Index of Production, UK QMI

Quality and methodology information for the Index of Production, detailing the strengths and limitations of the data, methods used, and data uses and users.

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1 . Output information

- National Statistic: yes
- Survey name: Index of Production
- Data collection: responses to the Monthly Business Survey for Production and Services (MBS) and other administrative data sources
- Frequency: monthly
- How compiled: MBS and external sources
- Geographic coverage: UK
- Related publications: Index of Services, Gross domestic product monthly estimate, Gross domestic product first quarterly estimate

2 . About this QMI report

This quality and methodology information report contains information on the quality characteristics of the data (including the European Statistical System's five dimensions of quality) as well as the methods used to create it.

The information in this report will help you to:

- understand the strengths and limitations of the data
- learn about existing uses and users of the data
- help you to decide suitable uses for the data
- understand the methods used to create the data
- reduce the risk of misusing data

3 . Important points

- The Index of Production (IoP) measures output in the manufacturing (the largest component of production), mining and quarrying, energy supply, and water supply and waste management sectors; this covers sections B to E of the UK Standard Industrial Classification 2007 (UK SIC 2007).

- IoP is an output measurement and used as a proxy for measuring the production industry's gross value added (GVA).

- Approximately 76% of the IoP estimates are based on monthly turnover data collected by the Monthly Business Survey for Production and Services (MBS); the remaining data are collected from volume data received from the Department for Energy, Security and Net Zero (DESNZ) and the International Steel Statistics Bureau (ISSB).

- Estimates are timely and published around six weeks after the reference month end.

- Value Added Tax (VAT) turnover data are also used to help inform estimates; while not as timely as the MBS, this provides improved estimates of small- and medium-sized businesses because of the amount of businesses that are registered for VAT in comparison with those firms sampled on the MBS.

- The geographical coverage includes all businesses whose primary output resides within the UK.

4 . Quality summary

Overview

The monthly Index of Production (IoP) provides a timely indicator of growth in the output of production industries across the UK.

Uses and users

The IoP is a key economic indicator and one of the earliest short-term measures of economic activity. It is designed to measure changes in the gross value added (GVA) of the production industries. GVA is defined as "total outputs minus total inputs". It is one of the main inputs into the early estimates of UK gross domestic product (GDP), both in terms of monthly and quarterly estimates.

The main external users of the IoP are the Bank of England (BoE), HM Treasury (HMT), the Office for Budget Responsibility (OBR) and the Cabinet Office. They primarily use the data to inform decisions on fiscal and monetary policy, and as such, the monthly IoP statistics are essential for their briefing and forecasting purposes.

Government users have regular communication illustrated with a monthly briefing to describe the latest estimates. This provides an opportunity to ask questions, query any notable data movements (including changes to methods), and ensure that user needs and requirements are still met.

The IoP is also used for analysing the economic performance of the production sector. Other users include business and research communities, economic and financial organisations, the media, and the public.

Strengths and limitations of the Index of Production data

Timeliness of the survey

The estimates for the latest reference month are published approximately six weeks after the end of the period.

Time series availability

Annual and quarterly headline Index of Production (IoP) estimates are available from 1948 to present. Detailed industrial data are available on a monthly, quarterly and annual basis from January 1997 to present.

Industrial breakdown

Estimates are provided to a granular industrial level as per the UK Standard Industrial Classification 2007. This allows users to understand trends in data and provide comparison between industries.

Coverage of larger employment businesses

Businesses with large employment (varies per industry) or large annual registered turnover are sampled period-on-period; this allows a high coverage in terms of turnover within the industry.

Seasonal adjustment

Estimates are published on a seasonally and non-seasonally adjusted basis. Therefore, the impact of seasonality can be viewed in the data.

Deflation

Estimates are published in both current prices and on a chained volume measure. Therefore, the impact of price changes (inflation), can be viewed in the data.

Export turnover data

Along with collecting turnover for production industries, businesses are also required to provide a breakdown of exports. This is published in pound (£) million terms each month, alongside domestic turnover.

