COVID-19 and Economics Indicators in the UK

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0.1 Research Questions

This report is aimed to research on the associations between the severity of COVID-19 and some important economics indicators in the UK. More specifically, this report will answer the following questions: 1) Which COVID-19 severity indicator(s) and which economics indicator(s) have high and significant relationships? 2) And how the severity indicator(s) impact the economics indicator(s) exactly?

0.2 Datasets

0.2.1 COVID-19 Datasets (updated on 05-02-2021)

The following three COVID-19 datasets contain the number of positive cases, deaths, and patients admitted to hospitals, respectively. Each dataset includes the newly-add number and cumulative number.
1) Positive cases by spicemen date [1];
2) Deaths with COVID-19 within 28 days of positive test by date of death [2];
3) Patients admitted to hospital [3]

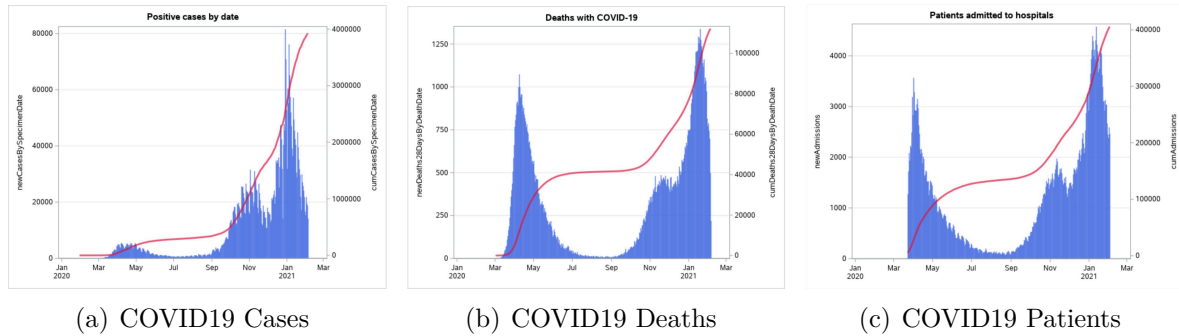(a) COVID19 Cases   (b) COVID19 Deaths   (c) COVID19 Patients

Figure 1: COVID19 Indicators

0.2.2 Economic indicators (updated in November 2020)

The following two datasets contain the data of five economics indicators: monthly GDP, service index, production index, construction index, and unemployment rate.
1) Monthly GDP and components index (seasonally adjusted) [4];

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[1] https://coronavirus.data.gov.uk/details/cases

[2] https://coronavirus.data.gov.uk/details/deaths

[3] https://coronavirus.data.gov.uk/details/healthcare

[4] https://www.ons.gov.uk/economy/grossdomesticproductgdp/

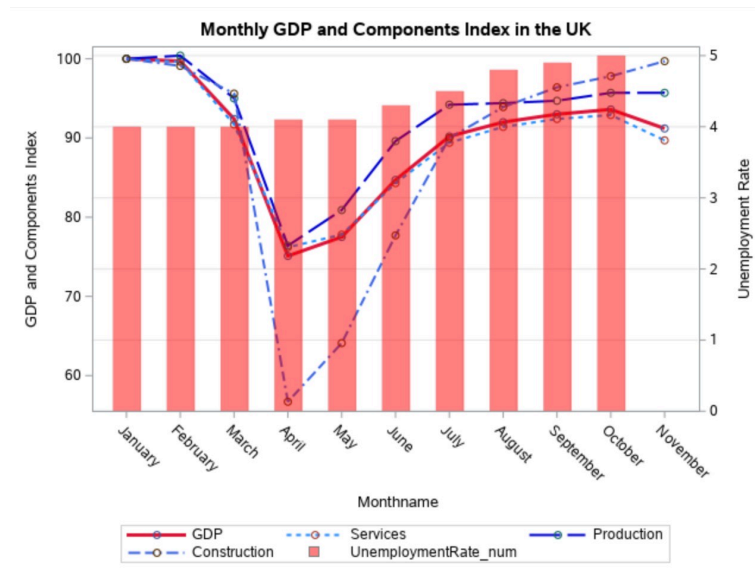2) Unemployment rate (aged 16 and over, seasonally adjusted) [5]

Figure 2: Economics Indicators

0.2.3 Stock Index (updated on 05-02-2021)

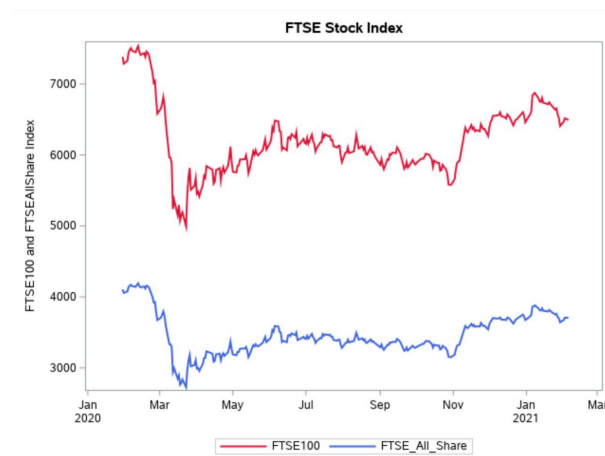1) FTSE 100 Index;
2) FTSE All-Share Index [6]

