3 . Data analysis

VAT heatmap and commentary

Figure 1: The balance of VAT indicators shows a mostly positive picture for May 2019

The monthly Value Added Tax (VAT) indicators show a mostly positive picture in May 2019. Figure 1 shows that most of the values were slightly above or around their 2008 to 2018 averages (light teal and light grey respectively), with no values considerably above (dark teal) or below (dark red) their long-run averages.

The month-on-month (MoM) turnover diffusion indices for both the agriculture and construction industries were slightly above their 2008 to 2018 averages (light teal) in May 2019, while for wholesale and retail trade, the level was around its 2008 to 2018 average (light grey). The levels of the month-on-a-year ago (MoY) turnover diffusion indices in May 2019 relative to their 2008 to 2018 averages are similar to the MoM turnover diffusion indices, with one being light grey (agriculture) and two being light teal (construction and wholesale and retail).

Only three industries (agriculture, forestry and fishing; construction; and wholesale and retail trade) have a sufficient number of reporters to be able to compile monthly diffusion indices within a month of the reporting period, which is May 2019 in this release. Monthly diffusion indices for other industries and the all-industries measure, containing many more reporters, are available up to April 2019 in this release.

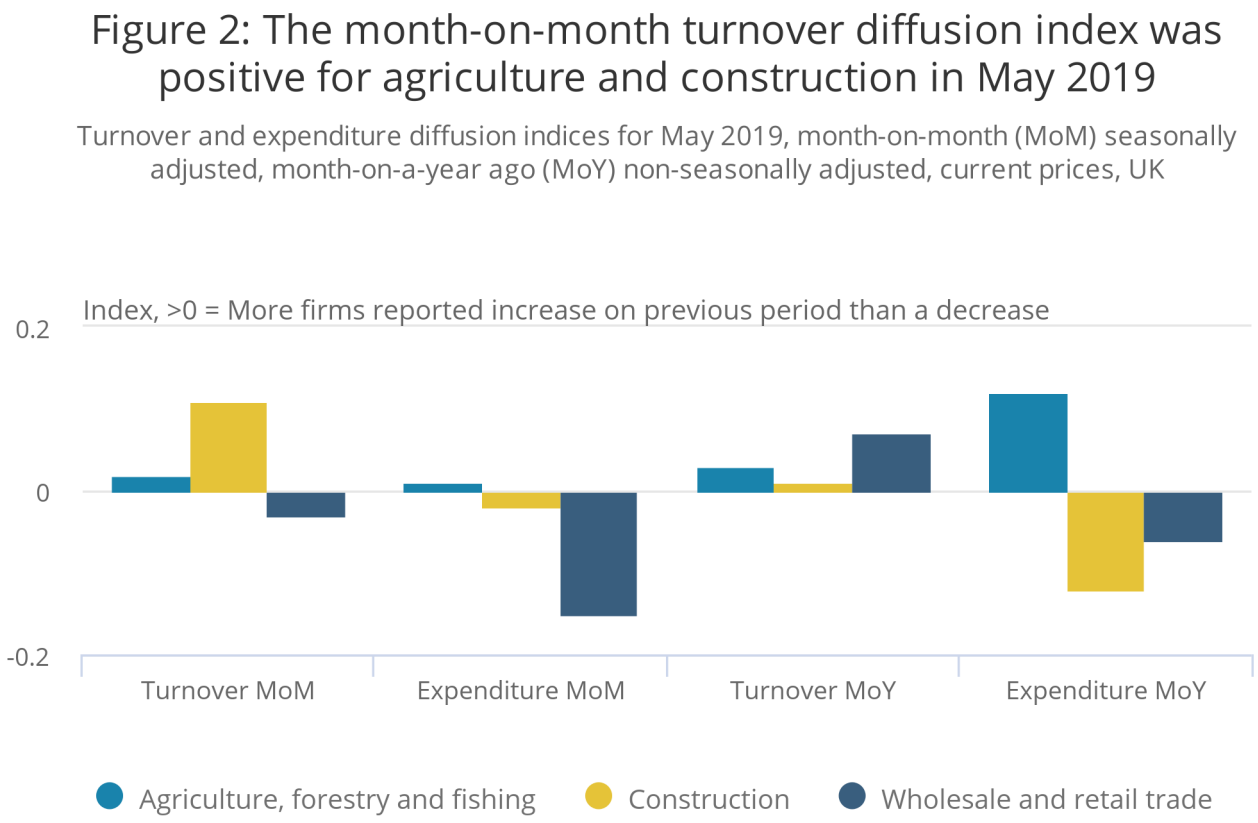
In April 2019, the MoM turnover diffusion index for all industries decreased to slightly lower than its 2008 to 2018 average (light red).

The number of repayment claims increased in April 2019 to slightly above its 2008 to 2018 average from being around its 2008 to 2018 average the month before.