Response rates to the survey

At the time of the latest monthly IoP publication, the approximate response rate for the latest month is nearly 80%, based on turnover coverage; these response rates are published within the Monthly Business Survey (production) response rates dataset in the statistical bulletin each month.

Limitations of the Index of Production data

Coverage of businesses under the Value Added Tax (VAT) and Pay As You Earn (PAYE) threshold

The Index of Production sample frame is the Inter-Departmental Business Register (IDBR). The IDBR is a comprehensive list of UK businesses used by government for statistical purposes.

The two main sources of input to the IDBR are Value Added Tax (VAT) and Pay As You Earn (PAYE) records from HM Revenue and Customs (HMRC). Additional information comes from Companies House, Dun and Bradstreet and ONS business surveys. The IDBR covers around 2.7 million businesses in all sectors of the economy, but since the main two tax sources have thresholds, very small businesses operating below these will, in most cases, not be included.

Clarity between the different industrial breakdowns

Some businesses are involved in multiple types of work across the economy. We try to separate business activity based on their dominant economic activity, however, this can include economic activity that should be classified elsewhere.

Volatility of monthly data

At times, it can be difficult for businesses to provide a representative monthly path for their business activity. Reasons vary, but in some cases, businesses submit non-monthly data (for example, quarterly, bi-annual or annual), which we then use expert judgment to smooth to obtain a true monthly path. This is why we sometimes advise caution when interpreting monthly movements and steer users towards the longer-term measures of growth, such as three-month on three-month and annual growth rates.

Turnover relating to the reference month

Businesses are asked to provide data for a specific reference month. However, we are aware that this is not always possible for a variety of reasons. As a result, we sometimes receive turnover for invoices raised in previous months. We may also receive data relating to when contract payments are received, which can cover many months prior to the reference month. Expert judgement will then be used to obtain a representative monthly path.

Recent improvements

Move to electronic data collection

Previously, the MBS was collected through a paper exercise. However, prior to the coronavirus (COVID-19) pandemic, the data collection moved to electronic data collection. Further details of this process are provided in the Data collection section.

Use of VAT turnover data to help inform IoP estimates

Alongside the MBS and other non-MBS data sources, VAT data is also used as an indicator of economic activity. This is part of the transformation of short-term output indicators to make more use of administrative data to help inform the estimates.

Further information on the use of VAT turnover and its impact can be found in:

- our VAT turnover implementation into national accounts article, published 22 December 2017
- our VAT turnover in national accounts: background and methodology, published 19 March 2018
- our Quality assurance of administrative data (QAAD) report for VAT turnover data, published 11 April 2019

5 . Quality characteristics of the data

Relevance

The degree to which statistical outputs meet users' needs.

The primary purpose of the Index of Production (IoP) is to produce a short-term measure of the output of the production industries within the UK economy and show the monthly movements in the gross value added (GVA) of the production industries (Standard Industrial Classification 2007 (SIC 2007) sections B to E).

The four main components of the production industries are mining and quarrying (B), manufacturing (C), electricity, gas, steam and air conditioning (D), and water, sewerage, waste management and remediation activities (E).

The IoP contributes 13.6% to the output estimate of gross domestic product (GDP), as per the GVA weights in the Blue Book 2023. The index is estimated using the same data sources and national accounts methodology as the quarterly estimate of production industries' gross value added within the output approach to measuring GDP.

The monthly IoP publication provides arrangements of estimates of the percentage change of the most recent:

- month on the same month a year earlier
- month on the previous month
- three months on the same three months a year earlier
- three months on the previous three months

Users are reminded of the volatility of monthly estimates in the statistical bulletin; however, the publication of these four measures of percentage change is in line with user requirements.

Although the IoP is a monthly indicator, it is based on a range of data collected monthly and quarterly from a small number of different sources. These include data from the Monthly Business Survey (MBS), which is our short-term survey on different parts of the economy and is one of the main data sources used in the compilation of the manufacturing sector and thus IoP. The data collected are sales turnover excluding Value Added Tax (VAT). These data are then deflated using Producer Price Indices (PPI) and Export Producer Price Indices (EPI).

