

Statistical bulletin

Model-based early estimates of regional gross value added in England, Wales, Scotland, and Northern Ireland: Quarter 4 (Oct to Dec) 2021

Experimental model-based estimates of quarterly regional gross value output for the nine English regions, Wales, Scotland and Northern Ireland.

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1 . Other pages in this release

- [Model-based estimates of regional GVA: an overview](#)

2 . Main points

- These experimental estimates are produced using an econometric model, an overview of which is provided in the [Model-based estimates of regional GVA accompanying article](#).
- The [Model-based estimates of regional GVA accompanying article](#) provides a historic comparison with the Office for National Statistics' (ONS') previously published [GDP, UK regions and countries](#) quarterly estimates, which these estimates are an early indication of.
- All nine English regions, Wales, Scotland, and Northern Ireland are estimated to have seen a positive quarter-on-previous-quarter growth in gross value added (GVA) in Quarter 4 (Oct to Dec) 2021, ranging from 0.7% to 1.2%.
- The modelled estimates are based on historical relationships, so regional shocks for the reported quarter will not be detected and the results should be treated with some caution; development work is being conducted with a view to add more timely regional indicators into the model to aid detection of regional shocks.
- Data within this release are presented as quarter-on-previous-quarter growth rates and indices.

3 . Model-based estimates of regional gross value added (GVA)

These estimates of seasonally adjusted growth are modelled from a variety of data sources, including the [first estimate of UK gross domestic product \(GDP\)](#) for Quarter 4 (Oct to Dec) 2021. The regional estimates are subject to a degree of uncertainty expressed as confidence intervals. More information is available in the [Measuring the data](#) section.

Users should be cautious when comparing these estimates with other existing regional estimates or the national estimates because the methodologies used to compile them differ. Information on how to interpret these data, and their strengths and limitations, can be found in the [Measuring the data](#) and [Strengths and limitations](#) sections.

Figure 1: All regions and countries are estimated to have seen a positive quarter-on-previous-quarter growth in gross value added (GVA) in Quarter 4 (Oct to Dec) 2021

Model-based estimates of regional GVA growth for the English regions, Wales, Scotland, and Northern Ireland for Quarter 4 2021

[Download the data](#)

The [first quarterly estimate of GDP](#) at UK level for Quarter 4 2021 estimated [gross value added \(GVA\)](#) in basic prices to have increased by 1% quarter-on-quarter.

The model-based estimates of regional GVA indicate that the East Midlands, East of England, London, South East, South West and West Midlands had greater growth than the UK-wide figure in Quarter 4 2021 (Figure 1). The highest was the South West with 1.2% growth.

The model estimates that the North East, Yorkshire and The Humber, North West, Wales, Scotland and Northern Ireland had growth below the UK GVA. The lowest was the North East with 0.7% growth.

This bulletin presents data as quarter-on-quarter growth percentage rates. We have also included indices of the model-based estimates in this publication as a result of user feedback. Once the methods used to produce our [GDP, UK regions and countries bulletins](#) (which are an input to these model-based estimates) have been refined, revisions to historical estimates will be incorporated.

4 . Methodology of the model

The model used to produce the estimates utilises a mixed-frequency vector autoregressive (MF-VAR). This is described in technical detail in [UK Regional Nowcasting using a Mixed Frequency Vector Autoregressive Model](#).

The Economic Statistics Centre of Excellence (ESCoE) nowcast model initially takes the latest figure for UK gross domestic product (GDP) growth. It then forms an estimate for each region of England, Wales, Scotland and Northern Ireland, based on the four factors noted. This ensures the weighted sum of regional changes is consistent with the change in aggregate UK GDP.

There are four main methodological processes in the model, which are used to create the estimates. These are:

- estimated historical relationships between regional growth and UK growth (this reflects how sensitive regional growth is to UK growth)
- estimated historical relationships between the growth of particular regions (this captures how growth in one region has translated into growth in another region)
- estimated historical relationships within the regions (this captures the persistence of regional growth from one quarter to the next)
- estimated historical relationships between other macroeconomic variables and regional growth (for example, how oil price changes can have a large impact on all regions, particularly with the additional UK quarterly macroeconomic variables, so there can be substantial increases in the connection between measures for the oil price and the exchange rate)

Further information is available on the [ESCoE website](#).

5 . Model-based estimates of regional gross value added (GVA) data

[Model-based early estimates of regional gross value added \(GVA\) in the regions of England, Wales, Scotland, and Northern Ireland](#)

Dataset | Released 24 February 2022

Experimental model-based estimates of quarterly regional gross value added (GVA) output for the nine English regions (North East, North West, Yorkshire and The Humber, East Midlands, West Midlands, East of England, London, South East, and South West), Wales, Scotland, and Northern Ireland.

[Model-based regional gross value added \(GVA\) revisions triangle](#)

Dataset | Released 24 February 2022

Model-based regional GVA estimates based on running the model that transitioned from Economic Statistics Centre of Excellence (ESCoE) to the Office for National Statistics (ONS) in “real time” from Quarter 2 (Apr to June) 2019.

6 . Glossary

Mixed-frequency vector autoregressive (MF-VAR)

A MF-VAR approach estimates the set of regressions (for example, one for each variable in the model) as a system. This allows us to take advantage of the interactions between variables to improve the fit of the model. In this case, we expect there to be correlations between the gross domestic product (GDP) growth across regions, so a MF-VAR framework enables this information to be used rather than if we had a separate forecast model for each region. The explanatory variables in each regression are past values of all the other variables in the model.

