Death Infectious: Impact of the Coronavirus Disease (COVID-19) on Stock Returns

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Abstract

This study examines the Coronavirus disease (COVID-19) on stock returns. The independent variables are daily new deaths and daily new cases. Total sample is 22,930 observations during the period from March to December in 2020. In this study, uses unbalanced panel data and multiple regression to prove those hypotheses. The result shows that the Coronavirus disease (COVID-19) hurt on stock returns. Further, during the pandemic period, Friday has reduced negative stock returns.

Keywords: Stock returns; Coronavirus disease (COVID-19); Friday
JEL Classification: G10, G41, C23

Introduction

Stock returns usually following the market events. Previous studies mention several market events, for example, news (Heston & Ranjan Sinha, 2017; Li, 2018), disasters (Bourdeau-Brien & Kryzanowski, 2017;Kowalewski & Śpiewanowski, 2020). Further, the stock market also responds to pandemic disease, for example, the SARS pandemic disease in 2003 (Nippani & Washer, 2004; Chen et al., 2009) and the Ebola outbreaks in 2008 (Ichev & Marinč, 2018).

Since 31 December 2019, another pandemic disease that causes illness like flu in Wuhan, China. The first report of a death on 11 January 2020. In Indonesia, the first case on 2 March 2020 and the first death case on 11 March 2020. Coronavirus disease (COVID-19) outbreak has affected business and investment. This pandemic is one of the major events that may affect stock returns. Mazur et al. (2021) mention that stock in sectors natural gas, software, healthcare, and food earns higher positive returns. However, stock in sectors petroleum, real estate, entertainment, and hospitality drop dramatically. In Indonesia, the financial sector is one of the most crucial sectors. The collapse of the financial sector can lead to a crisis.

To investigate the effect of the Coronavirus disease (COVID-19) on stock returns in the financial sector in Indonesia Stock Exchange, this study employs two measurements: (1) total number of daily new deaths over million people and (2) total number of daily new cases over million people (Al-Awadhi et al., 2020). To avoid the large numbers on the variables, both independent variables are converted into natural logarithms. Further, following by Miskolczi (2017), this study employ two measurements: (1) simple returns and (2) logarithm returns. Both calculations can be a comparing on stock return results.

The data is collected 22,930 observations include 106 unique firms in the financial sector in Indonesia Stock Exchange. The observation period from March to December 2020. The result provides evidence that Coronavirus disease (COVID-19) is a significant negative on stock returns.

Another concern is the Friday effect. Friday is a day that investors may earn higher stock returns (Derbali & Hallara, 2016; Birru, 2018; Gbeda & Peprah, 2018). However, Chiah & Zhong (2019) argue there ware higher speculation stocks, negative stock returns, and investors are more pessimistic on Friday. The result shows that during the pandemic period, investors still lose fewer negative stock returns when trading on Friday.

The contributions of this study included: (1) this study contributes to stock returns literature. The financial sector in Indonesia is a crucial sector that may arise another potential crisis. The Coronavirus disease (COVID-19) hurt the financial sector in the capital market in Indonesia. This finding also complements the previous study from Mazur et al. (2021). (2) this study also supports Chiah & Zhong (2019) that higher speculation stocks, negative returns, and investors are more pessimistic on Friday. Usually, Friday may increase the mood in psychology view. However, during the pandemic period, Friday has reduced negative stock returns. (3) this study also extends the pandemic diseases literature. Besides SARS and EVD, the Coronavirus disease (COVID-19) also be a crucial pandemic.

Literature Review and Hypotheses Development

Coronavirus disease (COVID-19)

According to Al-Awadhi et al. (2020), total cases of death and confirmed cases affect the Chinese stock market. Both total cases of death and confirmed cases caused Coronavirus disease (COVID-19). This major event also responds to negative returns in all firms. Narayan et al. (2021) argue that government policies such as travel bans, lockdowns, and economic stimulus packages effectively increase the G7 stock markets. Further, these government policies had positive returns because mitigate the spread of Coronavirus disease (COVID-19) and reduce panic. Xu (2021) finds the asymmetric is caused by uncertainty Coronavirus disease (COVID-19) pandemic and reacted negative stock returns in the U.S. However, the responses are dynamic in the Canadian market.

Previous studies found several sectors are triggered by Coronavirus disease (COVID-19). Mazur et al. (2021) mention that stock in sectors natural gas, software, healthcare, and food earns higher positive returns. However, stock in sectors petroleum, real estate, entertainment, and hospitality drop dramatically. The hypothesis is as follows:

H_1: Total cases of death decreases stock returns.

