The Impact of COVID-19 and Government Intervention on Stock Markets of OECD Countries

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We study the impact of COVID-19 and various government interventions on the stock market returns of 20 OECD countries from February 1, 2020 to October 1, 2020. We find that stock market returns react significantly negatively to the increase in the number of confirmed cases. The governments' intervention measures, such as social distancing, testing and contact tracing policies, magnify the negative effect of COVID-19 on stock returns. Our findings have important policy implications.

I. Introduction

The rapid outbreak of COVID-19 has triggered great uncertainty to the global economy, and the panic caused by the uncertainty has also spread among investors, increasing the volatility of the financial market (Iyke, 2020). In response, governments around the world are also actively taking various measures, such as closing schools, restricting entry, virus testing and financial support to control the spread of the pandemic (Phan & Narayan, 2020). The implementation of government intervention measures will not only control the spread of the pandemic but will also reduce the uncertainty and help restore the global economy. This paper first examines the impact of COVID-19 on stock market returns in OECD countries, and then explores the moderating role of government intervention.

Based on the uncertainty caused by the pandemic, we first assume that the continued spread of the pandemic will have a negative impact on stock market returns. Then we postulate that with the implementation of government intervention measures investor confidence will increase, leading to a positive market response and a possible reduction of the downside economic effects caused by COVID-19.

This note discusses the impact of four comprehensive indicators of government intervention on the stock market, including government response index, containment and health index, economic support index and stringency index. The four comprehensive indicators estimate government intervention policies from different dimensions. For example, the strict index mainly includes measures such as closing schools and restricting travel, while the containment and health index not only covers various control measures, but also considers testing policy and contact tracing (Hale, 2020). Existing research has found that the uncertainty caused by the development of COVID-19 has had a negative effect on global stock market returns (Gil-Alana & Claudio-Quiroga, 2020; He et al., 2020; Zaremba et al., 2020). The various intervention measures implemented by the government will have different effects on stock returns. For example, various shutdown measures will also have a passive impact on stock returns, while tracking policies will have an energetic effect on stock returns (Ashraf, 2020; Haldar & Sethi, 2020; Narayan, 2020b).

Based on empirical studies in 20 OECD countries, this paper finds that the emergence of COVID-19 has had a negative impact on the stock market returns. On the other hand, the implementation of various government intervention measures will increase stock market returns. Subsequently, through the analysis of the coefficient of the interaction term between the pandemic and government intervention measures, it is explored whether the negative effect of COVID-19 on stock market returns depends on government intervention measures (Iyke, 2020; Narayan, 2020a; Sharma, 2020).

The main contribution of this paper is to reveal the relationship between COVID-19 and stock market returns.

II. Data and Methodology

This paper uses data from February 1, 2020 to October 1, 2020 for 20 OECD countries testing our hypothesis. The data of government intervention measures in 20 OECD countries comes from *Our World in Data* and the stock market returns data are collected and calculated from the Wind database. Table 1 shows sample information for the 20 OECD countries.

In order to understand the relationship between COVID-19, government intervention (*Intervention*) and stock market returns (*Return*), we specify a panel regression model with robust standard errors. In view of the different cultures, circumstance and institution between countries, each regression includes the country-level and time fixed effects.

$$\begin{aligned} Return_{i,t} =&\ \alpha_0 + \alpha_1\,Return_{i,t-1} \\ &+ \alpha_2\,COVID\text{-}19_{i,t-1} \\ &+ \alpha_3\,X_{i,t} + \mu_i + \mu_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned} Return_{i,t} =&\ \alpha_0 + \alpha_1\,Return_{i,t-1} \\ &+ \alpha_2\,COVID\text{-}19_{i,t-1} \\ &+ \alpha_3\,Intervention_{i,t-1} + \alpha_4\,X_{i,t} \\ &+ \mu_i + \mu_t + \varepsilon_{i,t} \end{aligned} \quad (2)$$

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Table 1: Sample information

NO	Code	Country	Stock index
1	AUS	Australia	S&P_ASX 200
2	AUT	Austria	ATX
3	BEL	Belgium	BEL 20
4	CAN	Canada	S&P_TSX
5	CHE	Switzerland	SMI
6	DEU	Germany	DAX
7	DNK	Denmark	OMX Copenhagen 20
8	ESP	Spain	IBEX 35
9	FRA	France	CAC 40
10	GBR	United Kingdom	FTSE 100
11	IRL	Ireland	ISEQ Overall
12	ITA	Italy	FTSE MIB
13	JPN	Japan	Nikkei 225
14	KOR	Korea, South	KOSP 200
15	NLD	Netherlands	AEX
16	NOR	Norway	OSEAX
17	NZL	New Zealand	NZX 50
18	PRT	Portugal	PSI
19	SWE	Sweden	OMX Stockholm 30
20	USA	United States	S & P 500