The detailed deflators were chosen because of their appropriateness in deflating the products manufactured by the various industries. PPIs are the most conceptually appropriate deflators for manufacturing industries because they actually measure price changes in manufactured goods at the time they leave the producer (also known as factory gate prices), excluding taxes on products (such as VAT). Thus, they are completely consistent with the turnover data from the MBS.

VAT turnover data sourced from HM Revenue and Customs (HMRC) have also been used to inform IoP estimates from December 2017. While less timely than the survey data, it provides improved estimates of small- and medium-sized businesses because of the number of businesses with VAT data in comparison with the numbers sampled on the MBS.

A comprehensive list of the IoP source data can be found in the GDP(O) source catalogue published on our website. All of the data sources were assessed against internationally defined criteria, as per Eurostat's handbook on price and volume measures in national accounts, for relevance and conceptual appropriateness. Methods are classed as "A" (ideal), "B" (acceptable), or "C" (requiring improvement). As of the Blue Book 2023 publication, based on these quality metrics, the percentage of IoP industries based on GVA weights are rated as 75.3%, 24.2% and 0.5% A, B and C methods, respectively.

IoP data are assessed as part of an ongoing quality assurance programme from the Office for Statistics Regulation (OSR). Previous reports include:

- the April 2014 Statistics on GDP, and Indices of Production and Services report 278
- the January 2011 Short-term economic output indicators report 81

In terms of administrative data sources, a programme of work has been undertaken to further understand their quality and identify any issues with these data sources external to the Office for National Statistics's (ONS's) control. For each of these data sources, the published quality assurance of administrative data (QAAD) are published in:

- our QAAD report for electricity and gas (August 2017)
- our QAAD report for Manufacture of mineral oil refining (November 2017)
- our QAAD report for mining of coal and lignite and extraction of crude petroleum and natural gas industries (March 2019)
- our QAAD report for manufacture of basic iron and steel (March 2019)
- our QAAD report for VAT turnover data (April 2019)

Accuracy and reliability

Some common pitfalls in interpreting data series are that:

- expectations of accuracy and reliability in early estimates are often too high
- early estimates are based on incomplete data
- revisions are an inevitable consequence of the trade-off between timeliness and accuracy

Very few statistical revisions arise as a result of "errors". All estimates, by definition, are subject to statistical "error". In this context, the word refers to the uncertainty inherent in any process or calculation that uses sampling, estimation or modelling. Most revisions reflect either the adoption of new statistical techniques or the incorporation of new information, which allows the statistical error of previous estimates to be reduced. Only rarely are there avoidable "errors", such as human or system failures, and such mistakes are made clear when they do occur.

There is no easy way of measuring the accuracy of the IoP. Please read our Index of Production bulletin for more information. This is because of the extent to which the estimate measures the underlying "true" value of the output growth (of the production and manufacturing industries) in the UK for a particular period.

For many statistics, we can estimate and publish the sampling error associated with the estimate, using this as an indicator of accuracy. The IoP, however, is constructed from a variety of data sources, some of which are not based on random samples (for example, volume data sources from the Department for Energy, Security and Net Zero (DESNZ) and the International Steel Statistics Bureau (ISSB), and VAT data from HM Revenue & Customs (HMRC). As a result, it has not yet been possible to measure the sampling error for the IoP overall.

One dimension of measuring accuracy is reliability, which can be measured using evidence from analyses of revisions to assess the closeness of early estimates to subsequent estimated values. Many users try to minimise the impact of uncertainty by using the historical experience of revisions as a basis for estimating how confident they are in early releases and predicting how far and in what direction the early release might be revised.

The estimate is subject to revisions as more data become available, but between the first estimate of IoP and the estimate 12 months later, revisions are typically small (around 0.0 to 0.1 percentage points), with the frequency of upward and downward revisions broadly equal. This is using data over the last five years and therefore include the coronavirus (COVID-19) pandemic period, where the magnitude of growth rates and subsequent revisions were larger.

