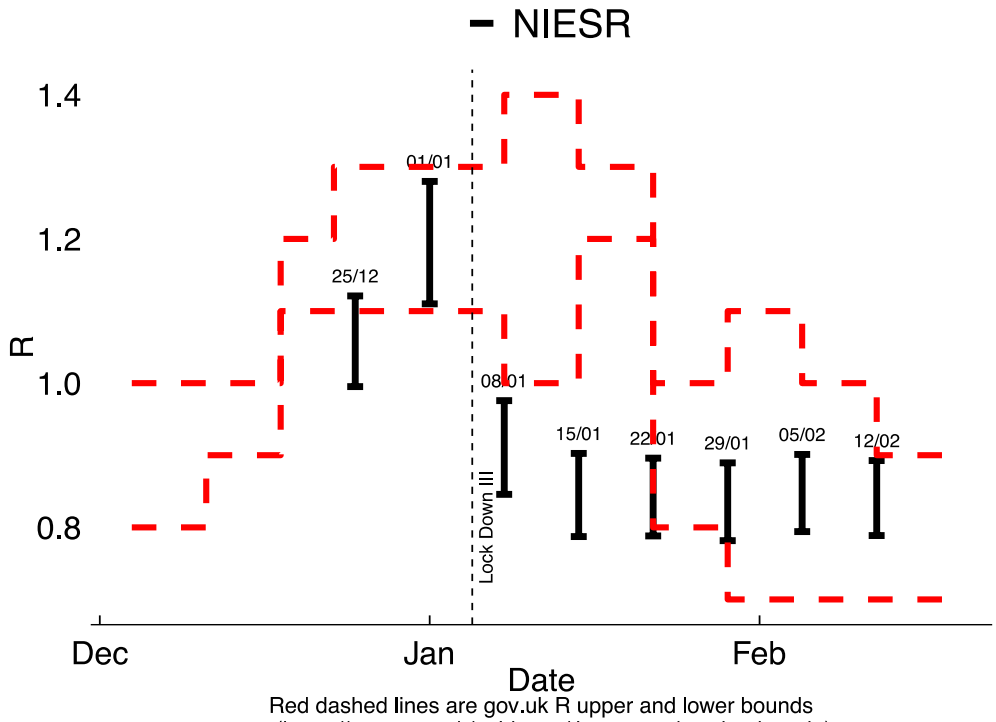
Covid-19 Tracker: Estimates of Reproduction Rate and Forecasts of new cases in the UK and Regions

Figure 1 - UK R – NIESR and SAGE



Red dashed lines are gov.uk R upper and lower bounds
(https://www.gov.uk/guidance/the-r-number-in-the-uk.)

NIESR estimates show ± 1 standard deviation intervals.

Main points

- The NIESR estimates use a new time series model to project new cases of Covid-19 and produce timely estimates of the R number. The forecasts reported here were made using publicly available data on 16th February 2021.
- Figure 1 shows that the effects of lockdown were becoming apparent by mid-January. By that time the Reproduction number, R, which is the average number

of secondary infections currently generated by an infected individual, had fallen to significantly below 1 to lie in the range of 0.8 – 0.9.

- Our time series approach reveals that the reduction in the R number in January occurred somewhat earlier than the analysis by SAGE suggests. The reason is that our model can adapt very quickly to emerging information contained in the data and thus estimates more sensitive to changes in trends.
- Should new cases in the UK continue to fall at the current rate, we can expect as a result of our model for them to fall below 1,000 cases by 9th April 2021. On 8th March, when schools are expected to reopen, the projected number of new cases will be around 3,900 (Figure 2).
- Regional differences are still apparent but less so than in the later part of last year (Figure 3). Currently, London and the South East have the lowest R numbers while Scotland and Yorkshire and the Humber have the highest.

"According to the latest data on new cases, our new model shows an R number for the UK in the range 0.8 – 0.9 and points towards new cases falling below 1,000 by early April. The model has consistently been showing this from mid-January, as it started to pick up the full extent of the lockdown. The advantage of the time series approach that underpins the results is that it analyses emerging information on the epidemic contained in the data quickly."