Gross value added (GVA)

GVA is the value of an industry's outputs minus the value of intermediate inputs used in the production process.

Output approach to gross domestic product (GDP)

When using the output approach to measuring GDP, we are actually estimating the contribution of each industry or producer by using GVA at basic prices. Put simply, the value of a unit's outputs minus the value of inputs used in the production process to produce the outputs. The basic price is the amount that the producer receives for a unit of a good or service that is produced. As such, it includes any subsidies that are received on products but excludes any taxes that are payable on those products.

GVA at basic prices plus taxes on products minus subsidies on products equals GDP at market prices (or headline GDP).

7 . Measuring the data

Experimental statistics

These model-based estimates are designated as [experimental statistics](#) while in development and are subject to revision. They should therefore be interpreted with some caution. Regional shocks will not be detected because the model relies on estimated historical relationships.

We will continue to develop the model and invite users' views on their uses and needs for these data. We welcome feedback to help inform our development work at regionalgdp@ons.gov.uk.

Model-based estimates of regional gross value added (GVA)

This release contains modelled estimates of regional GVA, published with a delay of approximately two weeks following the Office for National Statistics' (ONS') release of the first estimate of gross domestic product (GDP).

The model provides regional estimates for a given quarter around five months faster than our [GDP, UK regions and countries bulletins](#). This bulletin series covers the nine English regions and Wales and is based mainly on HM Revenue and Customs (HMRC) Value Added Tax (VAT) data.

Future publication date of regional estimates

[Scottish Government's first estimate of GDP](#)

The Quarter 4 (Oct to Dec) 2021 estimates are expected to be published 16 March 2022.

[Northern Ireland Statistics and Research Institute's \(NISRA's\) NI Composite Economic Index \(NICEI\)](#)

The Quarter 4 (Oct to Dec) 2021 estimates are expected to be published 31 March 2022.

[Welsh Government's short-term output indicators](#)

The Quarter 4 (Oct to Dec) 2021 estimates are expected to be published April 2022.

[ONS' GDP: UK regions and countries bulletin \(covering the nine English regions and Wales\)](#)

The Quarter 4 (Oct to Dec) 2021 estimates are expected to be published August 2022. The Quarter 3 (July to Sept) 2021 estimates are expected to be published May 2022.

Quality

More quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in the accompanying article, [Model-based estimates of regional GVA](#).

As an indication of quality for the quarterly modelled estimates, Table 1 provides approximate confidence intervals calculated from the root mean square errors (RMSE) of the model, compared with ONS' [GDP, UK regions and countries: April to June 2021 bulletin](#) published on 18 February 2022, as well as the [Scottish Government's](#) and [NISRA's](#) Quarter 2 (Apr to June) 2021 publications.

As an example of how to interpret the confidence intervals in Table 1, the model estimated the North West to have increased by 0.9% in Quarter 4 (Oct to Dec) 2021. The confidence interval indicates 95% confidence that the true growth will lie between negative 0.5% and positive 2.3%.

Table 1: Confidence Interval Root Mean Square Error (RMSE), relative to the published estimate

Region	Quarter 2 2019 to Quarter 2 2021 (excluding Quarter 2 and Quarter 3 2020)
East Midlands	estimate plus or minus 2.6%
East of England	estimate plus or minus 1.9%
London	estimate plus or minus 2.4%
North East	estimate plus or minus 2.7%
North West	estimate plus or minus 1.4%
Northern Ireland	estimate plus or minus 1.6%
Scotland	estimate plus or minus 1.3%
South East	estimate plus or minus 1.6%
South West	estimate plus or minus 1.7%
Wales	estimate plus or minus 1.8%
West Midlands	estimate plus or minus 1.7%
Yorkshire and The Humber	estimate plus or minus 2.2%

Source: Office for National Statistics

8 . Strengths and limitations

Strengths

Timeliness

The model-based estimates of quarterly regional gross domestic product (GDP) are available to approximately the same timetable as the release of the UK first estimate of GDP from published data sources of mixed frequencies. Our [Regional economic activity, by gross domestic product bulletin](#) is published annually. More recently, since September 2019, our [GDP, UK regions and countries bulletin](#) is published quarterly. However, there is a delay publishing sub-national estimates because of the data sources being less timely compared with UK estimates of gross value added (GVA).

Peer reviewed

The model has been peer reviewed as part of the Economic Statistics Centre of Excellence (ESCoE) process. Methodologists at the Office for National Statistics (ONS) were involved at various stages of the project and publications.

Performance

The model will continue to be evaluated against our existing predominately Value Added Tax (VAT) based [GDP, UK regions and countries](#) estimates.

Limitations

The main limitation that applies to modelling (that is not exclusive to this model) is mainly seen during times of economic uncertainty and extreme values. This applies to periods during the coronavirus (COVID-19) pandemic.

Given the model's reliance on estimated historical relationships, shocks in specific regions are unlikely to be detected in the model estimates. Development work is being conducted with a view to adding more timely regional indicators into the model.

Further detail on strengths and limitations can be found in [Model-based estimates of regional GVA: an overview](#).

9 . Related links

[Model-based estimates of gross value added: an overview](#)

Article | Released 8 October 2021

Provides an overview of the econometric model used for producing the estimates, research, and model that were produced as part of the Economic Centre of Excellence (ESCoE) research project Regional Nowcasting in the UK.

[GDP, UK regions and countries: April to June 2021](#)

Quarterly economic activity within the countries of the UK (England, Wales, Scotland and Northern Ireland) and the nine English regions (North East, North West, Yorkshire and The Humber, East Midlands, West Midlands, East of England, London, South East, and South West).