This table reports the sample countries and the main stock index for each country.

$$
\begin{aligned}
Return_{i,t} =& \alpha_0 + \alpha_1 Return_{i,t-1} \\
& + \alpha_2 COVID-19_{i,t-1} \\
& + \alpha_3 Intervention_{i,t-1} \\
& + \alpha_4 \left(COVID-19_{i,t-1} \right) \\
& \times \left(Intervention_{i,t} \right) + \alpha_5 X_{i,t} \\
& + \mu_i + \mu_t + \varepsilon_{i,t} \quad\quad (3)
\end{aligned}
$$

Following Narayan et al. (2020), since there is a certain inertia factor in stock returns, we capture its persistency with a lagged dependent variable as an explanatory variable. Similarly, the COVID-19 has a certain lag effect on stock returns, so the logarithm of the total number of confirmed cases in each country with a lag of one day was selected as the independent variable. For government intervention independent variables, we used four comprehensive indicators from the OxCGRT database. The variables include stringency index, government response index, containment and health index and economic support index. Finally, $X_{i,t}$ corresponds to a set of other explanatory variables including the logarithm of market value ($Ln(mv)$) and price-to-earnings ratio (PE).

III. Empirical results and discussion

A. Data description

Table 2 provides the statistical information on the variables used in this paper. From Table 2, we find that minimum value of stock returns is -0.169 and the maximum value is 0.119, which shows that the stock returns have changed significantly during the sample period. The minimum values of the stringency index, government response index and containment and health index are all zero, while the maximum values are 96.3, 85.42 and 91.32, respectively. This statistical result shows that there is a big gap in the intensity of government intervention measures. We infer that in the early stages of the pandemic, governments in various countries generally did not recognize the severity of COVID-19, so the degree of intervention was low. However, with the rapid spread of the pandemic, the degree of government intervention gradually increased.

B. Basic results

Table 3 presents these regression results of the first equations explained above. It can be seen from the results that the increase in the number of total confirmed cases of COVID-19 has had a significant negative impact on stock market returns. The second to fifth columns illustrate the regression results of the impact of the government's four comprehensive indicators on stock market returns. According to the results, the stringency index, government response index and containment and health index all have a significant and positive effect on stock market returns. However, the statistical regression result of the economic support index is insignificant. According to the above regression results, with the aggravation of COVID-19, the uncertainty of the market is aggravated, leading to investor panic and the loss of confidence in the market, which has a negative effect on stock returns. However, the social distancing, testing and contact tracing policies implemented by the government have had a positive effect on stock returns. The reason for the insignificant regression results of the economic support index may be that the index only reflects the level of income and debt relief support, and does not involve the financial market, so stock returns are not

Table 2: Descriptive statistics

Variable	Obs.	Mean	Std.Dev.	Min.	Max.
Return	3380	0	.022	-.169	.119
Ln(case)	3228	9.634	3.063	0	15.794
Stringency Index	3380	51.439	23.34	0	96.3
Government Response Index	3380	53.238	20.124	0	85.42
Containment & Health Index	3380	52.195	19.736	0	91.32
Economic Support Index	3380	59.501	31.901	0	100
Ln(mv)	2873	9.391	2.694	5.332	15.943
PE	3380	20.057	19.16	0	291.947

This table has selected descriptive statistics (number of observations (Obs.), mean, standard deviation (Std. Dev.), minimum (Min.) and maximum (Max.) values for stock market returns, log of COVID-19 cases, the four COVID-19 indices, log of market value (Ln(mv)), and price-earnings ratio (*PE*)).