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 month-on-month turnover diffusion index was positive for agriculture and construction in May 2019

Turnover and expenditure diffusion indices for May 2019, month-on-month (MoM) seasonally adjusted, month-on-a-year ago (MoY) non-seasonally adjusted, current prices, UK



Source: HM Revenue and Customs – Value Added Tax returns

Figure 2 shows the latest monthly diffusion indices for May 2019 for the three available industries. These are:

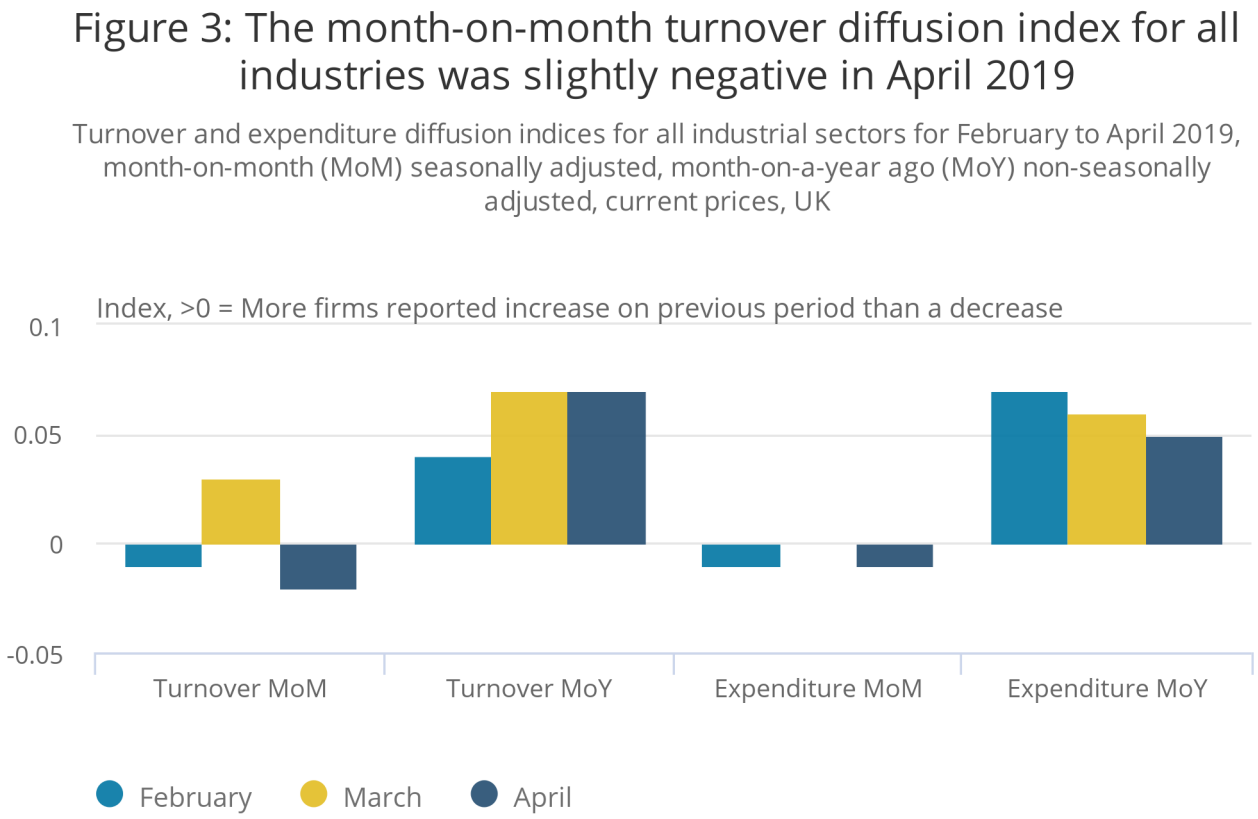
- agriculture, forestry and fishing
- construction
- wholesale and retail trade

The MoM turnover diffusion index for construction was 0.11 in May 2019, seasonally adjusted. This means that more construction firms reported an increase in turnover between April 2019 and May 2019 than reported a decrease in turnover between the two periods. The MoY turnover diffusion index was also positive for this industry, so more firms reported turnover increasing between May 2018 and May 2019 than reported turnover decreasing between these periods.

The MoM expenditure diffusion index for wholesale and retail trade was negative 0.15 in May 2019, seasonally adjusted. This means more wholesale and retail firms reported a decrease in expenditure than reported an increase in May 2019, compared with April 2019. VAT expenditure data include intermediate consumption, investment in capital assets and inventories. The seasonally adjusted MoM turnover diffusion index for wholesale and retail trade was also slightly negative in May 2019.

