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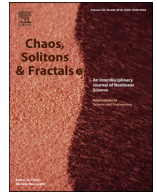
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Forecasting incidences of COVID-19 using Box-Jenkins method for the period July 12-September 11, 2020: A study on highly affected countries

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ABSTRACT

Background: The devastating spread of the novel coronavirus, named COVID-19, starting its journey from Wuhan Province of China on January 21st, 2020, has now threatened lives of almost all the countries of the world in different magnitudes. Mostly the developed countries have been hit hard, besides the emerging countries like China, India and Brazil. The scientists and the policy makers are in dark with respect to its spread and claiming lives in coming days.

Objectives: The present study aims to forecast the number of incidences in severely affected seven countries, USA, UK, Italy, Spain, France, China and India, for the period July 12-September 11, 2020 and compares the forecasted values with the actual values to judge its depth of severity and growth.

Method: The study uses Box-Jenkins method of forecasting in an Autoregressive Integrated Moving Average (ARIMA) structure on the basis of the daily data published by World Health Organization from January 21st to July 11, 2020.

Results: It is observed that USA and India are the two countries whose increasing trends will continue in the forecasted period (July 12 to September 11), others except China will face lower number of incidences. China's incidence has come to halt around 80000 in numbers. The growth rates of the number of incidences for all the countries during the forecasted period will be diminishing. The mean difference test results between the forecasted and actual values in level and growth forms show that in the former case, USA, India, UK will face increasing forecast than the actual number but in the latter case, all of the countries will face significantly decreasing growth rates in the forecasted values compared to their actual growth values.

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1. Introduction

Human civilization is now at high risk since its valor is now bowed down to a small organism which is thousands of parts of the area of the tip of a needle in size. Starting its journey from the Wuhan Province of China in 21st January, 2020, the Novel Corona Virus, named COVID-19, a variant of SARS and MERS, spread to almost all countries of the world by affecting around a crore of people and claiming lacs of lives till date. It has mutated itself several times within a very short period of time so that the scientists are just the spectators to its spread and devastating features. Hospitals and health centres of the countries are flooded with COVID patients and in most of the countries separate open spaces are constructed for temporary hospitals. Grave yards are over loaded, mass

graving is getting done in many countries. It is a striking fact that most of the so-called developed countries with improved health facilities are highly affected. USA leads the group followed by many European countries. From the developing world, India and Brazil are in the row. No governments policies and management systems are capable to control its devastating pace. Scientists have been putting their all efforts upon discovering medicines and vaccines to guard its spread. As of now it is known from the World Health Organization's (WHO) data on how many are affected and how many have died but we do not know how many will be affected and died by its ill effects. The present study aims to forecast the number of incidences across seven highly affected countries, USA, UK, Italy, Spain, France, China and India.

The study is organized as-brief literature review, rationale and objectives, data and methodology, results and discussion and finally conclusion and recommendations.

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2. Literature review

Having its novelty, COVID-19 has compelled the scientists and researchers around the globe to focus on it. There is not much studies in the related field till date and the studies on its forecasting is further scanty in the short time literature on COVID. We are here exploring some studies on the roles of immunity and socio-economic and environmental factors behind its spread and devastations, and some of the studies of forecasting or predictions of COVID-19 and of other viral or bacterial diseases.

According to Raja [14], Indians have some genetic advantage in fighting against viruses and bacteria, which may be one of the causes of not affecting the world's second most populated country. Hoch [12], in his work on immune mechanism activated by hunger and stress, finds that hunger or stress cause the production of peptides which protect against bacteria. Hence, the countries from Africa and Asia where relatively the hunger rate is high, they are less prone to COVID. Science Daily [16] 20, 2016] reveals that Africans have high immunity than Europeans which make capable the former to fight against infectious diseases. In another study Barreiro [2] has demonstrated that Americans of African descent have a stronger immune response to infection compared to Americans of European descent. Curtis et al. [10] assert that BCG Vaccination against tuberculosis in the weak regions of the world, Asia and Africa, could have increased the immunity level to fight against viruses. Studies related to demographic significance have been worth mentioning [15]. The study argues that people living in urban centers who have less access to green spaces may be more apposite to have chronic inflammation, a condition caused by immune system dysfunction.

With respect to the role of socio-economic factors behind the spread of COVID-19, Lau et al. [11] opines that many countries are facing increasing numbers of COVID-19 cases because they are mostly attributed to regular international flight connections with China. The study indicates a strong linear correlation between domestic and international COVID-19 cases and air traffic volume for regions within and outside China. Banik et al. [1] analyse the factors that determine the fatality rates across 29 economies spread from both the developing and developed world. It reveals that factors such as public health system, population age structure, poverty level and BCG vaccination are powerful contributory factors in determining fatality rates. Mukherji [13] unveils the socio-economic and health factors that can explain the differential impact of the coronavirus pandemic. It observes that counties with high per capita personal income have a high incidence of both reported cases and deaths. The results are striking in the sense that developed countries in USA in particular or regions of the world in general may not be safe from the outbreak, rather they are highly vulnerable than the less developed or developing countries.

With respect to the studies on predictions of COVID in particular the works of Yang et al. [9], Singh, et al. [7], Kumar, et al. [5] and Kumar et al. [6] are worth mentioning. The work of Yang et al. [9] predicts the COVID incidences for Hubei of China and Italy and shows that it will rise in different specifications. Singh et al. [7] predicted the number of incidences, death rates due to COVID for 15 countries for the period April 24 – July 7 using ARIMA method and observed that the predicted values on the confirmed cases, deaths, and recoveries will double in all the observed countries except China, Switzerland, and Germany. It was also observed that the death and recovery rates were rose faster when compared to confirmed cases over the next 2 months. USA, Italy like countries will suffer more. In a similar study, Kumar et al. [5] predicted some trajectories of COVID-19 in the coming days (until April 30, 2020) using the most advanced ARIMA model. The results predicted very frightening outcomes, which defines to worsen the conditions in Iran, entire Europe, especially Italy, Spain, and France

and USA will come as a surprise and going to become the epicenter for new cases during the mid-April 2020. Further, for India, Kumar et al. [6], by using ARIMA and Richard's model, predicted that by the end of April 2020, the incidence of new cases is predicted to be 5200 through the ARIMA model versus be 6378 Richard model and the estimated 197 deaths and drop down in the recovery rates will reach around 501 by the end of April 2020.

In the prediction of other infectious diseases, using the time series forecasting model, Siregar and Makmur [8] investigated the role of climate change in prediction of dengue fever in the districts of Medan in Indonesia for the monthly data for 2012-16 and shown that the trend is seasonal and the impact is high during the rainy season. For the study on dengue in Bangladesh, Choudhury, Banu and Islam [4] attempts to model the monthly number of dengue fever cases in Dhaka, Bangladesh, and forecast the dengue incidence using Seasonal Autoregressive Integrated Moving Average models for the monthly data, from January 2000 to October 2007, and the results showed that the predicted values were consistent with the upturns and downturns of the observed series. A forecast for the period November 2007 to December 2008 showed a pick in the incidence of dengue fever during July 2008, with estimated cases as 689.

3. Rationale and objectives of the study

The studies so far, we have reviewed have been very tiny in number with respect to COVID predictions. Those which are reviewed in this context do cover the period of prediction until July 7. But now we have already crossed the said period of forecasting and what is now available is the actual number of incidences as per WHO reports. Thus, we need to forecast the COVID incidence for further future periods. The present study has tried to do this and aimed to forecast of COVID incidences for seven highly affected countries for the period July 12-September 11, 2020. Besides, it tries to test whether the level and growth of forecasted values are significantly larger or smaller than that of the actual values available for the period Jan 21st to July 11.

4. Data source

The present study uses the time series data on the number of incidences or number of cases of COVID for the seven selected countries for the actual period January 21st, 2020 to July 11, 2020. The selected seven countries are USA, UK, Italy, Spain, France, China and India. The countries of Americas and Europe are selected on the ground of their huge death toll, China is for the origin of the pandemic and India as it is with highly dense population and still experiencing rising trends. Brazil was not considered as it was not in the list of the occurring countries in the initial phase, although its death tolls are also in alarming level. The data of number of incidences is borrowed from the World Health Organization's (WHO) day to day status report. The WHO's status reports are available up to July 11, the study thus treats all the data beyond that date as forecasted values to be computed and the data series within this date is treated as actual or historical values.

5. Methodology

In forecasting the values of a variable, from economic, social, natural fronts, among others, several methods or techniques are available. The popular methods are Average approach, Naïve approach, Drift method, Seasonal naïve approach, Time series methods, Econometric forecasting methods, Artificial neural networks. In economics, the widely applied methods fall in the domains of Time series methods and Econometric forecasting methods out of which the Box-Jenkins method is a widely applied technique. The

present study relies on the Box-Jenkins method [3] for forecasting the number of COVID incidences in all the selected countries for the period July 12, 2020 to September 11, 2020, based on the actual historical data of January 21st, 2020 to July 11, 2020.

5.1. Box-Jenkins method of forecasting

Box-Jenkins method is a linear structure model which traces all the past values of the variable and its stochastic components to predict the values for all the future periods. Prior to have the details of Box and Jenkins (B-J) method of forecasting we need to see how a time series data of a particular variable is generated.

There are three processes behind the cohort of a time series data-

1. AR (autoregressive) Process: Past values of the variable and error term generate the data
2. MA (moving average) Process: Only the errors or the disturbance term generate the data
3. ARMA (autoregressive and moving average) Process: Data is generated by the combination of AR and MA processes

Sometimes it is taken as ARIMA model where 'I' stands for the order of Integration of the series or how many differencing is done for making the time series of the variable to Stationary.

An AR (p) process is one where the current or present period's value of a variable 'y' depends on only the past values plus an error term. If there are 'p' order in the process i.e. current value of y depends on the 'p' order of past (e.g. t-1, t-2, etc.) values and an error term of the current period then the AR(p) can be written as-

$$y_t = \mu + \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \varphi_3 y_{t-3} + \varphi_4 y_{t-4} + \dots + \varphi_p y_{t-p} + u_t = \mu + \sum \varphi_i y_{t-i} + u_t \tag{1}$$

where u_t is the white noise (WN) error term with zero mean, constant variance and zero auto-covariance.

An MA(q) process, on the other hand, is the linear combination of all the q terms of the past values of the white noise terms depending on time. It is a white noise process in which the current value of y_t depends on the current value of the WN error term and all past values of the error terms. Because all the errors are WN, so, an MA process is necessarily a stationary process. It is true further because it is the linear combination of all plus and minus values of the errors which hover around the value zero.

Hence, an MA (q) process can be written as-

$$y_t = u_t + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \theta_3 u_{t-3} + \theta_4 u_{t-4} + \dots + \theta_q u_{t-q} = u_t + \sum \theta_i u_{t-i} \tag{2}$$

An AR process is stationary if the characteristic root lies outside the unit circle or having values > 1. If it is so then φ becomes less than 1. This means the condition $\varphi < 1$ lead to the values lying inside the unit circle representing stationarity of the AR process, the model is thus having stability property. The AR coefficients should then be less than unity or they should lie within the unit circle.