Revisions are an inevitable consequence of the trade-off between timeliness and accuracy. It is our role to produce the best possible estimate of IoP using all of the available information at that time. Therefore, the only way to avoid subsequent revisions to IoP as more information becomes available would be to delay publication until all the relevant information has been received. This could be up to 13 months because the main data source, the MBS, is open for revision for the latest 13 months at any one time. So, revisions should be treated as generally a good thing, as long as we document the reasons for them and communicate this to users. Revision triangles, which detail the month-on-month and three-month on three-month growth rates revisions, are available.

Figures for the most recent months are subject to revision in light of:

- late and revised responses to the MBS
- administrative sources (DESNZ and ISSB) forecasts being replaced by actual data
- revisions to seasonal adjustment factors, which are re-estimated every month and reviewed annually
- revisions to deflators (PPIs and EPIs), which can be seen in early estimates
- revisions to VAT turnover data because of late and revised returns
- changes to the methodological processes used to gather and process the data
- annual GDP balancing; for further information on the annual GDP balancing process, please see our Why GDP figures are revised article

The balance between necessary revisions and revisions for minor issues is achieved through a published National Accounts Revisions Policy. As the IoP is a main data source for monthly and quarterly GDP estimates, the National Accounts Revisions Policy determines when data are open for revisions.

Coherence and comparability

Every effort is made to ensure that the series is comparable over time, and a comparable time series is available back to 1948 for higher level aggregates. Where possible, changes to methodology are applied to the whole series to ensure this comparability is maintained. However, the National Accounts Revision Policy may mean that there is a time lag before methodological changes are published for the complete time series.

All of the data sources and methodologies used to compile the IoP are consistent with those used in the production industries element of the output approach to measuring GDP. The IoP data are benchmarked to the quarterly production index published as part of the output approach to measuring GDP, so that the arithmetic mean of the three-monthly indices is equal to the quarterly index.

Information on the compilation of GDP can be found in our GDP Quality and Methodology Information report.

IoP coherence with ONS Annual Business Survey

We at the ONS also collect turnover data through the Annual Business Survey (ABS). While broadly comparable, the survey design and reasons for data collection are different because of the following factors:

- variables collected – ABS collects many more variables than MBS as this as required to provide an accurate estimate of gross value added
- survey frequency – ABS is collected on an annual basis, whereas MBS is collected monthly
- timeliness of estimates – MBS is published six weeks after the end of the reference period, whereas ABS is published round 16 months after the end of the reference period
- granular detail – ABS sample design allows a detailed breakdown of industry, geography and business size

IoP coherence with ONS Prodcom Survey

We at the ONS also collect information around manufacturing products via UK manufacturers sales by product (Prodcom). Prodcom collects information manufactured about individual products, which is different to the data collected via MBS. MBS collects turnover for those businesses classified to the production industries, which may in turn have turnover associated with non-production products. For example, a manufacturing business may also offer retail or wholesale activity or after-sales services.

Accessibility and clarity

Our recommended format for accessible content is a combination of HTML web pages for narrative, charts and graphs, with data being provided in usable formats such as Excel spreadsheets and comma-separated values (CSV) files. Our website also offers users the option to download in PDF format.

The monthly publication provides a link to all data related to the Index of Production for that particular month.

Following guidance from the Government Statistical Service guidance (GSS) to improve digital accessibility of statistical spreadsheets, our published datasets now incorporate and adhere to this guidance. This is to help improve the usability, accessibility, and machine readability of our statistical spreadsheets.

For information regarding conditions of access to data, please refer to:

- our Terms and conditions (for data on the website)
- the UK government's copyright and reuse of published data information
- our Accessibility statement

Any enquiries should be made via email to indexofproduction@ons.gov.uk. We also publish user requested data.