Table 3: Impact of government actions amid COVID-19 on stock market returns

	(1)	(2)	(3)	(4)	(5)
Return(-1)	-0.111***	-0.148***	-0.116***	-0.142***	-0.132***
	(-2.96)	(-4.58)	(-3.17)	(-4.43)	(-3.30)
Ln*(case)(-1)*	-0.001**	-0.002**	-0.001*	-0.002***	-0.001
	(-2.14)	(-2.81)	(-1.78)	(-3.14)	(-1.37)
Stringency Index		0.001***			
		(6.81)			
Government Response Index			0.001***		
			(4.11)		
Containment & Health Index				0.001***	
				(5.13)	
Economic Support Index					0.001
					(1.15)
Ln(mv)	0.019***	0.024***	0.025***	0.018**	0.026***
	(3.32)	(3.15)	(4.24)	(2.26)	(4.49)
PE	-0.001	-0.001	-0.001	-0.001	-0.000
	(-0.61)	(-1.33)	(-0.86)	(-1.21)	(-0.29)
Constant	-0.167***	-0.213***	-0.236***	-0.153**	-0.245***
	(-3.25)	(-3.20)	(-4.38)	(-2.22)	(-4.48)
Country	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes
Observations	2,175	2,175	2,175	2,175	2,175
R-squared	0.371	0.234	0.375	0.229	0.403

This table reports results from the regression models. The *t*-statistics in parentheses are based on robust standard errors and *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

sensitive to this.

Next, we explore how the interaction between government intervention and COVID-19 affects stock returns. As shown in the Table 4, the interaction term of *Ln(case)*Stringency Index* is significantly negative, which indicates that stricter isolation and blockade policies will aggravate the negative effect of COVID-19 on stock market returns. Similarly, the interaction term of *Ln(case)*Government Response Index* and *Ln(case)*Containment & Health Index,* are both statistically significant and negative, sug-

gesting that various government intervention measures have further amplified the negative impact of the pandemic on stock market returns. However, only the interaction term of *Ln(case)*Government Response Index* is significantly negative at the 1% level. This result shows that the government's more dimensional intervention measures will more significantly aggravate the negative effect of the pandemic on stock market returns. The interaction term of *Ln(case)*Economic Support Index* is still statistically insignificant.

Table 4: The moderating effect of government actions on stock returns

	(1)	(2)	(3)	(4)
Return(-1)	-0.149***	-0.146***	-0.144***	-0.114**
	(-4.58)	(-4.55)	(-4.46)	(-2.19)
Ln(*case*)(-1)	-0.002***	-0.002***	-0.002***	-0.001
	(-3.15)	(-3.49)	(-3.21)	(-0.67)
Stringency Index	0.001***			
	(3.78)			
Ln(*case*)* Stringency Index(-1)	-0.001**			
	(-2.59)			
Government Response Index		0.001***		
		(4.35)		
Ln(*case*)* Government Response Index(-1)		-0.001***		
		(-3.71)		
Containment & Health Index			0.001***	
			(3.75)	
Ln(*case*)* Containment & Health Index(-1)			-0.001**	
			(-2.87)	
Economic Support Index				0.001*
				(1.75)
Ln(*case*)* Economic Support Index(-1)				-0.000
				(-1.67)
Ln(*mv*)	0.026***	0.023**	0.022**	0.053***
	(3.23)	(2.51)	(2.42)	(4.59)
PE	-0.001	-0.001	-0.001	0.000
	(-0.43)	(-0.33)	(-0.50)	(1.12)
Constant	-0.247***	-0.223**	-0.206**	-0.512***
	(-3.39)	(-2.63)	(-2.48)	(-4.60)
Country	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes
Observations	2,175	2,175	2,175	2,175
R-squared	0.236	0.233	0.232	0.480

This table reports results from the regression models. The *t*-statistics in parentheses are based on robust standard errors and *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Regardless of the regression results in Tables 3 and 4, the lagged one-period regression coefficients of stock returns are significant, which suggest that stock returns do have a certain inertial effect. Therefore, it is reasonable to incorporate the lagged one-period of the dependent variable in the model.

IV. Conclusion

In this paper, we illustrate the relationship between COVID-19, government intervention and stock market returns. We find that: (a) the gradual increase in the number of confirmed cases of COVID-19 has a negative impact on stock market returns; (b) government intervention measures such as social isolation, testing and contact tracing policies have had a positive effect on stock market returns; and (c) the government's economic support policies did not have a statistically significant impact on stock market returns. Subsequently, through the analysis of the interaction item, it is concluded that the implementation of various government intervention measures will exacerbate the negative effect of COVID-19 on stock returns.

Heyden & Heyden (2020) and Shanaev et al. (2020) also come to a similar conclusion that the government intervention measures such as social distancing, and containment measures will have a negative impact on financial market earnings. However, the above-mentioned research only reflects the market reaction in the short term. The time span covered in this paper is longer, from February 1 to October 1, so it can better reflect the counterproductive impact of government intervention on stock market returns. Overall, the spread of COVID-19 has had a devastating impact on the world economy, and as the pandemic in Europe has re-entered a rebound period, research on the impact of government interventions on the economy can better provide reference for future policy design.

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