An ARIMA (p, q) process is the combination of AR and MA process, I being the order of integration which can be represented by 'd', number of differencing to convert the series from non-stationary to stationary. The model for ARMA (p, d, q) can then be written as-

$$y_t = \mu + \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \varphi_3 y_{t-3} + \varphi_4 y_{t-4} + \dots + \varphi_p y_{t-p} + u_t + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \theta_3 u_{t-3} + \theta_4 u_{t-4} + \dots + \theta_q u_{t-q}$$

Using Lag operator, we have

$$(1 - \varphi_1 L - \varphi_2 L^2 - \varphi_3 L^3 - \varphi_4 L^4 - \dots - \varphi_p L^p) y_t = \mu + (1 + \theta_1 L + \theta_2 L^2 + \theta_3 L^3 + \theta_4 L^4 + \dots + \theta_q L^q) u_t$$

Or, $\varphi(L) y_t = \mu + \theta(L) u_t$ (3)

This relation (3) stands for invertibility between the AR and MA process which means AR and MA processes can be made invertible from one to another.

5.2. Forecasting in ARIMA model: Box-Jenkins method

The B-J model undergoes several sub-models and it is thus required to determine which model is appropriate. The entire procedure follows four-steps:

Step 1: Identification: To determine the appropriate values of p, d, and q.

Ø The main tools in this search are the correlogram and partial correlogram where the values of autocorrelation coefficients (ACF) and partial autocorrelation coefficients (PACF) are generated.

Step 2: Estimation: To estimate the parameters of the chosen model. The parameters are all AR and MA terms and a constant term.

Step 3: Diagnostic Checking: To check if the residuals from the fitted model are white noise. It is based on the statistical significance of the estimated values of AR and MA terms, the values of adjusted R square (which should be maximum), and lowest possible values of the information criterion such as Akaike Information Criteria (AIC) and Swartz Information Criteria (SIC).

Ø If they are, accept the chosen model; if not, start afresh.

Ø That is why the BJ methodology is an iterative process.

Step 4: Forecasting. The ultimate test of a successful ARIMA model lies in its forecasting performance, within the sample period as well as outside the sample period. On the basis of the acceptable results obtained from Step 1 to 3, forecasting is made on the appropriate model of ARIMA. The forecasting results are accepted on the basis of the acceptable values of root mean square error (RMSE), bias proportion, variance proportions and covariance proportions. The acceptable forecasted values will be those whose RMSE will be minimum possible and covariance proportions will be greater than bias proportions and variance proportions.

5.3. Computation of forecasted values of the number of COVID incidences

Before going for predicting the number of cases for all the seven selected countries we present the diagrammatical view of the actual trends of the same for all the available data. Fig. 1 presents the same.

It is observed from the series of the countries on number of incidences that all countries have experienced increasing trends starting from the first case in 21st January, 2020 in Wuhan Province of China. Maintaining a highly rising trends for the phase of early several weeks China's case became stagnated from the mid of March 2020. In the meantime, Italy became the epicenter of Europe in terms of number of incidences and deaths followed by Spain, France and UK. The ramifications were not restricted to the European zone only, it quickly spread to USA with a very high rate of growth in terms of both number of cases and deaths. USA overtakes China on March 28 and still maintaining top position in the world level with more than lacs of deaths and more than 30 lacs number of cases.

In the interim, side by side with Europe and Americas, India has become the only epicenter of Asia and it overtakes the top European members in the list, UK, in June 12. It is an unknown event

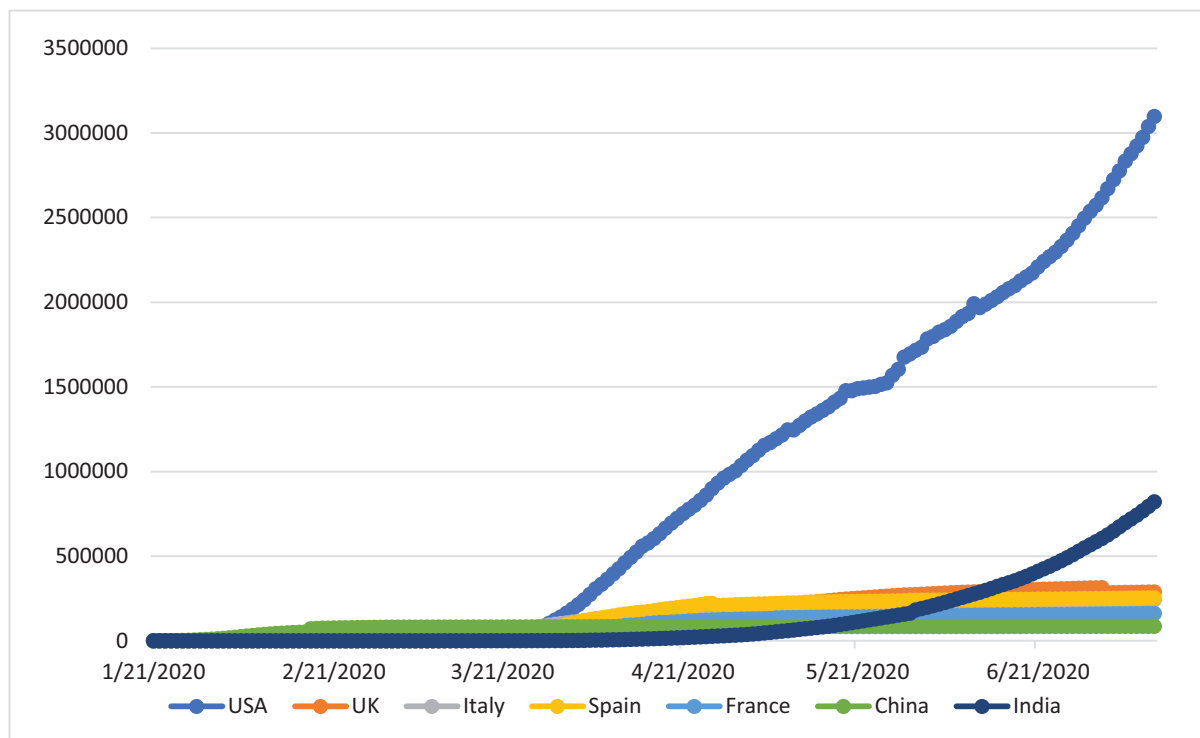


Fig. 1. Trends of number of incidences (i.e. actual values) of the selected countries. Source: Drawn by the authors based on the WHO's status reports.

now where the countries will stay in terms of incidence and death. We can only make forecasting of the same for all the future periods. The present study aims to forecast the number of incidences for the next two months from July 12. The following section focuses on the determination of the forecasted values by using all the four steps of B-J methods.

5.4. Step 1-3 of forecasting

Table 1 presents the basic results required in the first 3-steps of forecasting process. Column 2 gives the ADF values to show the stationarity of the series and order of integration, column 3 gives all possible forms of ARIMA based on the shapes of ACF and PACF functions, column 4 shows the regression results which determine the values of AR and MA terms, column 5 gives the values of adjusted R square and column 6 and 7 respectively show the values of AIC and SIC criteria.

It is observed from the table that the order of integration of the series for USA, Italy, Spain, France and India is 2 which means these series are second difference stationary. UK's series is first difference stationary but China's series is stationary at level. On the basis of these unit root test results in Augmented Dickey-Fuller (ADF) lines and shapes of ACF and PACF in the respective correlograms we have determined all possible combinations of AR and MA terms. The bold marked results for AR and MA terms after regression of the current values of the number of incidences upon all of its possible lagged values of AR and MA terms of each of the countries do indicate the acceptable structure of the ARIMA where highest values of adjusted R square and low AIC and SIC values are considered as the marking weapons. The optimum and stable structure of ARIMA for USA is (9,2,1), UK (1,1,1), Italy (7,2,1), Spain (2,2,1), France (1,2,1), China (1,0,28) and India (1,2,2).

5.5. Step 4 of forecasting

On the basis of the acceptable results obtained from Step 1 to 3, forecasting is made on the appropriate model of ARIMA. The fore-

casting results are accepted on the basis of the acceptable values of root mean square error (RMSE), bias proportion, variance proportions and covariance proportions. Figs. 2 and 3 present the graphical plots of forecasted values of number of incidences of the selected countries. The numerical values of the forecasted series are given in the Appendix (Table A1).

It is observed from the figures that USA leads the group in both actual and forecasted values of number of incidences followed by India. Both the countries have been experiencing exponential increase in incidences and are expected to experience so in coming two months. There is no signs of stagnancy or stationary forecasted values till September 11. It is thus inferred that these two countries may not face the peak of the severity in next 60 days. USA is forecasted to record over 80 lacs cases and India more than 40 lacs cases in September 11.

Now come to the discussion on the forecasted trends of remaining five countries in the list. Fig. 3 depicts that UK will follow India but there is a huge gap between India and UK. On September 11, UK may face around 30 lacs cases which is around 10 lacs less cases than India. China is in the next position after UK. Spain, France and Italy follow China. Italy is in the bottom position. The peak points of all these countries except USA, India and UK have already crossed and they are narrowing down the gap between actual occurrence and forecasted occurrence.

Remarkable sign is observed for China in the sense that its peak has reached on February 20 and the trend thereafter maintained at a stationary level around 80000. The European victims are now getting relief in terms of number of incidences but USA and India have been expected to hit hard in coming days.

Another way of finding the severity of the forecast values of the number of incidences is the growth trend. Fig. 4 depicts it.

It is observed from the figure that Chinese growth rate was maximum in the very first phase of the outbreak and then USA and UK followed China. But, on an average, the growth rate of China in all the forecasted period is 0.00001 per cent while that of others are around 1 per cent.

Table 1
Unit Root Test and ARIMA results for number of cases.