Figure 3: The month-on-month turnover diffusion index for all industries was slightly negative in April 2019

Turnover and expenditure diffusion indices for all industrial sectors for February to April 2019, month-on-month (MoM) seasonally adjusted, month-on-a-year ago (MoY) non-seasonally adjusted, current prices, UK



Source: HM Revenue and Customs – Value Added Tax returns

Figure 3 shows the latest monthly diffusion indices for February to April 2019 for all industries combined.

The seasonally adjusted MoM turnover diffusion index for all industries was negative 0.02 in April 2019, having been 0.03 in March 2019. The level of negative 0.02 in April 2019 means that slightly more firms reported a decrease in turnover between April 2019 and May 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.

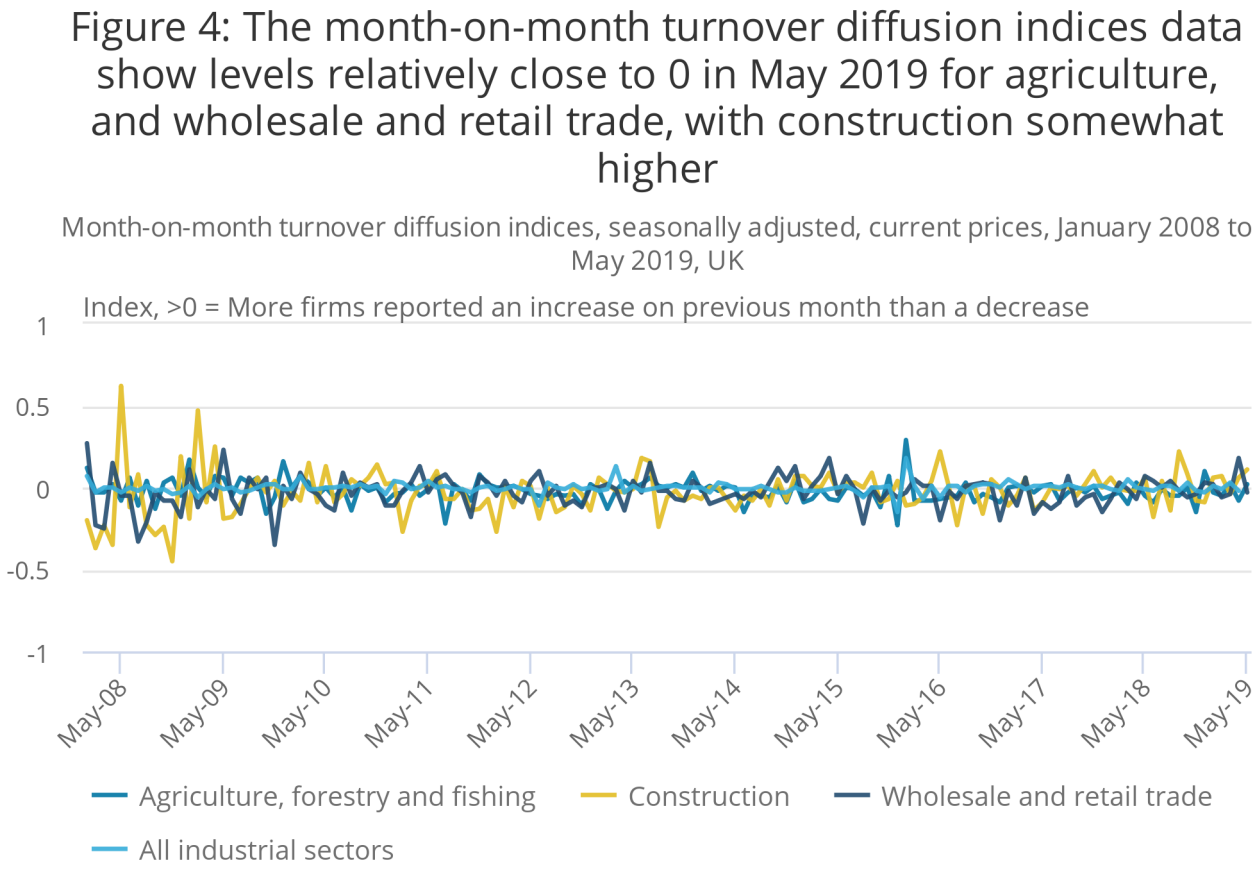
Despite this, the MoM turnover diffusion index for all industries in April 2019 has 34,530 firms contributing towards it in comparison with the MoM turnover diffusion indices for May 2019, where:

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

Monthly data to the end of April 2019 are available for other industries in the data spreadsheet. Each firm contributing to the indices has the same weight regardless of industry, turnover and size.