IoP data are available in our Secure Research Service (SRS) and the UK Data Service secure lab. These services provide access to unpublished, de-identified data; that is, access to data that have the potential to identify an individual record requires the approval of the independent Research Accreditation Panel (RAP) before access can be provided. Access to such data requires Approved Researcher accreditation.

Timeliness and punctuality

We publish our Index of Production bulletin approximately six weeks after the end of the reference month. It is the earliest official performance indicator of UK industry. As the Index of Production (IoP) is a short-term indicator, the main users want the figures to be available as soon as possible after the end of the period to which they refer. As a result, revisions are an inevitable consequence of the trade-off between timeliness and accuracy.

Publication dates are fixed to coincide with the publication of Monthly GDP data. Since April 2018, we at the ONS have published a monthly GDP estimate. As a main source for early estimate of GDP, the IoP is published alongside this. For further information on the move to monthly GDP estimates, please see read our Introducing a new publication model for GDP article from April 2018.

Details on related publications are available on the UK National Statistics release calendar, and provides 12 months' advanced notice of release dates. If there are any changes to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change will be explained fully at the same time, as set out in the UK Statistics Authority's Code of Practice for Official Statistics.

Concepts and definitions

IoP estimates are compiled using UK Standard Industrial Classification 2007 (SIC 2007), used for the first time at Blue Book 2011, replacing the previously used Standard Industrial Classification 2003. For further information on the introduction of SIC 2007, read our Implementation of Standard Industrial Classification 2007: December 2009 update, Economic and Labour Market Review, December 2009, Volume 3, Number 12.

Definitions of terms found within the main statistical bulletin are listed below.

Chained volume measure

A chained volume series is a series of economic data from successive years, put in real (or constant, that is, inflation- and deflation-adjusted) terms by computing the production volume for each year in the prices of the preceding year, and then "chain linking" the data together to obtain a time series of production figures from which the effects of price changes (that is, monetary inflation or deflation) have, at least in theory, been removed.

Current prices

Data that reported in current (or "nominal") prices for each year are measured in the prices for that particular year. Current price series are influenced by the effects of inflation. This is in contrast to constant price series (or "Chained Volume Measures") are used to measure the true volume growth, i.e., adjusting for the effects of price inflation.

Gross domestic product

This is the total value of production activity in the economic territory. It is defined as total output (sales plus changes in inventories, or stocks) less intermediate consumption (all the goods and services used up in a process of production, for example components and raw materials). Domestic product can be measured gross or net of consumption of fixed capital (or depreciation). It is presented in the accounts at market (or purchasers') prices. A further distinction is that it can be at current prices or chained volume measures.

Geography

The geographical coverage includes all businesses whose primary output resides within the United Kingdom. This includes England, Scotland, Wales and Northern Ireland but excludes, Isle of Man, Channel Islands and Falkland Islands.

Why you can trust our data

The ONS is the UK's National Statistics Institute and the country's largest independent producer of statistics. The Data Policies and Information Charter, available on the ONS website, detail how data are collected, secured and used in the publication of statistics. We treat the data that we hold with respect, keeping it secure and confidential, and we use statistical methods that are professional, ethical and transparent. You can find out more on our data policies web page.

The Index of Production has National Statistics status (explained on the OSR website), designated by the UK Statistics Authority (UKSA) in accordance with the Statistics and Registration Service Act 2007. This designation signifies compliance with the Code of Practice for Statistics, which has recently been updated and focuses on trustworthiness of data in greater depth.

6 . Methods used to produce the Index of Production data

Main data sources

Most data used to compile the IoP (approximately 76%), is collected via the Monthly Business Survey (MBS). As a result, the reminder is collected via volume data sources.