Groups	ADF	Possible forms of ARIMA	Regression Co-effs. (Prob)	R ²	AIC	SIC
USA	-11.4 (0.00) I(2)	(1,2,1)	AR(1) = -0.14 (0.15) MA(1) = -0.66(0.00)	0.40	21.17	21.23
		(7,2,1)	AR(7) = -0.18 (0.02) MA(1) = -0.72(0.00)	0.41	21.19	21.25
		(8, 2, 1)	AR(8) = 0.20(0.01) MA(1) = -0.74(0.00)	0.42	21.18	21.24
		(9,2,1)	AR(9) = -0.25(0.00) MA(1) = -0.70(0.00)	0.43	21.17	21.23
		(13,2,12)	AR(13) = -0.27(0.00) MA(12) = 0.14(0.12)	0.12	21.62	21.68
UK	-3.91(0.00) I(1)	(1,1,1)	AR(1) = 0.97 (0.00) MA(1) = -0.83 (0.00)	0.32	18.56	18.62
		(2, 1, 1)	AR(2) = 0.32(0.00) MA(1) = 0.28 (0.00)	0.19	18.74	18.79
		(1,1,2)	AR(1) = 0.32(0.00) MA(2) = 0.16(0.04)	0.17	18.75	18.81
		(8,1,1)	AR(8) = 0.29(0.00) MA(1) = 0.19(0.01)	0.16	18.80	18.85
Italy	-2.49(0.01) I(2) No intercept and trend	(1,2,1)	AR(1) = -0.16 (0.47) MA(1) = -0.16 (0.46)	0.10	15.16	15.21
		(7,2,1)	AR(7) = -0.38 (0.00) MA(1) = -0.46(0.00)	0.20	15.06	15.12
		(1,2,7)	AR(1) = -0.43 (0.00) MA(7) = 0.31 (0.00)	0.18	15.05	15.11
		(1,2,8)	AR(1) = -0.36 (0.00) MA(8) = -0.21 (0.00)	0.12	15.12	15.18
Spain	-12.05(0.00) I(2)	(1,2,1)	AR(1) = 0.22 (0.07) MA(1) = -0.72 (0.00)	0.20	17.47	17.53
		(1,2,2)	AR(1) = -0.48 (0.00) MA(2) = -0.43(0.00)	0.21	17.46	17.52
		(2,2,1)	AR(2) = -0.24 (0.00) MA(1) = -0.50 (0.00)	0.22	17.45	17.51
		(2,2,2)	AR(2) = -0.43(0.14) MA(2) = 0.22(0.48)	0.04	17.66	17.71
France	-13.05(0.00) I(2)	(1,2,1)	AR(1) = -0.13 (0.21) MA(1) = -0.66 (0.00)	0.38	16.32	16.37
		(1,2,2)	AR(1) = -0.70 (0.00) MA(2) = -0.50 (0.00)	0.38	16.33	16.37
China	-6.05(0.00) I(0)	(1,0,1)	AR(1) = 0.96(0.00) MA(1) = 0.14(0.05)	0.99	17.48	17.54
		(1,0,28)	AR(1) = 0.92(0.00) MA(28) = 0.99(0.00)	0.99	12.71	12.76
India	-13.57(0.00) I(2)	(1,2,1)	AR(1) = 0.03(0.79) MA(1) = -0.57(0.00)	0.21	17.16	17.22
		(1,2,2)	AR(1) = -0.52(0.00) MA(2) = -0.32(0.00)	0.21	17.16	17.22
		(1,2,7)	AR(1) = -0.39(0.00) MA(7) = 0.08(0.29)	0.14	17.24	17.30

Source: Computed by the author

Note: Bold marks indicate significant results and the accepted ARIMA structures for which forecasting are made.

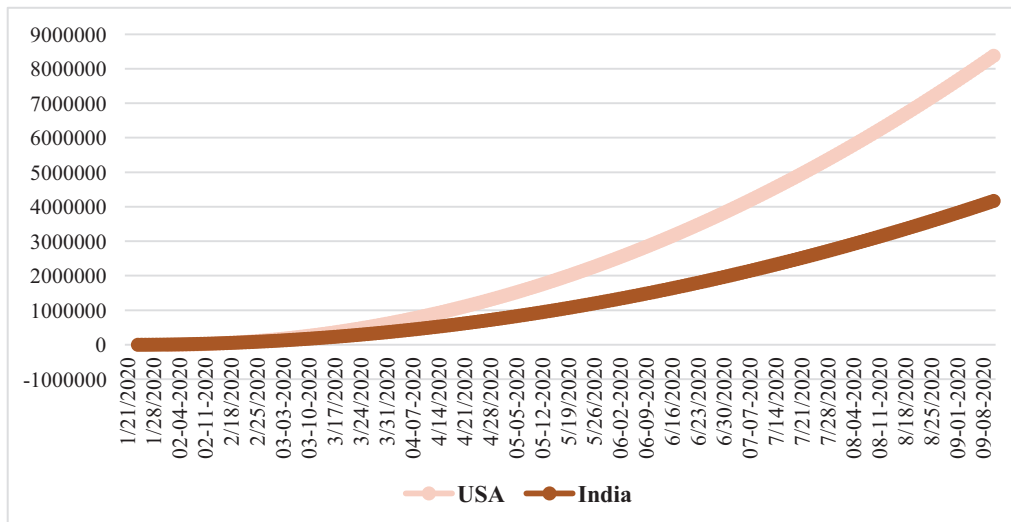


Fig. 2. Forecasted values of number of incidences in USA and India. Source: Drawn by the authors based on the derived forecasted values.

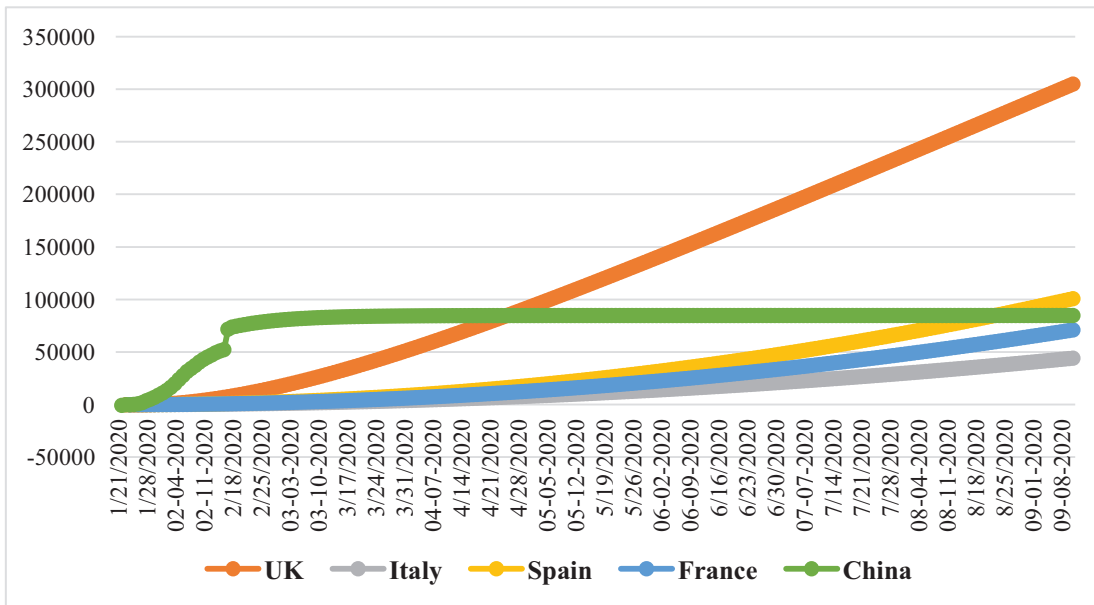


Fig. 3. Forecasted values of number of incidences in UK, Italy, Spain, France and China. Source: Drawn by the authors based on the derived forecasted values.

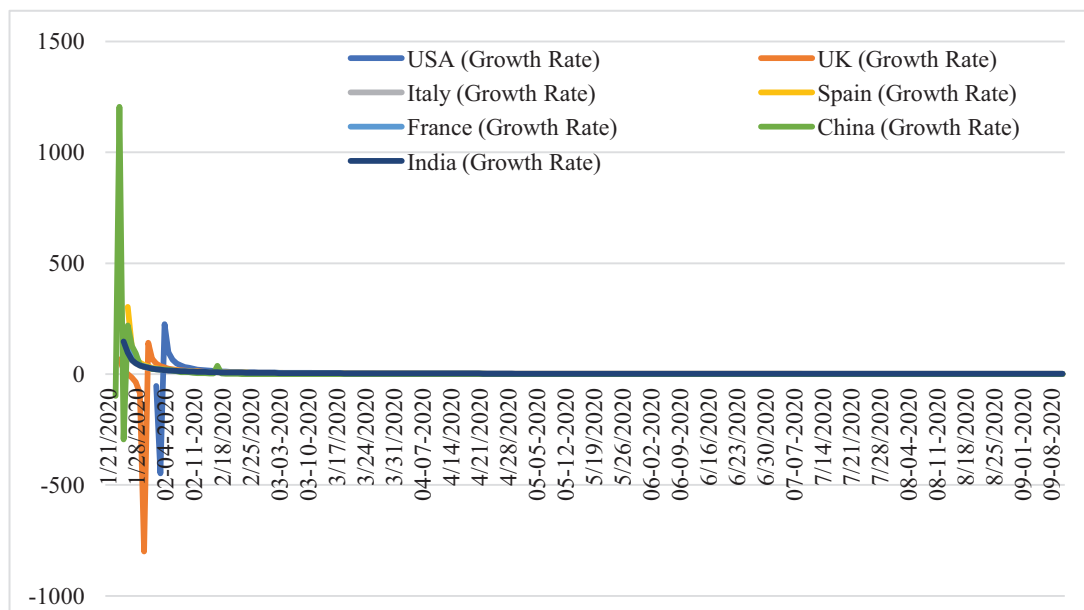


Fig. 4. Growth rate of forecasted values. Source: Drawn by the authors based on the derived forecasted values.

5.6. Comparative study on actual and forecasted values in level and growth forms

We now try to show whether there is a significant difference in forecasted values (for the period July 12 – September 11) of the number of incidences in level and growth forms in comparison to the actual values (for the period January 21st – July 11). For this purpose, we have computed the mean values of the forecasted values in levels and growths and that of actual values in levels and growths. After that we have computed the standard deviations of the same in both actual and forecasted periods. The test statistics for examining whether there are significant increases or decreases in the level and growth of the forecasted values vis-à-vis the corresponding actual values across the countries is student t statistics.

The formula for t statistics for the mean difference is-

$$t = (\mu_f - \mu_a) / \sqrt{(S_f^2/n_f + S_a^2/n_a)}$$

with degrees of freedom (n_f+n_a-2) . where ‘ μ ’ stands for mean value for forecasted (f) and actual (a). S^2 represents variance of the forecasted and actual values.

The mean and standard deviation (SD), mean differences and t values for both the level and growth forms are respectively given in Tables 2 and 3.

It is observed from Table 2 that the average forecasted values of number of incidences are greater than that of the actual values for USA, India, UK and China with significant positive values in calculated t statistic. All of them are highly significant. But, the results

Table 2
Results of mean difference tests for level values.

Country	Average Forecast Values (Jul 12 to Sept 11)	Average Actual Values (Jan 21 to Jul 11)	SD of Forecast Values (Jul 12 to Sept 11)	SD of Actual Values (Jul 12 to Sept 11)	t of mean diff (Forecast-Actual)
United States	6308829.855	895802.1098	1163835.327	945618.9185	32.93304191
United Kingdom	254811.2274	128530.3064	29537.26894	125255.824	12.33787841
Italy	33612.47177	130637.4104	5967.542088	101420.4233	-12.52256661
Spain	76560.67274	132417.9249	13654.72482	107697.7555	-6.673720841
France	54016.695	80319.65896	9605.449483	66498.99716	-5.057373276
China	84786.14774	73425.23699	0.028825043	22993.84306	6.498672284
India	3171701.097	124574.4451	562470.0158	203673.8686	41.68842023

Source: Author's calculations

Note: Bold marks indicate significant results at 5% level.