Figure 4: The month-on-month turnover diffusion indices data show levels relatively close to 0 in May 2019 for agriculture, and wholesale and retail trade, with construction somewhat higher

Month-on-month turnover diffusion indices, seasonally adjusted, current prices, January 2008 to May 2019, UK



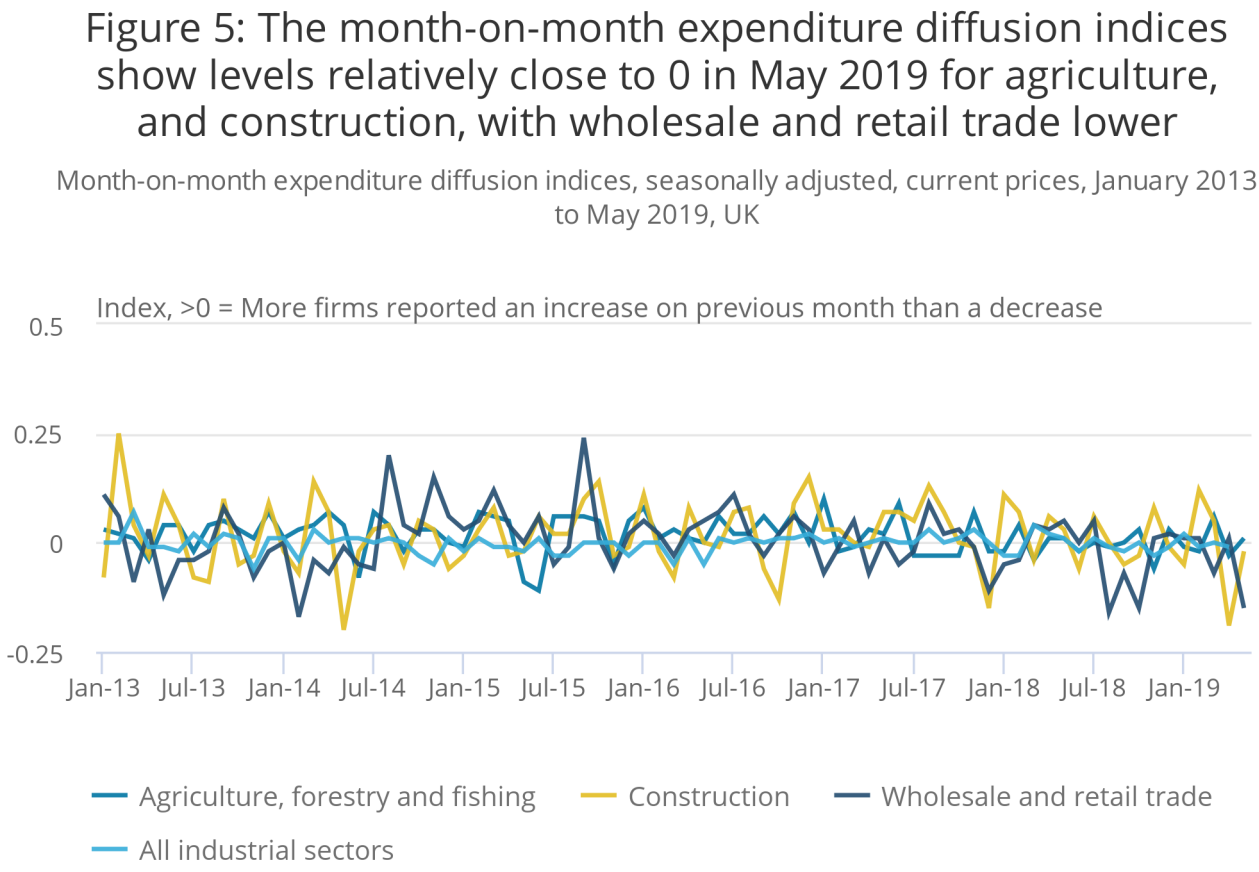
Source: HM Revenue and Customs – Value Added Tax returns

Figure 4 shows the volatility in the time series for the seasonally adjusted MoM turnover diffusion indices.

The May 2019 value for the MoM turnover diffusion index for the construction industry is a little higher than its average, and is at its highest level since September 2018. The MoM turnover diffusion indices for the agriculture, forestry and fishing industry and the wholesale and retail trade industry in May 2019 were closer to 0.