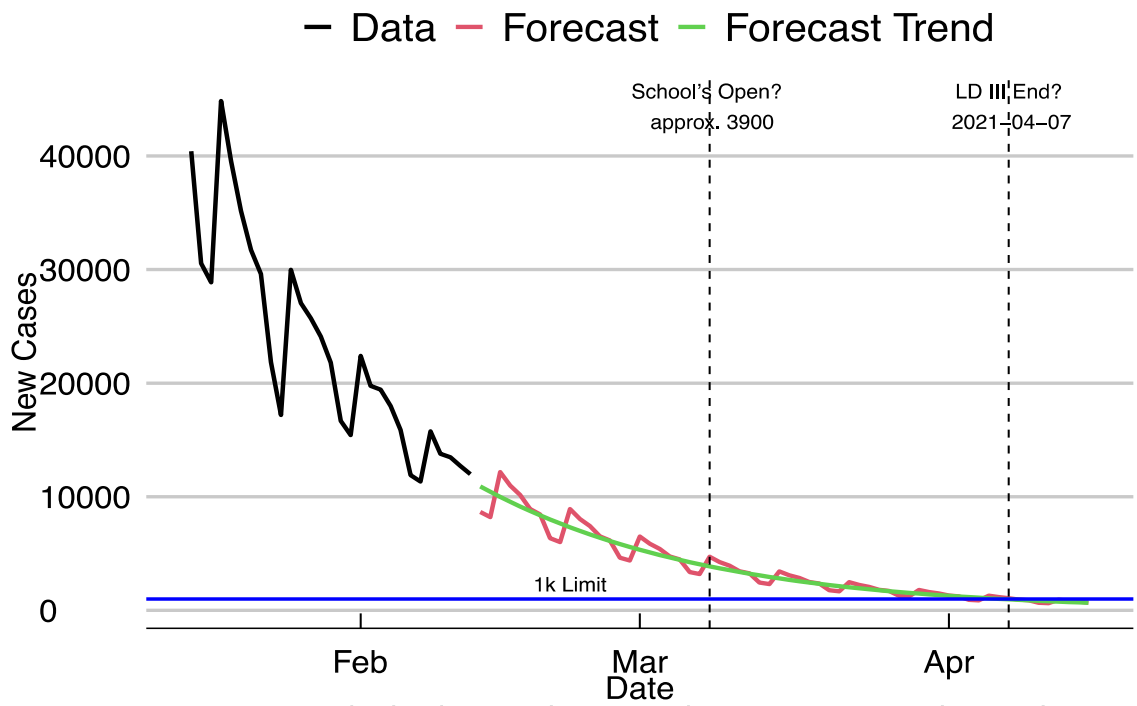
Dr Craig Thamotheram
Senior Economist - Macroeconomic Modelling and Forecasting

Results

The forecasts of new cases are based on specimen date data. The forecasts do not make assumptions about the timing or effects of pandemic control measures that may be imposed or relaxed in the days ahead and simply use historical data to make predictions.

- On this basis new cases in the UK are expected to fall below 1,000 by 7th April 2021.
- The projected number of new cases is around 3,900 on 8th March 2021, the reported school re-opening date.
- Table 1 shows that since mid-January our model has forecast new cases in the UK to fall below 1,000 by early April.

Figure 2 - UK forecast of new COVID-19 cases



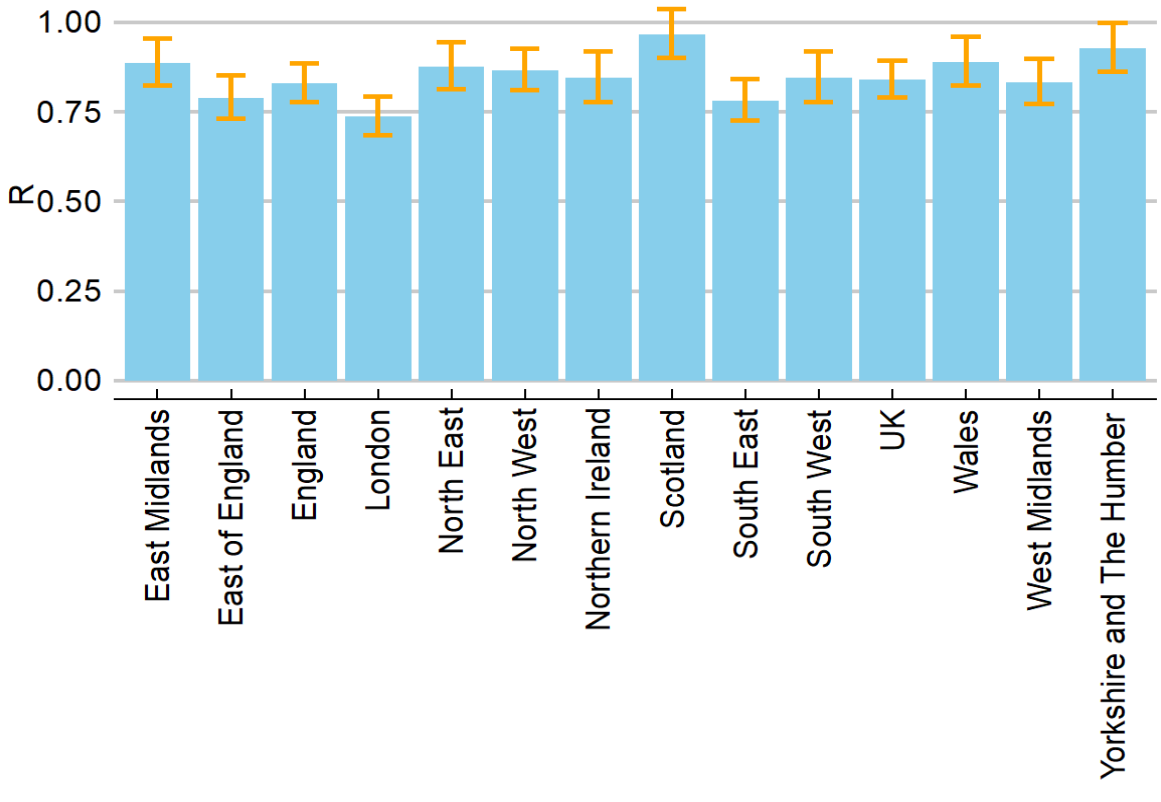
Vertical dashed lines show trend new cases on 8th March rounded to nearest 100 and Lock down III end date as the date when trend new cases fall below 1,000.
The data used in this forecast runs up to 12/02/2021.