Table 3
Results of mean difference tests for growth values.

Country	Average Forecast Values (Jul 12 to Sept 11)	Average Actual Values (Jan 21 to Jul 11)	SD of Forecast Values (Jul 12 to Sept 11)	SD of Actual Values (Jul 12 to Sept 11)	t of mean diff (Forecast-Actual)
United States	1.047	11.17993185	0.099185526	25.13991667	-5.301330843
United Kingdom	0.66	8.681737714	0.073769216	17.83869576	-5.914500178
Italy	1.006	11.83256182	0.091527666	61.26289483	-2.324420755
Spain	1.011	11.2502479	0.092408959	43.68115673	-3.083147251
France	1.008	8.725214814	0.091838458	19.6109477	-5.175731897
China	0	3.933097137	4.70E-06	12.11761724	-4.26914095
India	1.005	10.52936256	0.091320714	32.02762148	-3.911374117

Source: Authors' calculations

Note: Bold marks indicate significant results at 5% level.

of Italy, Spain and France, the trio in the adjacent region in Europe, show the difference to that of the above-mentioned countries with a negative and significant values of the t statistic. This means, the forecasted values of these three European countries are going to be falling.

Whenever we talk of the differences in the growth rates between forecasted and actual values then we see (refer to Table 3) that all the countries' forecasted growth rates are getting lower and lower as compared to their actual growth rates. This is evidenced from the negative and significant values of the calculated t statistic.

The negative sign of the t values gives the relieving signs to the affected countries in the sense that, although the number of cases is increasing day by day, the growth rates of such increases are going down over time. But it is not clear from the above analysis in which day there will be zero growth of the cases for the countries except China.

6. Conclusion and recommendations

The study so far, we made is now in a position to conclude. We started our journey by considering the objectives of forecasting the number of incidences of the seven highly affected countries of the globe in one hand and the severity of this forecasted values on the other. It was observed that USA and India are the two countries whose increasing trends will continue in the forecasted period (July 12 to September 11), others except China will face lower number of incidences. China's incidence has come to halt around 80000 in numbers. The growth rates of the number of incidences for all the countries during the forecasted period will be diminish-

ing. The mean difference test results between the forecasted and actual values in level and growth forms show that in the former case, USA, India, UK will face increasing forecast than the actual number but in the latter case, all of the countries will face significantly decreasing growth rates in the forecasted values compared to their actual growth values. Hence, in terms of total number of incidences, the forecasting results provide us gloomy pictures but in terms of the growth figures, the sign is definitely of relieving signs (Table A2).

The study recommends for maintaining appropriate measures such as physical/social distancing, awareness campaigns, large scale testing, uses of masks and sanitizers, incentives for inventing vaccines, sizable amount of national incomes on health care facilities, relief funds for the affected zones in terms of kinds to avoid outside home movements, etc.

7. Funding information

While doing the research and preparing the manuscript the author did not use funds of any government or agencies.

Declaration of Competing Interest

In preparing the manuscript the author did not face any conflict of interests and did not use any such materials of others where such conflict would at all arise.

Appendix

Source: Computed by the author.

Table A1
Forecasted values of number of incidences.

Date	USA	UK	Italy	Spain	France	China	India
1/21/2020							
1/22/2020						-651.32	
1/23/2020		-112.803				-10.4029	
1/24/2020		-187.487	2.091972		2.308769	-135.821	200.0047
1/25/2020		-224.869	5.480038	2.305918	5.495655	264.0949	494.3476
1/26/2020		-225.752	10.58698	9.293847	12.57273	844.1042	974.5049
1/27/2020		-190.922	17.06037	20.40184	21.40369	1914.875	1592.129
1/28/2020		-121.145	25.21898	35.05084	33.5037	3711.985	2372.772
1/29/2020		-17.174	34.76413	53.37779	47.79814	5198.481	3302.93
1/30/2020		120.2568	45.88011	75.52382	65.04918	6943.99	4389.739
1/31/2020		290.4277	58.6633	101.4555	84.71625	9019.436	5629.429
02-01-2020	-268.22	492.6347	73.07136	131.1386	107.1827	11103.61	7023.992
02-02-2020	-125.167	726.1891	89.12289	164.581	132.1768	13503.99	8572.374
02-03-2020	435.4174	990.4168	106.8097	201.7913	159.8911	16476.28	10275.13
02-04-2020	1413.79	1284.658	126.1354	242.7675	190.1891	19864.74	12131.97
02-05-2020	2808.92	1608.268	147.0984	287.5074	223.1676	23896.12	14143.05
02-06-2020	4622.354	1960.615	169.6995	336.0116	258.758	27722.13	16308.29
02-07-2020	6853.319	2341.082	193.9382	388.2806	297.0089	31543.65	18627.72
02-08-2020	9501.815	2749.063	219.8147	444.3142	337.8858	34459.51	21101.33
02-09-2020	12567.58	3183.966	247.3291	504.1124	381.4132	37271.42	23729.13
02-10-2020	16121.88	3645.214	276.4812	567.6752	427.5737	40424.62	26511.11
02-11-2020	19986.07	4132.24	307.2711	635.0025	476.3797	43058.88	29447.27
02-12-2020	24160.08	4644.489	339.6988	706.0944	527.8224	45258.08	32537.62
2/13/2020	28643.85	5181.42	373.7643	780.9509	581.9081	47226.56	35782.16
2/14/2020	33437.66	5742.5	409.4676	859.572	638.6322	49365.08	39180.87
2/15/2020	38541.08	6327.212	446.8087	941.9577	697.998	51008.58	42733.77
2/16/2020	43954.34	6935.047	485.7875	1028.108	760.0032	52274.09	46440.86
2/17/2020	49677.42	7565.508	526.4042	1118.023	824.6493	53716.66	50302.13
2/18/2020	55710.4	8218.109	568.6587	1211.702	891.9354	55317.58	54317.58
2/19/2020	62034.89	8892.372	612.5509	1309.146	961.8621	574608.79	58487.22
2/20/2020	68696.97	9587.834	658.0809	1410.355	1034.429	59385.47	62811.04
2/21/2020	75696.66	10304.04	705.2488	1515.328	1109.636	6102.88	67289.04
2/22/2020	83033.98	11040.54	754.0544	1624.066	1187.484	62765.54	71921.23
2/23/2020	90708.86	11796.9	804.4978	1736.568	1267.972	64377.63	76707.6
2/24/2020	98721.39	12572.69	856.579	1852.835	1351.1	66493.01	81648.16
2/25/2020	107071.5	13367.49	910.298	1972.867	1436.869	68465.24	86742.9
2/26/2020	115759.3	14180.9	965.6548	2096.663	1525.278	70476.62	91991.82
2/27/2020	124784.6	15012.52	1022.649	2224.224	1616.327	72493.19	97394.93
2/28/2020	134152.3	15861.95	1081.282	2355.549	1710.017	74804.75	102952.2
2/29/2020	143850.5	16728.82	1141.552	2490.639	1806.347	77184.91	108663.7
03-01-2020	153879	17612.74	1203.46	2629.493	1905.317	80536.05	114529.4
03-02-2020	164238	18513.35	1267.006	2772.112	2006.928	83660.39	120549.2
03-03-2020	174927.5	19430.29	1332.189	2918.496	2111.179	87159.99	126723.2
03-04-2020	185947.4	20363.21	1399.01	3068.644	2218.07	91436.72	133051.5
03-05-2020	197297.8	21311.77	1467.47	3222.557	2327.602	96192.33	139533.8
03-06-2020	208978.5	22275.62	1537.566	3380.234	2439.774	101928.44	146170.4
03-07-2020	220989.8	23254.45	1609.301	3541.676	2554.586	108146.52	152961.2
03-08-2020	233330.2	24247.93	1682.674	3706.883	2672.039	115347.97	159906.1
03-09-2020	246003	25255.74	1757.684	3875.854	2792.132	123044.04	167005.3
03-10-2020	259008	26277.58	1834.332	4048.59	2914.865	131705.91	174258.6
03-11-2020	272345.3	27313.14	1912.618	4225.09	3040.239	141264.66	181666.1
03-12-2020	286015	28362.13	1992.541	4405.355	3168.253	151911.3	189227.8
3/13/2020	300016.9	29424.26	2074.103	4589.384	3298.907	163466.75	196943.6
3/14/2020	314351.1	30499.25	2157.302	4777.179	3432.202	176271.86	204813.7
3/15/2020	329017.6	31586.83	2242.139	4968.737	3568.137	189737.42	212837.9
3/16/2020	344016.4	32686.71	2328.614	5164.06	3706.712	203494.17	221016.4
3/17/2020	359347.8	33798.64	2416.727	5363.148	3847.928	218592.77	229349
3/18/2020	375011	34922.35	2506.477	5566.001	3991.784	23483.84	237835.8
3/19/2020	391006	36057.61	2597.865	5772.618	4138.281	25167.96	246476.7
3/20/2020	407332.8	37204.14	2690.891	5982.999	4287.417	26945.67	255271.9
3/21/2020	423991.5	38361.72	2785.555	6197.145	4439.194	28817.44	264221.2
3/22/2020	440982	39530.11	2881.857	6415.056	4593.612	30733.74	273324.8
3/23/2020	458304.2	40709.07	2979.796	6636.731	4750.67	32704.98	282582.5
3/24/2020	475958.3	41898.37	3079.373	6862.171	4910.368	34711.54	291994.4
3/25/2020	493944.2	43097.8	3180.588	7091.376	5072.706	36715.79	301560.4
3/26/2020	512261.9	44307.14	3283.441	7324.345	5237.685	38720.05	311280.7
3/27/2020	530911.5	45526.17	3387.931	7561.079	5405.304	40726.62	321155.1
3/28/2020	549893	46754.68	3494.06	7801.577	5575.564	42787.8	331183.8
3/29/2020	569206.5	47992.47	3601.826	8045.84	5748.463	44825.83	341366.6
3/30/2020	588851.9	49239.35	3711.23	8293.867	5924.003	46930.96	351703.6
3/31/2020	608829.2	50495.11	3822.271	8545.659	6102.184	49039.41	362194.8
04-01-2020	629138.5	51759.56	3934.951	8801.216	6283.005	51143.39	372840.1
04-02-2020	649779.7	53032.53	4049.268	9060.537	6466.466	53245.07	383639.7
04-03-2020	670752.8	54313.82	4165.223	9323.623	6652.567	55376.64	394593.4
04-04-2020	692057.9	55603.25	4282.816	9590.473	6841.309	57500.27	405701.3
04-05-2020	713694.9	56900.66	4402.046	9861.088	7032.691	59622.08	416963.4
04-06-2020	735663.9	58205.86	4522.915	10135.47	7226.714	61742.24	428379.7
04-07-2020	757964.7	59518.7	4645.421	10413.61	7423.377	63860.85	439950.2