Figure 5: The month-on-month expenditure diffusion indices show levels relatively close to 0 in May 2019 for agriculture, and construction, with wholesale and retail trade lower

Month-on-month expenditure diffusion indices, seasonally adjusted, current prices, January 2013 to May 2019, UK



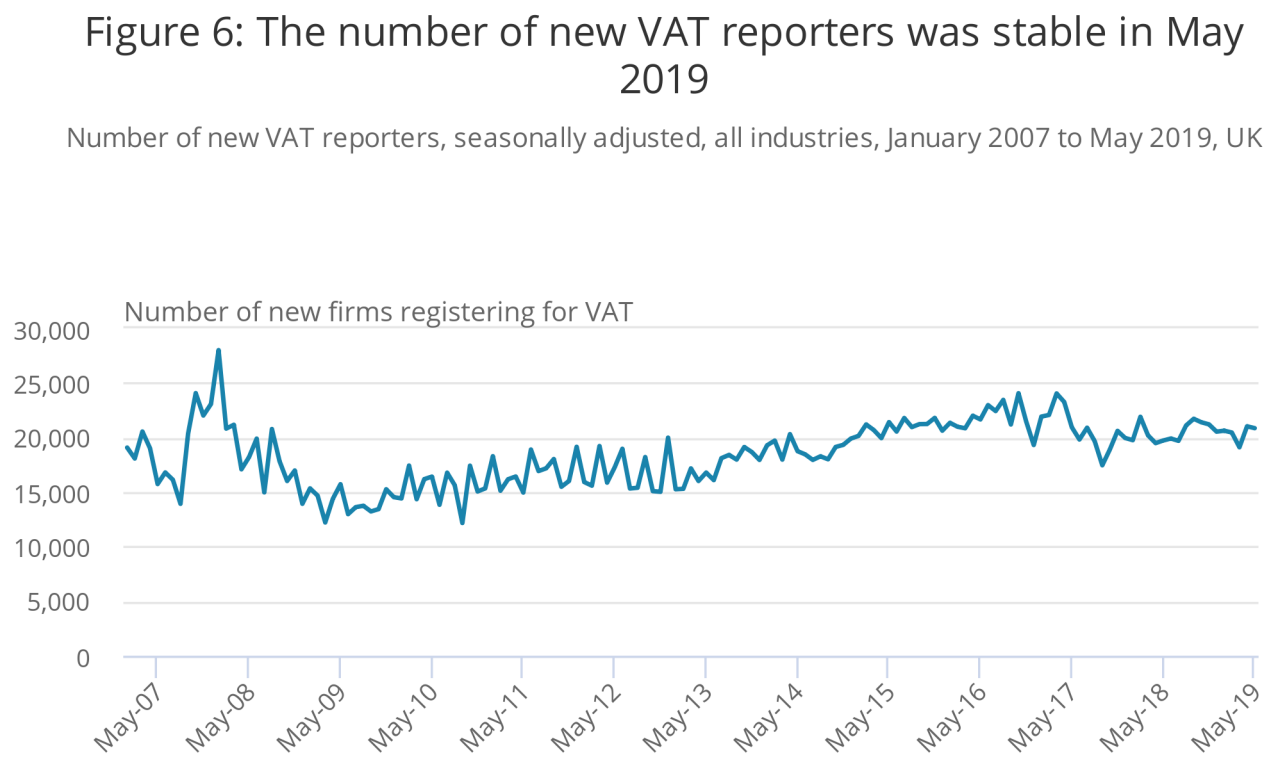
Source: HM Revenue and Customs – Value Added Tax returns

Figure 5 shows the latest values of the seasonally adjusted MoM expenditure diffusion indices in context.

The MoM expenditure diffusion index for wholesale and retail trade in May 2019 was at its lowest level since October 2018. The MoM expenditure diffusion index for the agriculture, forestry and fishing industry was around 0 in May 2019, as was the index for the construction industry.