Table 1: UK Forecast date for trend new cases to fall below 1,000

Estimation using data ending	15/01	22/01	29/01	05/02	12/02
Forecast date by when new cases fall below 1,000	28/03	01/04	01/04	09/04	07/04

- All regional R number estimates are below one as of 12th February 2021.
- Among nations of the UK, Scotland has the largest R number (0.97) and England has the lowest (0.83).
- Among regions of England, Yorkshire and Humber has the highest R number (0.93) and London has the lowest (0.74).

Figure 3 - UK Regional R



Bar chart shows point estimates of R and the ± 1 standard deviation confidence intervals

Background

NIESR aims to set out projections of the future path of the Covid-19 epidemic in the United Kingdom, its constituent nations and the regions of England, based on current policies.

NIESR will be producing weekly updates on Thursdays, projecting new cases and estimating the R number using a class of time series models developed by Prof. Andrew Harvey and Dr. Paul Kattuman of Cambridge University; see Harvey and Kattuman (2020a). The models generate forecasts by extracting changing trends from historical data. They are relatively simple and transparent, and their specifications can be assessed by standard statistical test procedures. The advantage of the time series approach is that it can adapt very quickly to the most recent information and hence produce timely estimates. This flexibility enables the effects of changes in policy, virus mutations and human behaviour to be tracked. The models are data driven and so are different from the structural models used by epidemiologists which rely on assumptions about transmission and behaviour; see Avery et al (2020).

A description of the methods used to produce these estimates and an evaluation of their forecasting performance can be found in Harvey, Kattuman, and Thamotheram (2021).

Data

Data: COVID-19 confirmed cases and deaths data are sourced from https://coronavirus.data.gov.uk

Caveat

The model relies on historical data and does not incorporate future outlined changes in the underlying environment. Thus, it is important to read the forecasts in this context. For example, it is widely reported that schools will reopen on the 8th March. The current forecast will not pick this up, but forecasts made after the event will quickly start to pick up any effect that the reopening has on transmissions. Looking at this one change, our forecasts for the date when new cases fall below 1,000 is likely to be pushed further out as the reopening is likely to increase transmissions. On the other hand, to the extent that immunisations lower the transmission rate we forecast that the date at which new cases fall below 1,000 is likely to occur earlier. The model adapts to these changes as they feed into new data.

Authors

Professor Andrew Harvey is Emeritus Professor of Econometrics at the University of Cambridge and a Fellow of Corpus Christi College. He has published over 100 articles and is the author of four books: *The Econometric Analysis of Time Series* (1981), *Time Series Models* (1981), *Forecasting. Structural Time Series Models and the Kalman Filter* (1989) and *Dynamic models for Volatility and Heavy Tails* (2013). He is a Fellow of the British Academy and the Econometric Society.

Dr Paul Kattuman is a reader in Economics at Cambridge University. He has been a Senior Research Fellow at the University of Cambridge Department of Applied Economics, and a lecturer in economics at Durham. He has held Visiting Professorships at Université Paris 12 and Paris-Est Créteil and was appointed Grupo Santander Visiting Professor at Universidad Complutense de Madrid. He was visiting Faculty Scholar at the Kennedy School of Government, and at the Department of Statistics, both at Harvard University.

Dr Craig Thamotheram is a Senior Economist at NIESR. Prior to joining NIESR, he studied Engineering at Imperial and obtained a PhD in Economics at Warwick. He has work experience as a post-doc in macro and financial econometrics.

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Harvey, A., P. Kattuman, and C. Thamotheram (2021). Tracking the mutant: forecasting and nowcasting COVID-19 in the UK in 2021. *National Institute Economic Review*. Forthcoming.

Notes for editors

For further information and to arrange interviews please contact the NIESR Press Office: press@niesr.ac.uk or Luca Pieri on l.pieri@niesr.ac.uk / 07930 544 631

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