(continued on next page)

Table A1 (continued)

Date	USA	UK	Italy	Spain	France	China	India
04-08-2020	780597.4	60839	4769.565	10695.52	7622.68	84578.05	451674.8
04-09-2020	803562	62166.62	4895.347	10981.19	7824.624	84593.93	463553.7
04-10-2020	826858.6	63501.38	5022.767	11270.63	8029.207	84608.6	475586.7
04-11-2020	850487	64843.14	5151.824	11563.83	8236.432	84622.15	487773.9
04-12-2020	874447.4	66191.74	5282.519	11860.8	8446.296	84634.67	500115.3
4/13/2020	898739.7	67547.04	5414.852	12161.53	8658.801	84646.23	512610.9
4/14/2020	923363.8	68908.9	5548.823	12466.03	8873.946	84656.91	525260.6
4/15/2020	948319.9	70277.17	5684.431	12774.29	9091.732	84666.78	538064.6
4/16/2020	973607.9	71651.72	5821.678	13086.32	9312.158	84675.89	551022.7
4/17/2020	999227.8	73032.4	5960.562	13402.11	9535.224	84684.3	564135
4/18/2020	1025180	74419.1	6101.084	13721.66	9760.931	84692.08	577401.5
4/19/2020	1051463	75811.68	6243.244	14044.98	9989.278	84699.26	590822.2
4/20/2020	1078079	77210.01	6387.041	14372.06	10220.26	84705.89	604397
4/21/2020	1105027	78613.97	6532.476	14702.91	10453.89	84712.02	618126.1
4/22/2020	1132306	80023.43	6679.549	15037.52	10690.16	84717.68	632009.3
4/23/2020	1159917	81438.29	6828.26	15375.9	10929.07	84722.9	646046.7
4/24/2020	1187861	82858.42	6978.609	15718.04	11170.62	84727.73	660238.3
4/25/2020	1216136	84283.71	7130.595	16063.95	11414.81	84732.19	674584.1
4/26/2020	1244743	85714.06	7284.22	16413.62	11661.64	84736.31	689084.1
4/27/2020	1273682	87149.34	7439.482	16767.06	11911.11	84740.12	703738.2
4/28/2020	1302953	88589.46	7596.382	17124.26	12163.22	84743.63	718546.6
4/29/2020	1332556	90034.31	7754.919	17485.22	12417.97	84746.88	733509.1
4/30/2020	1362491	91483.78	7915.095	17849.95	12675.36	84749.88	748625.8
05-01-2020	1392758	92937.79	8076.908	18218.45	12935.39	84752.65	763896.7
05-02-2020	1423356	94396.23	8240.359	18590.7	13198.06	84755.2	779321.7
05-03-2020	1454287	95859.01	8405.448	18966.73	13463.37	84757.57	794901
05-04-2020	1485549	97326.03	8572.174	19346.52	13731.32	84759.75	810634.4
05-05-2020	1517143	98797.21	8740.539	19730.07	14001.91	84761.77	826522
05-06-2020	1549070	100272.4	8910.541	20117.39	14275.15	84763.63	842563.9
05-07-2020	1581328	101751.7	9082.181	20508.47	14551.02	84765.35	858759.8
05-08-2020	1613918	103234.8	9255.459	20903.31	14829.53	84766.94	875110
05-09-2020	1646840	104721.7	9430.374	21301.92	15110.69	84768.41	891614.4
05-10-2020	1680094	106212.3	9606.927	21704.3	15394.48	84769.76	908272.9
05-11-2020	1713680	107706.6	9785.119	22110.44	15680.92	84771.01	925085.6
05-12-2020	1747597	109204.4	9964.947	22520.34	15969.99	84772.17	942052.6
5/13/2020	1781847	110705.8	10146.41	22934.01	16261.71	84773.24	959173.6
5/14/2020	1816429	112210.5	10329.52	23351.45	16556.06	84774.23	976448.9
5/15/2020	1851342	113718.6	10514.26	23772.65	16853.06	84775.14	993878.4
5/16/2020	1886587	115230	10700.64	24197.61	17152.69	84775.98	1011462
5/17/2020	1922165	116744.5	10888.66	24626.34	17454.97	84776.76	1029200
5/18/2020	1958074	118262.2	11078.31	25058.83	17759.89	84777.48	1047092
5/19/2020	1994315	119783	11269.61	25495.08	18067.44	84778.14	1065138
5/20/2020	2030888	121306.7	11462.54	25935.11	18377.64	84778.75	1083338
5/21/2020	2067793	122833.4	11657.11	26378.89	18690.48	84779.32	1101693
5/22/2020	2105030	124363	11853.32	26826.44	19005.96	84779.84	1120202
5/23/2020	2142599	125895.3	12051.16	27277.76	19324.07	84780.32	1138865
5/24/2020	2180499	127430.4	12250.64	27732.84	19644.83	84780.77	1157682
5/25/2020	2218732	128968.2	12451.76	28191.68	19968.23	84781.18	1176653
5/26/2020	2257296	130508.7	12654.52	28654.29	20294.27	84781.56	1195779
5/27/2020	2296193	132051.7	12858.92	29120.66	20622.95	84781.91	1215058
5/28/2020	2335421	133597.2	13064.95	29590.8	20954.27	84782.24	1234492
5/29/2020	2374981	135145.2	13272.62	30064.7	21288.23	84782.54	1254080
5/30/2020	2414874	136695.6	13481.93	30542.37	21624.83	84782.82	1273822
5/31/2020	2455098	138248.4	13692.88	31023.8	21964.07	84783.07	1293719
06-01-2020	2495654	139803.4	13905.46	31509	22305.96	84783.31	1313769
06-02-2020	2536542	141360.7	14119.68	31997.96	22650.48	84783.53	1333974
06-03-2020	2577761	142920.3	14335.54	32490.69	22997.64	84783.73	1354333
06-04-2020	2619313	144482	14553.04	32987.18	23347.44	84783.92	1374846
06-05-2020	2661197	146045.8	14772.18	33487.43	23699.89	84784.09	1395514
06-06-2020	2703412	147611.7	14992.95	33991.45	24054.97	84784.25	1416335
06-07-2020	2745960	149179.6	15215.36	34499.23	24412.69	84784.39	1437311
06-08-2020	2788839	150749.5	15439.41	35010.78	24773.06	84784.53	1458441
06-09-2020	2832050	152321.4	15665.1	35526.09	25136.06	84784.65	1479725
06-10-2020	2875594	153895.1	15892.43	36045.17	25501.7	84784.77	1501163
06-11-2020	2919469	155470.7	16121.39	36568.01	25869.99	84784.88	1522755
06-12-2020	2963676	157048.1	16351.99	37094.62	26240.91	84784.98	1544502
6/13/2020	3008215	158627.3	16584.23	37624.99	26614.48	84785.07	1566403
6/14/2020	3053086	160208.2	16818.1	38159.13	26990.69	84785.15	1588458
6/15/2020	3098288	161790.9	17053.62	38697.03	27369.53	84785.23	1610667
6/16/2020	3143823	163375.2	17290.77	39238.69	27751.02	84785.3	1633030
6/17/2020	3189690	164961.1	17529.56	39784.12	28135.15	84785.37	1655548
6/18/2020	3235888	166548.6	17769.98	40333.32	28521.91	84785.43	1678220
6/19/2020	3282418	168137.7	18012.05	40886.28	28911.32	84785.48	1701046
6/20/2020	3329281	169728.4	18255.75	41443	29303.37	84785.54	1724026
6/21/2020	3376475	171320.5	18501.09	42003.49	29698.06	84785.59	1747160
6/22/2020	3424001	172914.1	18748.07	42567.74	30095.39	84785.63	1770448
6/23/2020	3471859	174509.1	18996.69	43135.76	30495.35	84785.67	1793891
6/24/2020	3520049	176105.5	19246.94	43707.54	30897.96	84785.71	1817488

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Table A1 (continued)