The effect of Friday

Previous studies mention that Friday earns higher returns (Derbali & Hallara, 2016; Birru, 2018; Gbeda & Peprah, 2018). However, Chiah & Zhong (2019) argue were higher speculation stocks, negative returns, and investors are more pessimistic on Friday. The hypothesis is as follows:

H_2: Total cases of death decreases stock returns on Friday.

Research Methods

The data resources have come from Yahoo Finance (https://finance.yahoo.com/), Oxford COVID-19 Government Response Tracker (https://covidtracker.bsg.ox.ac.uk/), and Our World in Data (https://ourworldindata.org/). This study uses financial sector public firms in Indonesia Stock Exchange (IDX) with 22,930 observations include 106 unique firms. The financial sectors include banks, insurance, investment services, holding companies, venture capital, and consumer financing institutions. The observations period from March to December in 2020 and uses unbalanced panel data to avoid a drastically reduced number of samples. (Baltagi, 2021)

Coronavirus disease (COVID-19) measurement

Following by Al-Awadhi et al. (2020) and Hale et al. (2020), the Coronavirus disease (COVID-19) variable is measured in two ways. (1) *New_Deaths*$_{t-1}$ is the one plus natural logarithm of a total number of daily new deaths over million people. (2) *New_Cases*$_{t-1}$ is the one plus natural logarithm of a total number of daily new cases over million people. Both of the variables are lagged one day (t-1) following by Narayan et al. (2021). Hsiao (2014), Al-Awadhi et al. (2020), and Baltagi (2021) mention that panel data reduce multicollinearity and estimation bias, the time-varying relationship between variables, and individual heterogeneity.

Stock returns measurement

The dependent variable is the firm's stock returns. Following Miskolczi (2017), simple and logarithm returns are close to each other. However, both calculations can be a comparing on stock return results. (1) the simple return is $Return_t = \frac{\text{Price}_t - \text{Price}_{t-1}}{\text{Price}_{t-1}}$ and (2) the logarithm return is $Ln\_Return_t = Ln\ \frac{\text{Price}_t}{\text{Price}_{t-1}}$.

Control variables

Previous studies also control several variables include stock trading volume (*Volume*$_{t-1}$), previous stock returns (*Return*$_{t-1}$), Indonesia Composite Index (IDX Composite)/ *Indeks Harga Saham Gabungan* (*IHSG*$_{t-1}$), and New York Stock Exchange Composite Index (*NYSE*$_{t-1}$). All the control variables are lagged one day. *Volume*$_{t-1}$ is the one plus natural logarithm of the total daily stock trading volume. *Return*$_{t-1}$ is the one previous day of stock returns. *IHSG*$_{t-1}$ is the daily market

return of Indonesia composite index. $NYSE_{t-1}$ is the daily market return of the New York Stock Exchange composite index.

Results and Discussion

The statistic descriptive is shows in Table 1. The variables of stock returns, previous stock returns, IHSG, and NYSE are winsorized at 1% and 99%. The average value of new deaths per million (New_Deaths_{t-1}) is 0.2214 (1.2478 per million in natural logarithm). The average value of new cases per million (New_cases_{t-1}) is 1.8821 (6.5673 per million in natural logarithm). The average stock return ($Return_t$) is 0.08%.

Table 1. Statistic descriptive

Variables	N	Mean	Min	Max	Std.Dev
New_Deaths_{t-1}	22,933	0.2214	0.0000	0.6513	0.1426
New_Cases_{t-1}	22,933	1.8821	0.0000	3.3976	0.9622
$Return_t$	22,930	0.0008	-0.0690	0.1676	0.0337
$Volume_{t-1}$	22,930	8.8786	0.0000	21.4894	6.1078
$Return_{t-1}$	22,927	0.0008	-0.0690	0.1682	0.0338
$IHSG_{t-1}$	20,941	0.0005	-0.0501	0.0408	0.0165
$NYSE_{t-1}$	22,195	0.0008	-0.0853	0.0642	0.0213

All of the variable is winsorized at 1% and 99%.

Coronavirus disease (COVID-19) on stock returns

Table 2 provides the coefficient of a total number of daily new deaths per million is significant on stock returns. The coefficient of -0.0234 means that a total number of daily new deaths per million is negative significant on stock returns. Increasing the total number of daily new deaths decreases stock returns. Similar to pandemic disease in 2003, the Severe Acute Respiratory Syndrome (SARS) also decreases stock market returns (Chen et al., 2009). Al-Awadhi et al. (2020) found that daily growth in total deaths in the pandemic disease hurt the stock market returns.