Figure 6: The number of new VAT reporters was stable in May 2019

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



Source: HM Revenue and Customs – Value Added Tax returns

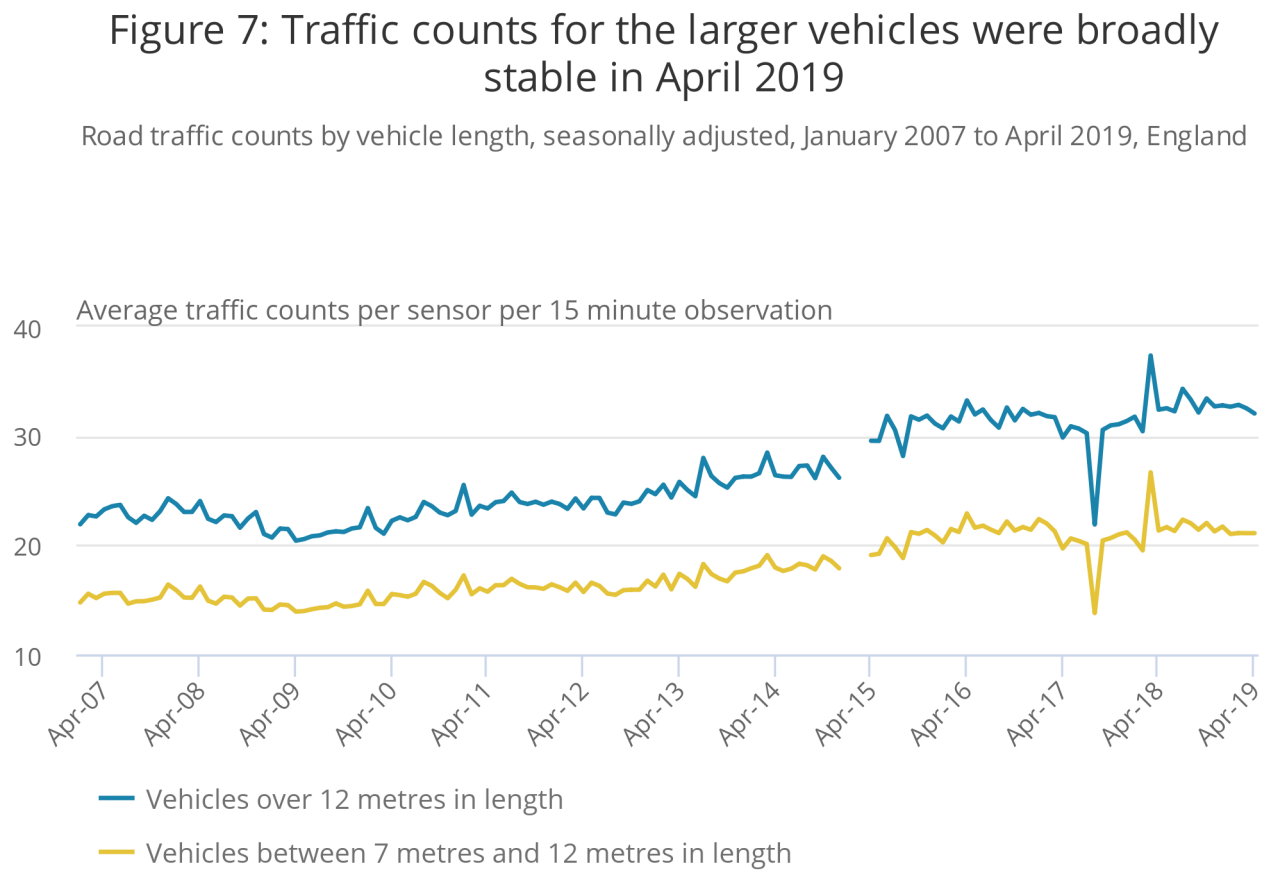
Figure 6 shows the number of new VAT reference numbers appearing in the VAT returns data, seasonally adjusted.

In May 2019, the number of new reporters remained broadly stable at 20,850, close to the number the month before of 21,020.

Road traffic commentary

Figure 7: Traffic counts for the larger vehicles were broadly stable in April 2019

Road traffic counts by vehicle length, seasonally adjusted, January 2007 to April 2019, England



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 11.6 metres in length.

In April 2019, the average traffic counts for England were broadly stable for the two largest vehicle categories, those over 11.66 metres and those between 6.6 metres and 11.66 metres.