Date	USA	UK	Italy	Spain	France	China	India
6/25/2020	3568571	177703.3	19498.83	44283.09	31303.21	84785.74	1841239
6/26/2020	3617425	179302.4	19752.36	44862.4	31711.1	84785.78	1865144
6/27/2020	3666611	180902.8	20007.53	45445.47	32121.63	84785.81	1889203
6/28/2020	3716128	182504.5	20264.34	46032.31	32534.8	84785.83	1913417
6/29/2020	3765978	184107.5	20522.78	46622.92	32950.62	84785.86	1937785
6/30/2020	3816159	185711.7	20782.86	47217.29	33369.07	84785.88	1962307
07-01-2020	3866673	187317.1	21044.58	47815.42	33790.16	84785.91	1986983
07-02-2020	3917518	188923.7	21307.93	48417.32	34213.89	84785.93	2011813
07-03-2020	3968695	190531.5	21572.93	49022.98	34640.26	84785.94	2036797
07-04-2020	4020204	192140.3	21839.56	49632.41	35069.28	84785.96	2061936
07-05-2020	4072045	193750.3	22107.83	50245.6	35500.93	84785.98	2087229
07-06-2020	4124218	195361.3	22377.74	50862.56	35935.22	84785.99	2112676
07-07-2020	4176723	196973.4	22649.28	51483.28	36372.16	84786.01	2138277
07-08-2020	4229560	198586.6	22922.46	52107.77	36811.73	84786.02	2164033
07-09-2020	4282728	200200.7	23197.29	52736.02	37253.94	84786.03	2189942
07-10-2020	4336229	201815.8	23473.74	53368.03	37698.8	84786.04	2216006
07-11-2020	4390061	203432	23751.84	54003.81	38146.29	84786.05	2242224
07-12-2020	4444226	205049	24031.57	54643.35	38596.43	84786.06	2268596
7/13/2020	4498722	206667	24312.95	55286.66	39049.2	84786.07	2295122
7/14/2020	4553550	208285.9	24595.96	55933.74	39504.62	84786.08	2321803
7/15/2020	4608710	209905.6	24880.6	56584.58	39962.68	84786.08	2348638
7/16/2020	4664202	211526.3	25166.89	57239.18	40423.37	84786.09	2375626
7/17/2020	4720026	213147.8	25454.81	57897.55	40886.71	84786.1	2402769
7/18/2020	4776182	214770.1	25744.37	58559.68	41352.69	84786.1	2430067
7/19/2020	4832670	216393.2	26035.57	59225.57	41821.31	84786.11	2457518
7/20/2020	4889490	218017.2	26328.41	59895.23	42292.56	84786.11	2485124
7/21/2020	4946641	219641.9	26622.88	60568.66	42766.46	84786.12	2512884
7/22/2020	5004125	221267.3	26918.99	61245.85	43243	84786.12	2540798
7/23/2020	5061940	222893.5	27216.74	61926.8	43722.18	84786.12	2568866
7/24/2020	5120088	224520.5	27516.13	62611.52	44204	84786.13	2597088
7/25/2020	5178567	226148.2	27817.16	63300.01	44688.46	84786.13	2625465
7/26/2020	5237378	227776.5	28119.82	63992.26	45175.56	84786.13	2653995
7/27/2020	5296521	229405.6	28424.12	64688.27	45665.3	84786.14	2682680
7/28/2020	5355996	231035.3	28730.06	65388.05	46157.68	84786.14	2711519
7/29/2020	5415803	232665.6	29037.64	66091.59	46652.7	84786.14	2740513
7/30/2020	5475942	234296.6	29346.85	66798.9	47150.36	84786.14	2769660
7/31/2020	5536413	235928.3	29657.7	67509.97	47650.67	84786.15	2798962
08-01-2020	5597215	237560.5	29970.19	68224.8	48153.61	84786.15	2828417
08-02-2020	5658350	239193.4	30284.32	68943.4	48659.19	84786.15	2858027
08-03-2020	5719816	240826.8	30600.09	69665.77	49167.41	84786.15	2887792
08-04-2020	5781615	242460.8	30917.49	70391.9	49678.28	84786.15	2917710
08-05-2020	5843745	244095.4	31236.53	71121.79	50191.78	84786.15	2947783
08-06-2020	5906207	245730.5	31557.21	71855.45	50707.92	84786.16	2978009
08-07-2020	5969001	247366.2	31879.53	72592.88	51226.71	84786.16	3008390
08-08-2020	6032127	249002.4	32203.48	73334.06	51748.13	84786.16	3038925
08-09-2020	6095585	250639.1	32529.08	74079.02	52272.2	84786.16	3069615
08-10-2020	6159375	252276.3	32856.31	74827.73	52798.9	84786.16	3100458
08-11-2020	6223497	253914	33185.17	75580.22	53328.25	84786.16	3131456
08-12-2020	6287951	255552.1	33515.68	76336.46	53860.23	84786.16	3162608
8/13/2020	6352736	257190.8	33847.82	77096.47	54394.86	84786.16	3193914
8/14/2020	6417854	258829.9	34181.6	77860.25	54932.13	84786.16	3225374
8/15/2020	6483303	260469.5	34517.02	78627.79	55472.03	84786.16	3256988
8/16/2020	6549085	262109.5	34854.08	79399.09	56014.58	84786.16	3288757
8/17/2020	6615198	263749.9	35192.77	80174.16	56559.77	84786.16	3320679
8/18/2020	6681643	265390.8	35533.11	80953	57107.6	84786.16	3352756
8/19/2020	6748420	267032.1	35875.08	81735.6	57658.07	84786.16	3384988
8/20/2020	6815529	268673.8	36218.68	82521.96	58211.17	84786.17	3417373
8/21/2020	6882970	270315.9	36563.93	83312.09	58766.92	84786.17	3449912
8/22/2020	6950743	271958.3	36910.81	84105.98	59325.31	84786.17	3482606
8/23/2020	7018848	273601.2	37259.34	84903.64	59886.34	84786.17	3515454
8/24/2020	7087284	275244.4	37609.5	85705.06	60450.01	84786.17	3548456
8/25/2020	7156053	276888	37961.29	86510.24	61016.32	84786.17	3581612
8/26/2020	7225153	278532	38314.73	87319.19	61585.27	84786.17	3614923
8/27/2020	7294586	280176.3	38669.8	88131.91	62156.86	84786.17	3648387
8/28/2020	7364350	281820.9	39026.51	88948.39	62731.09	84786.17	3682006
8/29/2020	7434446	283465.9	39384.86	89768.63	63307.97	84786.17	3715779
8/30/2020	7504874	285111.2	39744.84	90592.64	63887.48	84786.17	3749706
8/31/2020	7575634	286756.8	40106.47	91420.42	64469.63	84786.17	3783787
09-01-2020	7646726	288402.7	40469.73	92251.95	65054.42	84786.17	3818023
09-02-2020	7718150	290048.9	40834.63	93087.26	65641.86	84786.17	3852413
09-03-2020	7789906	291695.5	41201.17	93926.32	66231.93	84786.17	3886957
09-04-2020	7861993	293342.3	41569.34	94769.16	66824.64	84786.17	3921655
09-05-2020	7934413	294989.4	41939.15	95615.75	67420	84786.17	3956507
09-06-2020	8007165	296636.8	42310.6	96466.11	68017.99	84786.17	3991513
09-07-2020	8080248	298284.5	42683.69	97320.24	68618.63	84786.17	4026674
09-08-2020	8153663	299932.4	43058.42	98178.13	69221.9	84786.17	4061989
09-09-2020	8227411	301580.6	43434.78	99039.78	69827.82	84786.17	4097458
09-10-2020	8301490	303229.1	43812.78	99905.2	70436.37	84786.17	4133081
09-11-2020	8375901	304877.8	44192.42	100774.4	71047.57	84786.17	4168858

Table A2
Growth rates of the forecasted values.

Date	USA (Growth Rate)	UK (Growth Rate)	Italy (Growth Rate)	Spain (Growth Rate)	France (Growth Rate)	China (Growth Rate)	India (Growth Rate)
1/21/2020							
1/22/2020							
1/23/2020						-98.40279635	
1/24/2020		66.20643				1205.604874	
1/25/2020		19.93861	161.9556093		138.0339913	-294.4434914	147.1679916
1/26/2020		0.39294	93.19172604	303.0432565	128.7758238	219.6215451	97.12948945
1/27/2020		-15.4286	61.14482128	119.5198608	70.23900139	126.852917	63.37824469
1/28/2020		-36.5472	47.82199917	71.80234724	56.53235494	93.84999021	49.0313913
1/29/2020		-85.8236	37.8490724	52.28676403	42.66525787	40.04585148	39.20132234
1/30/2020		-800.226	31.97542985	41.48922239	36.09144624	33.57728921	32.90439095
1/31/2020		141.5063	27.86216075	34.33576321	30.23415514	29.8883783	28.24063116
02-01-2020		69.62387	24.56060263	29.25726057	26.51964647	23.10758677	24.77272562
02-02-2020	-53.3343002	47.40925	21.96692384	25.50156857	23.31915505	21.61801432	22.04418798
02-03-2020	-447.870279	36.38552	19.84541794	22.60911041	20.96759794	22.01045765	19.86329575
02-04-2020	224.697635	29.70883	18.09358139	20.30622728	18.94914726	20.56568594	18.07120688
02-05-2020	98.68014344	25.19036	16.61944228	18.42911428	17.33984755	20.29414933	16.57669777
02-06-2020	64.55983082	21.90848	15.36461308	16.87059185	15.94783472	16.01100932	15.30956901
02-07-2020	48.2646937	19.40549	14.28330667	15.55571296	14.78249948	13.78508794	14.22239855
02-08-2020	38.64545047	17.42703	13.34265245	14.43121289	13.76285357	9.243889024	13.27918822
02-09-2020	32.2650462	15.82004	12.51708826	13.45853902	12.88228153	8.160040581	12.45324347
02-10-2020	28.2814989	14.48659	11.78676508	12.60885469	12.10249147	8.460101601	11.72390222
02-11-2020	23.96860664	13.3607	11.13634489	11.86017991	11.41464033	6.516474366	11.07520583
02-12-2020	20.88459612	12.3964	10.55344938	11.19553073	10.79867593	5.107424996	10.49452122
2/13/2020	18.55858921	11.5606	10.02814847	10.60148615	10.24695049	4.34945539	9.971657423
2/14/2020	16.73591364	10.82869	9.552356927	10.06735507	9.747948173	4.528214632	9.498336601
2/15/2020	15.26249145	10.18219	9.119427276	9.58450252	9.29577306	3.329274685	9.067945658
2/16/2020	14.04542893	9.60668	8.723822969	9.145877782	8.883291929	2.480974769	8.674848954
2/17/2020	13.02051174	9.090941	8.361001467	8.745676524	8.506029975	37.28342282	8.314380914
2/18/2020	12.14431023	8.626004	8.027006623	8.378986837	8.159359379	2.798898883	7.982663955
2/19/2020	11.35244048	8.2046	7.718548929	8.041911295	7.83988392	1.139858318	7.676409737
2/20/2020	10.7392469	7.820883	7.432851703	7.730917713	7.54441827	1.041003346	7.392760333
2/21/2020	10.18922669	7.469946	7.167492629	7.443019665	7.270387818	0.951655538	7.129319941
2/22/2020	9.69305647	7.147682	6.920337901	7.175872154	7.015633956	0.870742342	6.884018556
2/23/2020	9.243059287	6.850752	6.689623454	6.927181531	6.778028167	0.797349957	6.655016884
2/24/2020	8.833238561	6.576219	6.473752943	6.695217233	6.555980731	0.730676295	6.440769885
2/25/2020	8.458258134	6.321638	6.271342165	6.478288677	6.348086744	0.670015182	6.239871174
2/26/2020	8.114017269	6.084987	6.081173418	6.274928822	6.152892156	0.614769037	6.051123493
2/27/2020	7.796608998	5.864367	5.902129829	6.084001101	5.969338049	0.564386868	5.87346788
2/28/2020	7.507096228	5.658144	5.733443244	5.904306401	5.796475589	0.518381992	5.705913029
2/29/2020	7.229246163	5.465091	5.573939083	5.734968791	5.63327733	0.547226263	5.547720204
03-01-2020	6.971473857	5.283816	5.42314323	5.575035162	5.479013722	0.437912819	5.398030805
03-02-2020	6.731912737	5.113401	5.280275206	5.423821246	5.333023324	0.402726481	5.256117643
03-03-2020	6.508542481	4.952858	5.144648092	5.280594723	5.194556058	0.370515156	5.121560326
03-04-2020	6.299695588	4.801369	5.015879879	5.14470467	5.063095076	0.340968499	4.993797505
03-05-2020	6.104091802	4.658205	4.893460376	5.015668158	4.938166965	0.313875608	4.872023239
03-06-2020	5.92033971	4.522618	4.776656422	4.892915781	4.819208782	0.289023462	4.75626694
03-07-2020	5.747624756	4.394176	4.665490782	4.776059882	4.705845705	0.266183513	4.645810643
03-08-2020	5.584149133	4.272215	4.559308669	4.664655943	4.597731296	0.245232543	4.540301724
03-09-2020	5.431272934	4.156272	4.457785644	4.558304106	4.494432903	0.225955783	4.439605493
03-10-2020	5.286520896	4.045971	4.360738335	4.456721022	4.39567327	0.208241351	4.343155576
03-11-2020	5.149377625	3.94085	4.267820656	4.359542458	4.301194052	0.191945171	4.250866241
03-12-2020	5.019253132	3.840606	4.178722568	4.266536334	4.210655807	0.176963256	4.162416653
3/13/2020	4.895512473	3.744888	4.093366209	4.177393195	4.123849958	0.163170556	4.077519265
3/14/2020	4.777975717	3.653414	4.011324413	4.091943494	4.040580714	0.1504689	3.996118686
3/15/2020	4.665642971	3.565924	3.932550936	4.009856026	3.960576912	0.138774371	3.917804327
3/16/2020	4.558661907	3.482084	3.856808164	3.931039216	3.883679354	0.128016912	3.842595703
3/17/2020	4.45658986	3.40178	3.783924687	3.85526117	3.809737579	0.118092078	3.770127466
3/18/2020	4.358785555	3.32472	3.713700389	3.782349471	3.73853149	0.108944829	3.700386747
3/19/2020	4.265208221	3.250812	3.646073752	3.712126534	3.669963104	0.1005212	3.633136811
3/20/2020	4.175588098	3.179717	3.580863517	3.644464262	3.603815207	0.092768166	3.568369749
3/21/2020	4.089702572	3.111428	3.51794257	3.579241782	3.540056869	0.085597742	3.505791276
3/22/2020	4.007273731	3.045718	3.457192552	3.516312754	3.478514343	0.079006223	3.445446467
3/23/2020	3.928096838	2.982435	3.398468418	3.455542711	3.419052371	0.072918877	3.387069157
3/24/2020	3.852048487	2.921462	3.34173883	3.396853059	3.361588997	0.067297297	3.330673343
3/25/2020	3.778881469	2.862713	3.286870412	3.340123701	3.306025129	0.062127281	3.276090226
3/26/2020	3.708455328	2.806037	3.233773126	3.285243936	3.252287832	0.057347387	3.223334364
3/27/2020	3.640637728	2.751317	3.182332194	3.2321525	3.200249729	0.052932203	3.172185105
3/28/2020	3.575266311	2.69847	3.132560846	3.180736506	3.149869092	0.048880299	3.12269679
3/29/2020	3.512228743	2.647414	3.084263006	3.13094391	3.101013637	0.045119222	3.0746673
3/30/2020	3.451366068	2.598074	3.037459333	3.082673779	3.053685829	0.041659833	3.028122845
3/31/2020	3.392584791	2.550318	2.992026902	3.035881815	3.007780381	0.03846566	2.982966339
04-01-2020	3.335795984	2.504104	2.947985635	2.990489089	2.963217759	0.035524101	2.93910901
04-02-2020	3.280867408	2.459391	2.905169594	2.946422403	2.919956295	0.032787122	2.896576844
04-03-2020	3.22772472	2.416045	2.86360399	2.903646881	2.877939821	0.030277888	2.855205027
04-04-2020	3.176296841	2.374037	2.823210186	2.862084835	2.837130389	0.02797223	2.815024276
04-05-2020	3.12647251	2.333335	2.783916003	2.8217065	2.797447097	0.025810568	2.775958569
04-06-2020	3.078206107	2.293822	2.745745955	2.782471873	2.758872813	0.023851756	2.737962133
04-07-2020	3.031384305	2.255512	2.708562951	2.744223998	2.721333652	0.022012665	2.700991667