Figure 3: FTSE Stock Indicators

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[5]https://www.ons.gov.uk/employmentandlabourmarket/peoplenotinwork/unemployment/
[6]Source: Capital IQ

0.3 Methodology and Results

1. To answer the first research question, correlations between COVID-19 severity indicators and economics indicators(including stock index) have been examined:

Table 1: Correlation Matrix Economics Indicators (new)

		cases	deaths	patients	MonthlyGDP_num	Services_num	Production_num	Construction_num	UnemploymentRate_num
	Pearson Correlation Coefficients Prob > |r| under H0: Rho=0 Number of Observations								
cases		1.00000 11	0.32482 0.3598 10	0.51616 0.1549 9	0.01622 0.9622 11	-0.02370 0.9448 11	0.06801 0.8425 11	0.22120 0.5133 11	0.61669 0.0576 10
deaths		0.32482 0.3598 10	1.00000 10	0.95908 <.0001 9	-0.72783 0.0170 10	-0.72210 0.0184 10	-0.75782 0.0111 10	-0.66762 0.0349 10	-0.36392 0.3357 9
patients		0.51616 0.1549 9	0.95908 <.0001 9	1.00000 9	-0.52790 0.1441 9	-0.53257 0.1399 9	-0.55376 0.1219 9	-0.44660 0.2282 9	-0.40141 0.3243 8
MonthlyGDP_num		0.01622 0.9622 11	-0.72783 0.0170 10	-0.52790 0.1441 9	1.00000 11	0.99713 <.0001 11	0.98133 <.0001 11	0.94987 <.0001 11	0.14369 0.6921 10
Services_num		-0.02370 0.9448 11	-0.72210 0.0184 10	-0.53257 0.1399 9	0.99713 <.0001 11	1.00000 11	0.96541 <.0001 11	0.92494 <.0001 11	0.10920 0.7639 10
Production_num		0.06801 0.8425 11	-0.75782 0.0111 10	-0.55376 0.1219 9	0.98133 <.0001 11	0.96541 <.0001 11	1.00000 11	0.97387 <.0001 11	0.18798 0.6030 10
Construction_num		0.22120 0.5133 11	-0.66762 0.0349 10	-0.44660 0.2282 9	0.94987 <.0001 11	0.92494 <.0001 11	0.97387 <.0001 11	1.00000 11	0.31562 0.3743 10
UnemploymentRate_num		0.61669 0.0576 10	-0.36392 0.3357 9	-0.40141 0.3243 8	0.14369 0.6921 10	0.10920 0.7639 10	0.18798 0.6030 10	0.31562 0.3743 10	1.00000 10

Table 2: Corrlation Matrix Economics Indicators (cum)

		cumcases	cumdeaths	cumpatients	MonthlyGDP_num	Services_num	Production_num	Construction_num	UnemploymentRate_num
	Pearson Correlation Coefficients Prob > |r| under H0: Rho=0 Number of Observations								
cumcases		1.00000 11	0.75790 0.0180 9	0.87215 0.0022 9	0.02525 0.9413 11	-0.02961 0.9311 11	0.12148 0.7220 11	0.27129 0.4197 11	0.85307 0.0017 10
cumdeaths		0.75790 0.0180 9	1.00000 9	0.97736 <.0001 9	0.15564 0.6893 9	0.12697 0.7448 9	0.21518 0.5782 9	0.22532 0.5600 9	0.70706 0.0498 8
cumpatients		0.87215 0.0022 9	0.97736 <.0001 9	1.00000 9	0.28856 0.4514 9	0.25908 0.5009 9	0.33980 0.3710 9	0.36895 0.3285 9	0.81811 0.0131 8
MonthlyGDP_num		0.02525 0.9413 11	0.15564 0.6893 9	0.28856 0.4514 9	1.00000 11	0.99713 <.0001 11	0.98133 <.0001 11	0.94987 <.0001 11	0.14369 0.6921 10
Services_num		-0.02961 0.9311 11	0.12697 0.7448 9	0.25908 0.5009 9	0.99713 <.0001 11	1.00000 11	0.96541 <.0001 11	0.92494 <.0001 11	0.10920 0.7639 10
Production_num		0.12148 0.7220 11	0.21518 0.5782 9	0.33980 0.3710 9	0.98133 <.0001 11	0.96541 <.0001 11	1.00000 11	0.97387 <.0001 11	0.18798 0.6030 10
Construction_num		0.27129 0.4197 11	0.22532 0.5600 9	0.36895 0.3285 9	0.94987 <.0001 11	0.92494 <.0001 11	0.97387 <.0001 11	1.00000 11	0.31562 0.3743 10
UnemploymentRate_num		0.85307 0.0017 10	0.70706 0.0498 8	0.81811 0.0131 8	0.14369 0.6921 10	0.10920 0.7639 10	0.18798 0.6030 10	0.31562 0.3743 10	1.00000 10