Direct volume data are received from:

- the Department for Energy, Security and Net Zero (DESNZ) for part of mining and quarrying industries; this covers UK SIC 2007 divisions 05 – mining of coal and lignite and 06 – extraction of crude petroleum and natural gas

- the Iron and Steel Statistics Bureau (ISSB) for steel industries (UK SIC 2007 – 24.1-3 – Manufacture of basic iron and steel)

- the manufacture of coke and refined petroleum products industry, which mainly comprises data from DESNZ; this covers UK SIC 2007 division 19 – manufacture of coke and refined petroleum products

- data used to produce the energy sector (UK SIC 2007 – Section D – Electricity, Gas, Steam and Air Conditioning Supply) is also from DESNZ and includes energy and gas supply output

- Value Added Tax (VAT) turnover data sourced from HM Revenue and Customs (HMRC) have also been used to inform IoP estimates from December 2017; while less timely than the MBS survey data, it provides improved estimates of small- and medium-sized businesses owing to the number of businesses with VAT data in comparison with the numbers sampled on the MBS (for further information, please refer to the "How we process VAT turnover IoP estimates" subsection later in Section 6)

How we process the Monthly Business Survey data

Data Collection

Data for the MBS are primarily collected via an electronic questionnaire (also paper questionnaire but on request of the business). In 2023, approximately 72,000 questionnaires were dispatched across the industry. Data are collected via the ONS Secure Data Collection (SDC) platform. Businesses are asked to register to this platform where all the Office for National Statistics (ONS) surveys, for which a business may be selected, can be accessed in one secure area.

Paper and telephone modes of collection are still available, but only available on request. These data collection methods now only account for 0.3% of the returns.

Businesses are asked to provide answers to the questions on total turnover exclusive of VAT and the proportion of this, which is generated from goods exported outside the UK. A voluntary comments box is also provided at the end of the questionnaire, which helps businesses provide further detail and commentary around their return. This helps validate data and means the ONS is less likely to recontact businesses to confirm returns.

Businesses producing alcohol and tobacco (UK SIC 2007 industries 11.01 to 11.06 and 12) are also asked to provide the value of excise duty and businesses producing potable water (UK SIC 2007 division 36) are asked to provide the volume in megalitres.

Most businesses are able to report data for the requested calendar month although some provide data for a similar accounting period. The questionnaire asks respondents to indicate the dates to which the reported turnover data relates i.e., accounting period or calendar month. If periods are outside the requested calendar month, then these will be date adjusted in the IoP systems so the data align to the reference month being collected.

In addition to turnover being collected the survey also collects employment information on calendar quarter months (March, June, September and December). Businesses are asked to provide information on employment including a breakdown of male and female employees and full and part-time staff.

Sample frame

The Index of Production sample frame is the Inter-Departmental Business Register (IDBR). The IDBR is a comprehensive list of UK businesses used by government for statistical purposes.

The IDBR provides the main sampling frame for surveys of businesses carried out by the ONS and other government departments. It is also an important data source for analyses of business activities.

The two main sources of input are Value Added Tax (VAT) and Pay As You Earn (PAYE) records from HMRC. Additional information comes from Companies House, Dun and Bradstreet and ONS business surveys. The IDBR covers around 2.7 million businesses in all sectors of the economy, but since the main two tax sources have thresholds, very small businesses operating below these will, in most cases, not be included.

The MBS for Production and Services draws its sample from approximately 1.7m businesses classified to the production sectors in scope of the survey.

Sample size

The MBS for Production and services has a sample size of approximately 6,000 businesses across the UK's production sectors.

Sample design

The MBS for Production and Services uses a stratified random sample design. This is group by:

- employment size bands
- industrial classification as defined by the UK SIC 2007 at Supply-Use Table classification level

Larger employment businesses (varies per industry) will automatically be included in the sample for each month. Also, businesses with annual turnover greater than £60 million will be automatically sampled each month because of their importance to the industry. Smaller and medium-sized businesses are then sampled with a decreasing sampling fraction as you descend through the employment size bands.

Imputation for missing response

Each month, the MBS has an element of respondents who do not respond to the survey in time for the first monthly estimate of a reference month. On average (from January 2020 to March 2024), approximately 70% and 82% of the sample based on forms and turnover of the sampled universe return in time for the first monthly estimate. Therefore, for some businesses we impute their data when we do not receive a return.