(continued on next page)

Table A2 (continued)

Date	USA (Growth Rate)	UK (Growth Rate)	Italy (Growth Rate)	Spain (Growth Rate)	France (Growth Rate)	China (Growth Rate)	India (Growth Rate)
04-08-2020	2.985983384	2.218294	2.672395032	2.70713038	2.684802348	0.020340382	2.664983446
04-09-2020	2.941926273	2.182186	2.637179701	2.670931381	2.649251969	0.018775557	2.629967401
04-10-2020	2.899166461	2.147069	2.602879837	2.635779911	2.614604868	0.01734167	2.59581576
04-11-2020	2.857610721	2.112962	2.56944031	2.601451738	2.580889993	0.01601492	2.562561148
04-12-2020	2.817256466	2.079788	2.536868496	2.568093789	2.547996511	0.014795181	2.530147677
4/13/2020	2.778017294	2.047536	2.505111671	2.535495076	2.515954923	0.013658705	2.498543836
4/14/2020	2.739847811	2.016165	2.474139644	2.503796808	2.484697362	0.012617219	2.46770016
4/15/2020	2.702737534	1.985622	2.443905672	2.472800082	2.454218225	0.011658824	2.437647141
4/16/2020	2.666610708	1.955898	2.414436907	2.442640648	2.424466537	0.010759828	2.408279601
4/17/2020	2.631439207	1.926932	2.385635207	2.413130659	2.395427569	0.009931989	2.379629732
4/18/2020	2.597225578	1.898746	2.357529374	2.38432605	2.367086499	0.009187063	2.351653416
4/19/2020	2.563744903	1.871267	2.330077737	2.356274678	2.339397748	0.00847777	2.32432718
4/20/2020	2.531330156	1.844478	2.303241712	2.328803601	2.312299247	0.007827695	2.297611701
4/21/2020	2.499631289	1.818365	2.27703251	2.302036034	2.285949673	0.007236805	2.271536755
4/22/2020	2.468627463	1.792887	2.251412787	2.275807986	2.260115612	0.00668146	2.246014203
4/23/2020	2.438475112	1.768057	2.226362888	2.250238071	2.234858973	0.006161642	2.221074911
4/24/2020	2.409137895	1.743811	2.201864018	2.225170559	2.210160608	0.005700938	2.196683305
4/25/2020	2.380329012	1.720151	2.177883873	2.200719683	2.186002209	0.00526392	2.17282154
4/26/2020	2.352286257	1.697066	2.154448542	2.176737353	2.162366259	0.004862379	2.149472542
4/27/2020	2.324897589	1.674498	2.131484222	2.153333634	2.139235991	0.004496302	2.126605446
4/28/2020	2.298140352	1.652474	2.109017805	2.130367518	2.116595347	0.004142076	2.104248426
4/29/2020	2.271992927	1.63095	2.087006683	2.107886706	2.094428942	0.003835097	2.082328411
4/30/2020	2.246434671	1.609908	2.065476119	2.085933148	2.072722031	0.003539953	2.060874228
05-01-2020	2.221445866	1.589364	2.044359543	2.064431553	2.051460471	0.003268441	2.039857563
05-02-2020	2.196935864	1.569265	2.023682825	2.043258345	2.030630696	0.003008755	2.01925208
05-03-2020	2.173103567	1.549617	2.003419997	2.022678006	2.010219684	0.002796289	1.999084589
05-04-2020	2.149644465	1.530393	1.983546862	2.002401046	1.990214931	0.002572042	1.979290503
05-05-2020	2.126755832	1.51116	1.964087523	1.98252709	1.970604428	0.002383207	1.959897088
05-06-2020	2.104415998	1.493149	1.944983027	1.96309491	1.951448052	0.002194386	1.940892075
05-07-2020	2.082410737	1.475281	1.926257901	1.943989752	1.932519098	0.002029172	1.922216226
05-08-2020	2.060926006	1.457568	1.907889746	1.925253322	1.914023897	0.001875766	1.903931693
05-09-2020	2.039880589	1.440309	1.88985765	1.906922875	1.895946803	0.001734167	1.885980048
05-10-2020	2.019261113	1.423392	1.872173893	1.888937711	1.878074396	0.001592574	1.868352508
05-11-2020	1.999054815	1.406899	1.854828292	1.871242104	1.86066694	0.001474582	1.851062605
05-12-2020	1.979190981	1.39063	1.83777019	1.853875364	1.843450512	0.001368392	1.834100542
5/13/2020	1.959833989	1.374853	1.821013198	1.8368728	1.826676159	0.001262207	1.817414442
5/14/2020	1.940795141	1.359188	1.804677714	1.820178852	1.810080244	0.001167821	1.80106083
5/15/2020	1.92206797	1.343992	1.788466453	1.80374238	1.793905072	0.001073439	1.784988441
5/16/2020	1.903754142	1.32907	1.772640205	1.787600457	1.777896714	0.000990857	1.769190275
5/17/2020	1.885839349	1.314328	1.757091165	1.771786552	1.76228918	0.000920072	1.753699101
5/18/2020	1.868153879	1.300018	1.741720285	1.756209002	1.74689501	0.000849289	1.738437621
5/19/2020	1.850849355	1.285956	1.726797679	1.740903306	1.731711176	0.000778509	1.723439774
5/20/2020	1.833862755	1.27205	1.711949216	1.725940848	1.716900679	0.000719525	1.708698779
5/21/2020	1.817185389	1.258545	1.697442277	1.711116706	1.702286039	0.000672338	1.694300394
5/22/2020	1.800808882	1.245264	1.683178764	1.696621806	1.687918127	0.000613357	1.680050613
5/23/2020	1.784725158	1.232119	1.669068244	1.68237008	1.673738133	0.000566172	1.666038804
5/24/2020	1.768879758	1.219347	1.655276339	1.668318806	1.659898769	0.000530784	1.652259047
5/25/2020	1.753405986	1.206776	1.641710147	1.654500585	1.646234658	0.0004836	1.63870562
5/26/2020	1.738109875	1.194481	1.628364183	1.64094513	1.632793693	0.000448213	1.625457973
5/27/2020	1.723167896	1.182297	1.615233134	1.627574789	1.61957045	0.000412826	1.612254438
5/28/2020	1.708392979	1.170375	1.602234091	1.614455167	1.606559682	0.000389234	1.599429821
5/29/2020	1.693913003	1.158707	1.589520052	1.601511281	1.593756308	0.000353848	1.586725552
5/30/2020	1.679718701	1.147211	1.577005896	1.588806807	1.581155408	0.000330257	1.57422174
5/31/2020	1.665676967	1.135955	1.564686955	1.576269294	1.568752217	0.000294871	1.561992178
06-01-2020	1.651909618	1.124787	1.552485671	1.563960572	1.556587645	0.000283075	1.549795589
06-02-2020	1.638368139	1.113921	1.540545944	1.551810594	1.54451994	0.000259485	1.537941602
06-03-2020	1.625007589	1.103277	1.528788188	1.539879417	1.532682751	0.000235895	1.526191665
06-04-2020	1.611941526	1.092707	1.517208281	1.52809928	1.521025636	0.0002241	1.514620112
06-05-2020	1.599045246	1.082349	1.505802224	1.516498227	1.509587347	0.00020051	1.503295642
06-06-2020	1.586316233	1.072198	1.494498442	1.505102064	1.498234802	0.000188715	1.491995064
06-07-2020	1.573862955	1.062179	1.483430546	1.493846247	1.487093935	0.000165125	1.481005553
06-08-2020	1.561530394	1.052356	1.472525132	1.482786717	1.476158506	0.000165125	1.470106331
06-09-2020	1.549426123	1.042723	1.461778656	1.471860953	1.46530142	0.000141535	1.459366543
06-10-2020	1.537543476	1.033144	1.451187672	1.46112336	1.45464325	0.000141535	1.448782713
06-11-2020	1.525771719	1.023814	1.440685911	1.450513342	1.444178231	0.00012974	1.438351465
06-12-2020	1.514213715	1.014596	1.430397751	1.440083833	1.43378486	0.000117946	1.428135189
6/13/2020	1.502829594	1.005552	1.420255272	1.42977607	1.423616788	0.000106151	1.417997516
6/14/2020	1.49161546	0.996613	1.410195107	1.419641573	1.413553825	9.44E-05	1.408002921
6/15/2020	1.480534777	0.987902	1.400396002	1.409623333	1.403595091	9.44E-05	1.398148393
6/16/2020	1.469682612	0.979227	1.39061384	1.399745665	1.393849292	8.26E-05	1.388431004
6/17/2020	1.458956182	0.97071	1.381025831	1.390031115	1.384201373	8.26E-05	1.378909144
6/18/2020	1.448353915	0.962348	1.371511892	1.38045029	1.374650571	7.08E-05	1.369455914
6/19/2020	1.437936047	0.954136	1.362241263	1.37079566	1.365301272	7.08E-05	1.360131568
6/20/2020	1.427697508	0.94607	1.352983142	1.361630356	1.356043238	7.08E-05	1.350933484
6/21/2020	1.417543307	0.938028	1.343905345	1.352435876	1.346909929	5.90E-05	1.341859113
6/22/2020	1.407562621	0.930186	1.334948373	1.343340756	1.337898839	4.72E-05	1.332905973
6/23/2020	1.397721554	0.922423	1.326109834	1.334390785	1.328974305	4.72E-05	1.32412813
6/24/2020	1.388017198	0.914795	1.317334757	1.325535936	1.320234068	4.72E-05	1.315408796