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

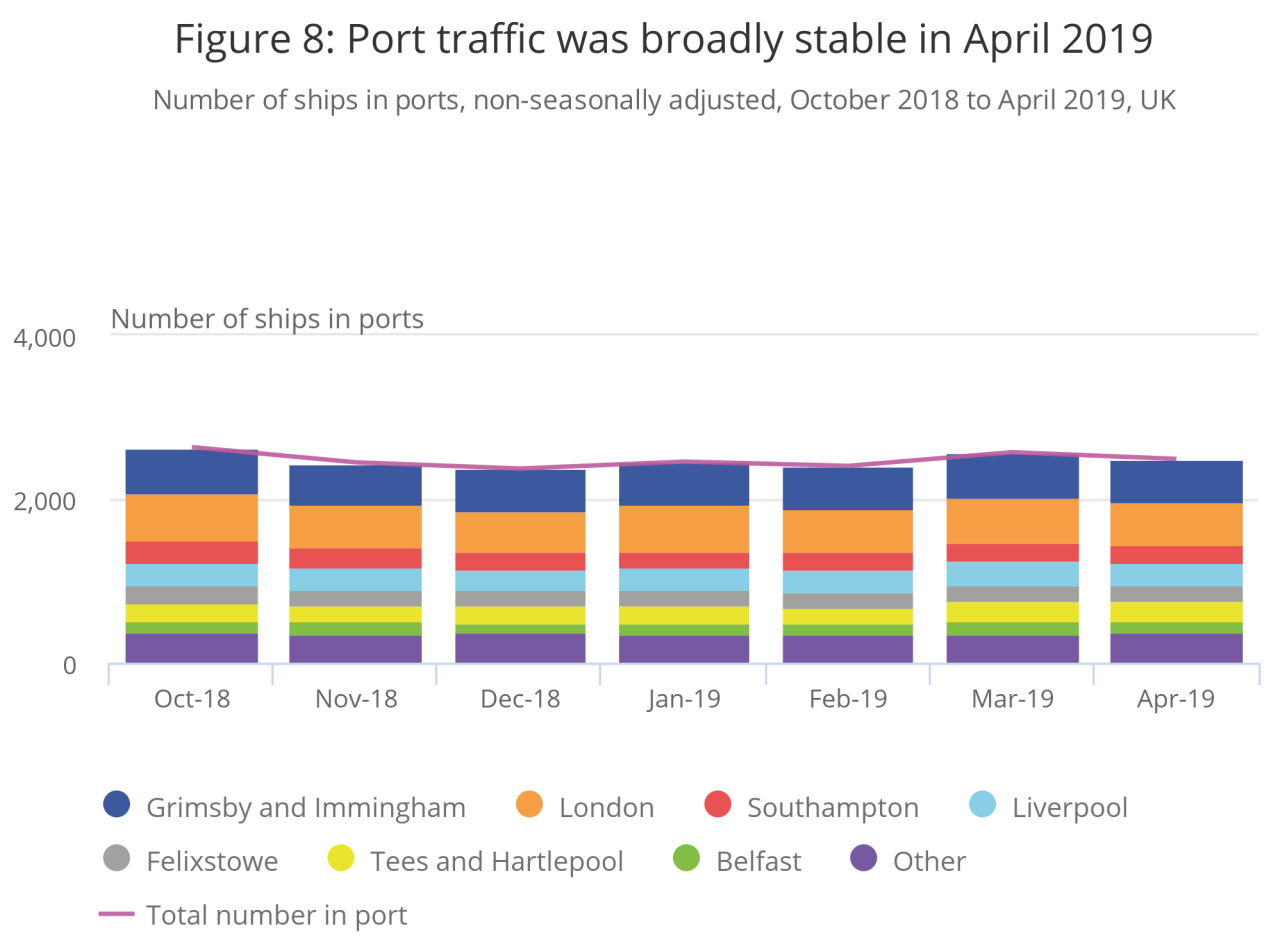
Shipping commentary

In April 2019, the number of ships visiting key UK ports was similar to March 2019, as was the time ships spent in those ports. The shipping indicators are non-seasonally adjusted making any monthly changes harder to interpret. The shipping indicators are available from August 2016 in the accompanying 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 Section 5 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: Port traffic was broadly stable in April 2019

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



Source: Orbcomm

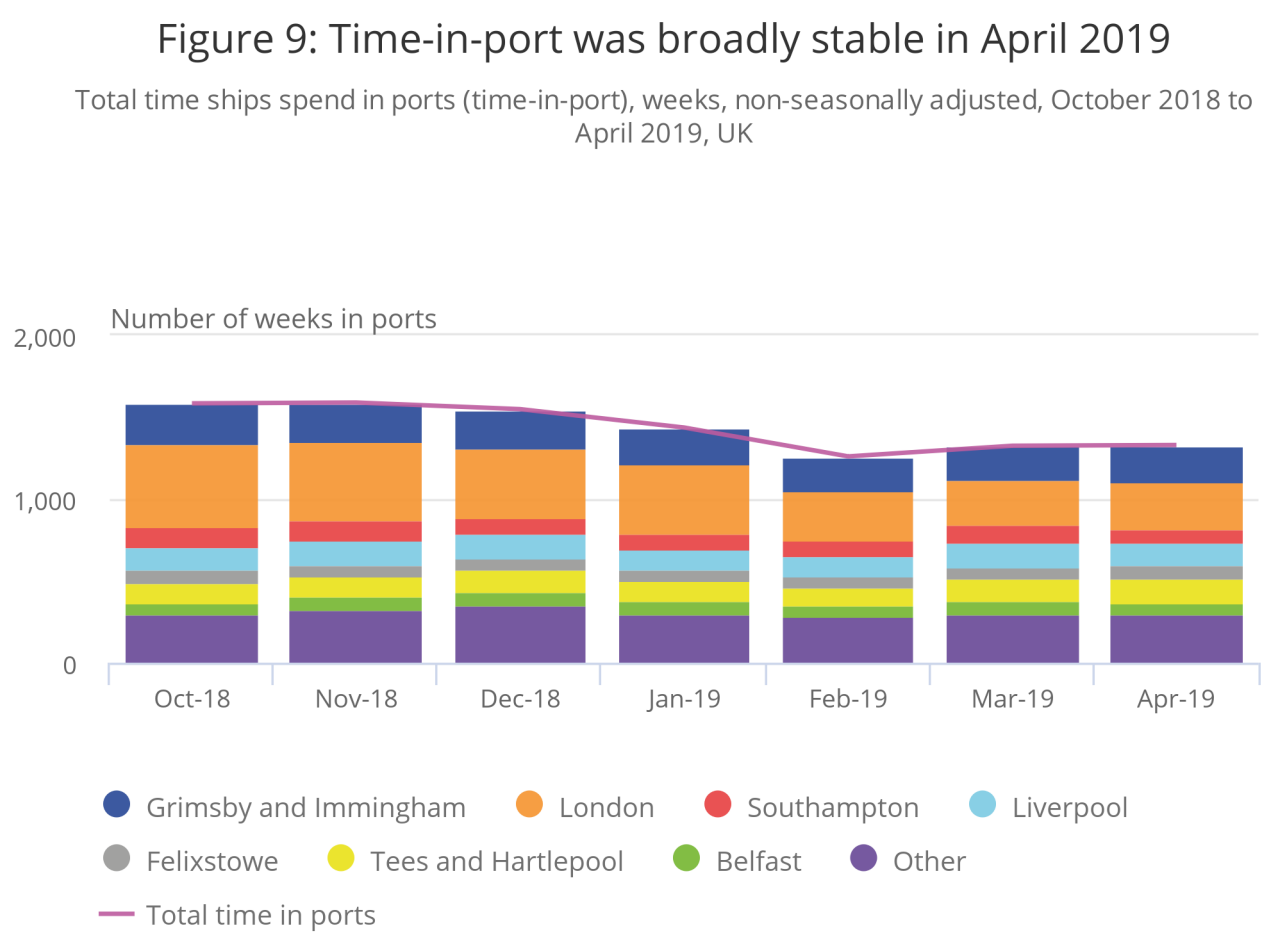
Notes:

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

The port traffic indicator was relatively constant in April 2019, falling by 82 ships to a total of 2,490, which is a fall of 3.2% compared with the month before. London, and Grimsby and Immingham continue to make the largest contributions, with over 40% of the total number of ships in ports in the dataset visiting these two ports.

Figure 9: Time-in-port was broadly stable in April 2019

Total time ships spend in ports (time-in-port), weeks, non-seasonally adjusted, October 2018 to April 2019, UK



Source: Orbcomm

Notes:

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

The total time ships spent in ports in the dataset in April 2019 was similar to March 2019.

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.

1. Indicators from HM Revenue and Customs (HMRC) Value Added Tax (VAT) returns:
    - monthly diffusion indicators from turnover reported on VAT returns, January 2008 to May 2019
    - quarterly diffusion indicators from turnover reported on VAT returns, January 2008 to March 2019
    - monthly diffusion indicators from expenditure reported on VAT returns, January 2013 to May 2019
    - quarterly diffusion indicators from expenditure reported on VAT returns, January 2013 to March 2019
    - VAT record types and new VAT reporters, January 2007 to May 2019
2. Road traffic sensor data for England from Highways England:
    - monthly average road traffic counts for England and English port areas, January 2007 to April 2019
    - monthly average road speeds for England and English port areas, January 2007 to April 2019
3. Shipping indicators from Automated Identification Systems (AIS):
    - a monthly count of the time spent in UK ports from August 2016 to April 2019
    - a monthly count of ships in UK ports from August 2016 to April 2019

It is important to note that 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 carefully interpreted. 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 0 values 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 1 to 1], inclusive. If all firms report an increase in the latest period relative to the base period, the index would be 1. If all firms report a decline, the index would be negative 1. If an equal number grow and decline, the index would be 0.

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 quarterly diffusion indicators, the earliest monthly diffusion indicators (month 1, MoM) 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 1 (within a month). The agriculture, forestry and fishing, construction, and wholesale and retail trade industries dominate the monthly returns in month 1. More generally it is possible that early-reporting firms may have different characteristics from firms reporting later, even in the same industry.

Changes to tax and collection policies 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 too.

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 two 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, motorcycles
- 5.2 metres to 6.6 metres – for example, panel vans, minibus
- 6.6 metres to 11.66 metres – for example, rigid lorries, buses
- greater than 11.66 metres – for example, larger rigid lorries and coaches, 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.

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, due, for example, to 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 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 for 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). For data since October 2018, we have used ORBCOMM data. The ORBCOMM data uses 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 (satellite compared with terrestrial) results in different distributions for the captured message types and subsequently 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.

At a later stage, when we have data from both data sources for overlapping periods, we will investigate the discrepancy in detail and will research a method for converting between them.

Constructing the shipping indicators

After initial filtering, which 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” and “port traffic” 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 “port traffic” indicator is computed by counting the number of unique Maritime Mobile Service Identity (MMSI) observations that have originated within the port area and the particular period.

The UK’s 10 largest ports by cargo in 2017, as reported by the Department for Transport in Port freight annual statistics: 2017 final figures, 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 Large. Although these three ports are a small fraction of the total for both 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.

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 the above 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 computation of 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 (hour, day, week, month), 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 two 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 whereas 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.