The IoP automatic imputation uses ratio imputation when item non-response occurs. Item non-response in this example could be any of the questions that are required on the questionnaire. The imputation methodology uses the ratio of means approach, which is consistent with other ONS short-term economic indicators (retail sales, Index of Services and construction output) and is recognised in the Recommended Practices for Editing and Imputation in Cross-Sectional Business Surveys EDIMBUS manual (PDF, 799KB) (see Chapter 4.2) as international best practice for imputation.

There are three types of scenarios where we impute for missingness:

- constructed imputation – these are estimates for the non-response of a business, for the first period it is on the sample

- forwards imputation – these are estimates for non-response of a business, which has been on the sample for more than one period; a forwards impute can be made from any of a returned value, a previous forward impute or a constructed value if the previous month was its first month selected for the survey

- backwards imputation – these are estimates for non-response, in cases where a business's first response to the survey is not for its first period on the sample; it is used for all periods that are before the period of its first response

An influential responder (a business that is known to make a substantial contribution to the estimates at an industry level) may also have its details manually constructed if it does not respond. This construction is based on previous returns to the survey and specialist knowledge of the industry.

Outliers

Once validated and approved, outliers can be removed from the processing, so they do not affect the imputation link highlighted previously for those who have not responded. An automatic process of Winsorisation is applied, which is a statistical technique that is used to handle outliers.

Occasionally, manual intervention is also applied. These judgement-based decisions are based on expert knowledge of the industry, where these atypical responses would otherwise affect the values of other businesses who are yet to respond to the survey.

Weighting and estimation

As it is not possible to conduct a census of all businesses classified to the MBS each month, owing to cost and respondent burden, a sample is drawn each month.

For every business in the population, we weight the data from the sample of businesses to provide estimates for the full population. In strata that are not fully enumerated, two weights are applied to data collected in the Monthly Business Survey: the design ("a") weight and calibration ("g") weight.

The "design" weight also known as the "a" weight takes into account the ratio of the size of a sample to the size of the population from which the sample is selected.

The "calibration" weight also known as the "g" weight; this takes into account how representative a sample's register turnover is compared with the register turnover of the population from which the sample is selected.

Seasonal adjustment

The data published in the IoP release are all seasonally adjusted (although non-seasonally adjusted estimates are also available). This aids interpretation by removing annually recurring fluctuations, for example, caused by holidays or other seasonal patterns.

For example, different months have different lengths, the period leading up to Christmas and the New Year, and other bank holidays such as in May and August. As Easter changes between March and April, we can estimate the effect on the time series and allocate it accordingly. Seasonal adjustment is performed each month using the standard, widely used software package X-13-ARIMA-SEATS.

Deflation

The value estimates collected by the MBS reflect both price and volume changes. To remove the direct effects of price changes, value data are deflated to produce IoP volume measures. SUT Industries are broken down by product and deflators are applied prior to aggregation back to SUT Industry level.

In the majority of cases, the deflators used are a combination of a home deflator (Producer Price Indices (PPI)) and an export deflator (Export Price Indices (EPI)). These deflators are weighted together using the proportion of export turnover sales as collected by MBS as a weight.

The volume series received from other government departments do not require deflating.

Indexing

We calculate indices for IoP as this allows a measure of the average level of prices, quantities, or other measured characteristics relative to their level for a defined base reference period or location. It is usually expressed as a percentage above or below, but relative to, the base index of 100. As of Blue Book 2023 the reference year is currently 2019 equals 100.

Statistical disclosure control

Statistical disclosure control methodology is also applied to the data.

The Code of Practice for Official Statistics, and specifically Principle 5:

Confidentiality, set out practices for how we protect data from being disclosed.

Principle 5 includes a guarantee to survey respondents to "ensure that official statistics do not reveal the identity of an individual or any private information relating to them".

Data sources from external suppliers are never supplied in a form that would enable identification of individual businesses.