(continued on next page)

Table A2 (continued)

Date	USA (Growth Rate)	UK (Growth Rate)	Italy (Growth Rate)	Spain (Growth Rate)	France (Growth Rate)	China (Growth Rate)	India (Growth Rate)
6/25/2020	1.37844672	0.907297	1.308727517	1.316820851	1.311575263	3.54E-05	1.306803676
6/26/2020	1.36900737	0.899871	1.30023186	1.308196876	1.303029306	4.72E-05	1.29831054
6/27/2020	1.359696469	0.89257	1.291845633	1.29968526	1.294594007	3.54E-05	1.289927212
6/28/2020	1.350484139	0.885393	1.283566737	1.291305822	1.286267229	2.36E-05	1.281704507
6/29/2020	1.341450025	0.878335	1.275343781	1.283033591	1.278077628	3.54E-05	1.273533161
6/30/2020	1.332482558	0.871339	1.267274706	1.274845076	1.269930581	2.36E-05	1.265465467
07-01-2020	1.323686985	0.864458	1.259306948	1.266760545	1.261917099	3.54E-05	1.257499464
07-02-2020	1.314954743	0.85769	1.251391095	1.25879894	1.254004124	2.36E-05	1.249633238
07-03-2020	1.306362855	0.851031	1.243668437	1.250915995	1.246189778	1.18E-05	1.241864925
07-04-2020	1.297882553	0.844375	1.235947087	1.243151681	1.238501097	2.36E-05	1.234241802
07-05-2020	1.289511677	0.837929	1.228367238	1.235462876	1.230849336	2.36E-05	1.226662709
07-06-2020	1.28124812	0.831483	1.220879661	1.227888611	1.223320065	1.18E-05	1.219176238
07-07-2020	1.273089832	0.825189	1.213437997	1.220386862	1.215910185	2.36E-05	1.211780699
07-08-2020	1.265034813	0.818994	1.206131056	1.212995753	1.20853422	1.18E-05	1.20452121
07-09-2020	1.257057472	0.812794	1.198955086	1.205674317	1.201274702	1.18E-05	1.19725531
07-10-2020	1.249227128	0.80674	1.191734034	1.198440838	1.194128728	1.18E-05	1.190168507
07-11-2020	1.24144735	0.800829	1.184728126	1.191312477	1.18701391	1.18E-05	1.18311954
07-12-2020	1.233809735	0.79486	1.177719284	1.184249778	1.180036119	1.18E-05	1.176153676
7/13/2020	1.226220269	0.78908	1.170876476	1.177288728	1.17308777	1.18E-05	1.169269451
7/14/2020	1.218746124	0.783337	1.164029869	1.17040892	1.166272292	1.18E-05	1.162509008
7/15/2020	1.211362563	0.777633	1.157263225	1.163591063	1.159509951	0	1.155782812
7/16/2020	1.20406795	0.772109	1.150655531	1.156852273	1.152800563	1.18E-05	1.149091516
7/17/2020	1.196860685	0.766571	1.144042828	1.150208651	1.146218141	1.18E-05	1.142562003
7/18/2020	1.189739209	0.761115	1.137545321	1.143623521	1.139685732	0	1.136105885
7/19/2020	1.182701999	0.755738	1.131121096	1.137113454	1.133227367	1.18E-05	1.129639635
7/20/2020	1.175747568	0.750486	1.124768922	1.130694057	1.126817883	0	1.123328496
7/21/2020	1.168854011	0.745216	1.118449614	1.12434663	1.120528055	1.18E-05	1.117046876
7/22/2020	1.162081501	0.740023	1.112238796	1.118053462	1.114284418	0	1.1108352
7/23/2020	1.155346839	0.734948	1.106096477	1.111830434	1.108109983	0	1.104692305
7/24/2020	1.148729538	0.729945	1.100021531	1.105692527	1.102003605	1.18E-05	1.098617055
7/25/2020	1.142148338	0.724967	1.094012857	1.099621923	1.095964166	0	1.092646841
7/26/2020	1.135661661	0.720015	1.08803343	1.093601723	1.08999057	0	1.086664648
7/27/2020	1.129248261	0.715219	1.082154864	1.087647162	1.084081747	1.18E-05	1.080823438
7/28/2020	1.122906904	0.710401	1.076339391	1.08177263	1.078236648	0	1.075007082
7/29/2020	1.116636383	0.70565	1.070585999	1.075945834	1.072454248	0	1.069289944
7/30/2020	1.110435516	0.701006	1.064859265	1.070196677	1.066733544	0	1.063559998
7/31/2020	1.10430315	0.696425	1.059227822	1.064493577	1.061094762	1.18E-05	1.057963793
08-01-2020	1.098220093	0.69182	1.053655543	1.058851011	1.055473092	0	1.052354409
08-02-2020	1.092239623	0.687362	1.048141503	1.053282677	1.049931667	0	1.046875337
08-03-2020	1.086288406	0.682878	1.042684795	1.047772521	1.04444813	0	1.041452722
08-04-2020	1.080436853	0.678496	1.037251851	1.042305281	1.039041918	0	1.036016444
08-05-2020	1.074613235	0.674171	1.03190783	1.03689487	1.033650924	0	1.030705588
08-06-2020	1.068869364	0.669861	1.026618514	1.031554465	1.028335716	1.18E-05	1.025380769
08-07-2020	1.063186576	0.665648	1.021383069	1.02626871	1.023094617	0	1.020178247
08-08-2020	1.057563904	0.661448	1.01616931	1.021009223	1.017867437	0	1.014994731
08-09-2020	1.052000397	0.657303	1.011070853	1.015844479	1.012732248	0	1.009896592
08-10-2020	1.046495127	0.65321	1.005961435	1.010691016	1.007610164	0	1.004783988
08-11-2020	1.041047184	0.649169	1.000903632	1.005629865	1.002577705	0	0.999787773
08-12-2020	1.035655677	0.64514	0.995956929	1.000579252	0.99755758	0	0.994808805
8/13/2020	1.03030383	0.641239	0.99099884	0.995605508	0.992624799	0	0.989879239
8/14/2020	1.025038661	0.637309	0.986119638	0.990680896	0.987722002	0	0.984998344
8/15/2020	1.019795714	0.633466	0.981288178	0.985791851	0.9828492	0	0.980165401
8/16/2020	1.014637138	0.629632	0.976503765	0.980950883	0.978060475	0	0.97541041
8/17/2020	1.0094998	0.625845	0.971737025	0.976169878	0.973300166	0	0.970640275
8/18/2020	1.004429497	0.622142	0.967073635	0.971435186	0.968585976	0	0.965977139
8/19/2020	0.999409876	0.618446	0.962398169	0.966733784	0.963917237	0	0.961358357
8/20/2020	0.99444018	0.614795	0.957767899	0.962077724	0.959275952	1.18E-05	0.956724219
8/21/2020	0.989519669	0.611187	0.95323739	0.95747847	0.954713674	0	0.952164133
8/22/2020	0.984647616	0.607585	0.948694519	0.952910916	0.950117743	0	0.947676347
8/23/2020	0.979823308	0.6041	0.944249124	0.948398675	0.94568406	0	0.943201729
8/24/2020	0.9750318	0.600582	0.939791204	0.943917128	0.941233009	0	0.938769217
8/25/2020	0.970315286	0.597142	0.935375371	0.939477786	0.936823666	0	0.93437822
8/26/2020	0.965616102	0.593742	0.931053713	0.935091615	0.932455448	0	0.930056075
8/27/2020	0.96099003	0.590345	0.926719306	0.930746151	0.928127781	0	0.925718196
8/28/2020	0.956380527	0.586988	0.922451112	0.926429485	0.923840104	0	0.92147571
8/29/2020	0.951828743	0.583704	0.918221998	0.922152722	0.919607805	0	0.917244567
8/30/2020	0.947320083	0.580423	0.914006042	0.917926452	0.915382376	0	0.913052149
8/31/2020	0.942853937	0.577178	0.909879119	0.913738688	0.911211399	0	0.908897924
09-01-2020	0.938429708	0.573971	0.905739149	0.909567031	0.907078263	0	0.904807802
09-02-2020	0.934046806	0.570799	0.901661563	0.905465955	0.902997829	0	0.900277942
09-03-2020	0.929704657	0.567697	0.897620476	0.901369317	0.898923339	0	0.896684753
09-04-2020	0.925389857	0.564561	0.893591129	0.897341661	0.894900692	0	0.892677743
09-05-2020	0.921140479	0.561494	0.889622015	0.893318037	0.890928855	0	0.888706426
09-06-2020	0.916917231	0.558461	0.885687955	0.889351388	0.886962326	0	0.884770329
09-07-2020	0.912720045	0.55546	0.881788488	0.88541976	0.883060496	0	0.880894037
09-08-2020	0.908573598	0.552459	0.87792316	0.881512417	0.879163574	0	0.877026548
09-09-2020	0.90447692	0.549524	0.874068301	0.87763945	0.875329917	0	0.873192911
09-10-2020	0.900392602	0.54662	0.870270323	0.873810503	0.871500786	0	0.869392682
09-11-2020	0.89635716	0.543714	0.866505161	0.870024783	0.86773353	0	0.865625426

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