Table 3: Correlation Matrix FTSE

Pearson Correlation Coefficients, N = 219 Prob > |r| under H0: Rho=0								
	cases	deaths	patients	cumcases	cumdeaths	cumpatients	FTSE100_num	FTSE_AS_num
cases	1.00000	0.61481 <.0001	0.75789 <.0001	0.82023 <.0001	0.70012 <.0001	0.76110 <.0001	0.54659 <.0001	0.62152 <.0001
deaths	0.61481 <.0001	1.00000	0.94280 <.0001	0.69671 <.0001	0.45259 <.0001	0.52817 <.0001	0.33781 <.0001	0.35844 <.0001
patients	0.75789 <.0001	0.94280 <.0001	1.00000	0.73770 <.0001	0.46879 <.0001	0.55868 <.0001	0.35904 <.0001	0.39259 <.0001
cumcases	0.82023 <.0001	0.69671 <.0001	0.73770 <.0001	1.00000	0.93223 <.0001	0.96675 <.0001	0.73760 <.0001	0.79786 <.0001
cumdeaths	0.70012 <.0001	0.45259 <.0001	0.46879 <.0001	0.93223 <.0001	1.00000	0.99170 <.0001	0.81782 <.0001	0.87243 <.0001
cumpatients	0.76110 <.0001	0.52817 <.0001	0.55868 <.0001	0.96675 <.0001	0.99170 <.0001	1.00000	0.79776 <.0001	0.86003 <.0001
FTSE100_num	0.54659 <.0001	0.33781 <.0001	0.35904 <.0001	0.73760 <.0001	0.81782 <.0001	0.79776 <.0001	1.00000	0.98943 <.0001
FTSE_AS_num	0.62152 <.0001	0.35844 <.0001	0.39259 <.0001	0.79786 <.0001	0.87243 <.0001	0.86003 <.0001	0.98943 <.0001	1.00000

2. As for the second question, regression analysis is implemented to further explore how the COVID-19 indicators impact the economics indicators. Only highly and significantly correlated variables are chosen to perform regression analysis.

1) Table 4 and Table 5 is the summary of regression analysis (with only one parameter) on COVID-19 indicators with economics indicators and stock indexes, respectively;

2) This report also tries to build regression models to predict the stock indexes with multiple variables. Table 6 is the summary of some models with relatively good performance.

Table 4: Regression Analysis on Economics Indicators

Y	X	Coef	Intercept	p	R-square
Monthly GDP	Deaths	-0.00073	93.31	0.017	0.53
Service Index	Deaths	-0.00068	92.62	0.018	0.52
Production Index	Deaths	-0.00074	96.14	0.011	0.57
Condtruction Index	Deaths	-0.0014	95.28	0.035	0.45
Unemployment Rate	CumCases	1.09e-6	4.05	0.0017	0.73
Unemployment Rate	CumDeaths	2.04e-5	3.73	0.050	0.50
Unemployment Rate	CumCases	7.14e-6	3.62	0.013	0.67

Table 5: Regression Analysis on FTSE Indexes

Y	X	Coef	Intercept	p	R-square
FTSE100	CumDeaths	0.0124	5544.47	<0.0001	0.67
FTSE100	CumPatients	0.0031	5626.53	<0.0001	0.64
FTSE100	CumCases	0.00023	5912.69	<0.0001	0.54
FTSE100	cases	0.0112	5976.05	<0.0001	0.30
FTSE All Share	CumDeaths	0.0083	3029.41	<0.0001	0.76
FTSE All Share	CumPatients	0.0021	3080.99	<0.0001	0.74
FTSE All Share	CumCases	0.00016	3274.74	<0.0001	0.64
FTSE All Share	cases	0.0080	3312.77	<0.0001	0.39

Table 6: Multi-variable Regression Models

Y	X1	Coef1	X2	Coef2	Intercept	p	R-square
FTSE100	cumdeaths	0.025	cumpatients	-0.0031	5480.91	<0.0001	0.68
FTSE All Share	cumdeaths	0.011	cumpatients	-0.0008	3013.86	<0.0001	0.76

0.4 Conclusion and Limitations

From the analysis above, we can conclude: 1) Among three newly-added COVID-19 indicators, only the number of deaths has close relationship with economics indicators and it negatively affects the these indicators. One additional death case will lead to these indicators decrease 0.00073, 0.00068, 0.0074, and 0.0014, respectively. 2)