How we process VAT turnover in IoP estimates

Since December 2017, VAT turnover data have been used to inform estimates of IoP. This is part of our ongoing effort to transform the way we use large, externally collected administrative data to supplement data collected via ONS surveys. This allows us to use the strengths of the MBS survey data, which is the timeliness, which means the output can be published around six weeks after the reference period end, and the stories and anecdotal evidence by having direct contact with businesses. Whereas the coverage of VAT units is far greater than is possible through the survey, in the smaller employment strata, where sample rotation and response can be a factor.

The method in which this administrative dataset has been combined with survey data to produce the final, seasonally adjusted chained volume measure is described further in VAT turnover in national accounts: background and methodology, published on 19 March 2018. Further information regarding the use of VAT turnover data is available in our VAT turnover implementation into national accounts: December 2017 update methodology, published on 22 December 2017.

As of May 2024, VAT turnover data have been used for selected industries previously covered by the Monthly Business Survey (MBS) from Quarter 1 (Jan to Mar) 2016 to Quarter 3 (Jul to Sep) 2023.

For details on this hybrid series, including how it is compiled please see Section 3.3 of our VAT turnover data in National Accounts: background and methodology.

For a list of those industries selected to use VAT turnover within production, please see the VAT industry selection matrix.

How we analyse and interpret the data

Once the data are submitted by businesses, they may be recontacted where substantial data changes are identified. The data are then aggregated, and a further phase of validation checks is carried out via thorough micro-level investigation. Businesses may receive further queries if important changes driving aggregate movements at the type of work level are highlighted.

How we quality assure and validate Monthly Business Survey data

The MBS uses an editing and validation approach known as selective editing (SELEKT) is an internationally recognised method that uses a data-based approach to assess the influence of business estimates on the aggregate outputs.

SELEKT is a generic selective editing tool. It allows each response to be scored according to a set of agreed criteria, which attempt to give high scores to the errors that will have the largest influence on estimates.

Those responses with the highest scores are prioritised for editing and validation. This increases the efficiency of the editing process by focusing on the responses with the highest impact and importance. The score can be split into three parts:

- suspicion of an error or mistake
- potential impact on estimate
- importance of the variable

Prior to passing through selective editing, individual returns are subject to a number of user-defined checks, including exports exceeding total turnover, turnover being zero or impossible dates.

Once individual business-level data have been confirmed, the aggregated data at an industry level is then quality assured. This is done with consistency checks with other internal and external ONS data sources, investigation of anomalies, ensuring disclosure procedures and reviewing data sources.

After these checks, there are internal curiosity meetings, where important internal stakeholders are able to interrogate the data and to explore any anomalies or interesting findings. External stakeholders, for example, other government departments, also have regular opportunities to analyse the data and share feedback with ONS colleagues once data are published.

How we disseminate the data

The IoP time series data disseminated through publication of the monthly Index of Production bulletin. Each bulletin includes a link to view the data in each publication, so comparisons of different ages are available. These are published at 7am on the day of release.

7 . Related links

A guide to the National Accounts
Methodology | Last revised 6 March 2020
An update to the 2015 publication of "A Short Guide to the UK National Accounts". The purpose of this guide is to give the reader an introduction to the concepts and underlying principles of national accounting and additionally to describe the various publications available.

GDP monthly estimate, UK: March 2024
Bulletin | Released 10 May 2024
Gross domestic product (GDP) measures the value of goods and services produced in the UK. It estimates the size of and growth in the economy.

Gross domestic product (GDP) QMI
Methodology | Last revised 08 April 2022
Quality and Methodology Information for gross domestic product (GDP), detailing the strengths and limitations of the data, methods used and data uses and users.

VAT turnover data in National Accounts background and methodology
Methodology | Last revised 19 March 2018
A methodological summary of the use of Value Added Tax returns within national accounts.

Producer Price Indices QMI
Methodology | Last revised 18 November 2020
Quality and Methodology Information (QMI) report for the Producer Price Index, detailing the strengths and limitations of the data, methods used, and data uses and users.

8 . Cite this methodology

Office for National Statistics (ONS), released 7 June 2024, ONS website, methodology, Index of Production, UK QMI