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 these severity indicator(s) impact these 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]

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

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

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

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:

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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/

[5]https://www.ons.gov.uk/employmentandlabourmarket/peoplenotinwork/unemployment/

[6]Source: Capital IQ

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	cases	deaths	patients	MonthlyGDP_num	Services_num	Production_num	Construction_num	UnemploymentRate_num
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

Figure 1: Correlation Matrix Economics Indicators (new)

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	cumcases	cumdeaths	cumpatients	MonthlyGDP_num	Services_num	Production_num	Construction_num	UnemploymentRate_num
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

Figure 2: Corrlation Matrix Economics Indicators (cum)

	cases	deaths	patients	cumcases	cumdeaths	cumpatients	FTSE100_num	FTSE_AS_num
cases	1.00000 372	0.61136 <.0001 342	0.75717 <.0001 317	0.81054 <.0001 372	0.67677 <.0001 340	0.75025 <.0001 317	0.20032 0.0012 259	0.23658 0.0001 259
deaths	0.61136 <.0001 342	1.00000 343	0.93827 <.0001 317	0.68688 <.0001 342	0.46213 <.0001 341	0.50527 <.0001 317	-0.05279 0.4266 229	-0.13917 0.0353 229
patients	0.75717 <.0001 317	0.93827 <.0001 317	1.00000 317	0.73891 <.0001 317	0.47370 <.0001 317	0.56348 <.0001 317	-0.23499 0.0007 206	-0.33817 <.0001 206
cumcases	0.81054 <.0001 372	0.68688 <.0001 342	0.73891 <.0001 317	1.00000 372	0.90944 <.0001 340	0.96843 <.0001 317	0.11948 0.0548 259	0.21212 0.0006 259
cumdeaths	0.67677 <.0001 340	0.46213 <.0001 341	0.47370 <.0001 317	0.90944 <.0001 340	1.00000 341	0.99176 <.0001 317	0.61734 <.0001 227	0.67977 <.0001 227
cumpatients	0.75025 <.0001 317	0.50527 <.0001 317	0.56348 <.0001 317	0.96843 <.0001 317	0.99176 <.0001 317	1.00000 317	0.45014 <.0001 206	0.55592 <.0001 206
FTSE100_num	0.20032 0.0012 259	-0.05279 0.4266 229	-0.23499 0.0007 206	0.11948 0.0548 259	0.61734 <.0001 227	0.45014 <.0001 206	1.00000 259	0.99318 <.0001 259
FTSE_AS_num	0.23658 0.0001 259	-0.13917 0.0353 229	-0.33817 <.0001 206	0.21212 0.0006 259	0.67977 <.0001 227	0.55592 <.0001 206	0.99318 <.0001 259	1.00000 259

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

Figure 3: Correlation Matrix FTSE

From Fig.1, we can see that only 'deaths' have significant and relatively high correlations with monthly GDP and components indexes; Fig.2 tells us that all three cumulative COVID-19 indicators have significant and high correlations with unemployment rate; Fig.3 shows that 'cumdeaths' and 'cumpatients' have significant and relatively high correlations with two stock indexes whereas 'cases' and 'patients' have significant correlations with stock indexes, 'deaths' and 'cumcases' also have significant correlations with FTSE All Share.

2. As for the second question, regression analysis is implemented to further explore how COVID-19 indicators impact economics indicators. Only highly and significantly correlated variables are chosen to perform regression analysis.
1) Table1 is the summary of regression analysis (with only one parameter) on COVID-19 indicators and economics indicators (including stock indexes);
2) This report also treis to build regression models to predict the stock indexes with multiple variables. Table2 is the summary of some models with relatively good performance.

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
FTSE100	CumDeaths	0.015	5634.58	<0.0001	0.38
FTSE100	CumPatients	0.0038	5736.78	<0.0001	0.20
FTSE All Share	CumDeaths	0.010	3080.48	<0.0001	0.46
FTSE All Share	CumPatients	0.0030	3114.20	<0.0001	0.31

Table 1: Regression Analysis

Y	X1	Coef1	X2	Coef2	Intercept	p	R-square
FTSE100	cases	0.0480	patients	-0.1458	6.114.67	<0.0001	0.44
FTSE100	cumcases	0.0020	cumpatients	-0.0029	5931.38	<0.0001	0.40
FTSE100	cumdeaths	0.0314	patients	-0.1170	3428.90	<0.0001	0.54
FTSE All Share	cases	0.0314	patients	-0.1170	3428.90	<0.0001	0.54
FTSE All Share	cumcases	0.0013	cumpatients	-0.0014	3241.15	<0.0001	0.52
FTSE All Share	cumdeaths	-0.0535	cumpatients	0.0209	5686.38	<0.0001	0.31

Table 2: Regression Models to Predict the Stock Indexes

0.4 Limitations