Table 2. Daily new deaths on stock returns

	(1)	(2)	(3)	(4)
New_Deaths_{t-1}	-0.0226***	-0.0229***	-0.0232***	-0.0234***
	(-5.35)	(-5.44)	(-4.92)	(-4.97)
$Volume_{t-1}$		0.0001***		0.0001**
		(2.96)		(2.30)
$Return_{t-1}$		0.0093		0.0080
		(0.78)		(0.61)
$IHSG_{t-1}$			-0.0403**	-0.0438**
			(-2.18)	(-2.31)
$NYSE_{t-1}$			0.0853***	0.0857***
			(5.75)	(5.78)
Constant	-0.0044***	-0.0051***	-0.0041***	-0.0047***
	(-4.15)	(-4.78)	(-3.61)	(-4.12)
Control for:				
Day-FE	Yes	Yes	Yes	Yes
Month-FE	Yes	Yes	Yes	Yes
N	22.930	22.927	20.620	20.617
Adjusted. R^2	0.0069	0.0074	0.0096	0.0099

Where $Return_t$ is the dependent variable and New_Deaths_{t-1} is the independent variable. Control for day and month fixed effects. Superscripts ***, **, and * represent the levels of significance at the 1%, 5%, and 10%.

Sensitivity analysis: Omitted variable bias

Omitted variable bias occurs when a model leaves relevant independent variables. This study uses a firm fixed effect to eliminate the unobservable variables. After controls the firm fixed effect, the coefficient of a total number of daily new deaths per million is -0.0233 on stock returns. Table 3 shows that the result supports the previous hypothesis.

Table 3. The firm fixed effect

	(1)	(2)	(3)	(4)
New_Deaths$_{t-1}$	-0.0226***	-0.0228***	-0.0232***	-0.0233***
	(-5.36)	(-5.41)	(-4.93)	(-4.96)
Volume$_{t-1}$		0.0000		0.0000
		(0.77)		(0.01)
Return $_{t-1}$		0.0053		0.0034
		(0.44)		(0.26)
IHSG $_{t-1}$			-0.0402**	-0.0413**
			(-2.18)	(-2.18)
NYSE $_{t-1}$			0.0853***	0.0859***
			(5.73)	(5.78)
Constant	-0.0040*	-0.0043**	-0.0036	-0.0036
	(-1.96)	(-2.04)	(-1.61)	(-1.55)
Control for:				
Day-FE	Yes	Yes	Yes	Yes
Month-FE	Yes	Yes	Yes	Yes
Firm-FE	Yes	Yes	Yes	Yes
N	22,930	22,927	20,620	20,617
Adjusted. R^2	0.0072	0.0072	0.0097	0.0097

Where $Return_t$ is the dependent variable and New_Deaths_{t-1} is the independent variable. Control for day, month, and firm fixed effects. Superscripts ***, **, and * represent the levels of significance at the 1%, 5%, and 10%.

Simple and logarithm return

There are two ways to calculation stock returns. Miskolczi (2017) mentions that both calculations are close to each other. (1) the simple return is $Return_t = \frac{\text{Price}_t - \text{Price}_{t-1}}{\text{Price}_{t-1}}$ and (2) the logarithm return is $Ln\_Return_t = Ln\ \frac{\text{Price}_t}{\text{Price}_{t-1}}$. Table 4 shows the total number of daily new deaths per million is negative and significant on stock returns.

Table 4. Daily new deaths on logarithm stock returns

	(1)	(2)
New_Deaths$_{t-1}$	-0.0278***	-0.0277***
	(-4.65)	(-4.64)
Volume$_{t-1}$	0.0000	-0.0001
	(0.84)	(-0.87)
Return $_{t-1}$	0.0249	0.0208
	(1.44)	(1.20)
IHSG $_{t-1}$	-0.0703**	-0.0677**
	(-2.29)	(-2.19)
NYSE $_{t-1}$	0.0949***	0.0951***
	(5.24)	(5.24)
Constant	-0.0070***	-0.0054**
	(-4.02)	(-1.97)
Control for:		

Day-FE	Yes	Yes
Month-FE	Yes	Yes
Firm-FE	No	Yes
N	20,617	20,617
Adjusted. R^2	0.0091	0.0075

Where Ln_Return_t is the dependent variable and New_Deaths_{t-1} is the independent variable. Control for day, month, and firm fixed effects. Superscripts ***, **, and * represent the levels of significance at the 1%, 5%, and 10%.

The moderating effect of Friday

Various papers have pointed out that Friday increases stock returns (Derbali & Hallara, 2016; Birru, 2018; Gbeda & Peprah, 2018). However, Chiah & Zhong (2019) mention that investors are more pessimistic on Friday compares to other days. Following the previous studies that use Friday as a dummy variable and it equals one if the day is Friday and zero otherwise. In Table 5, the result shows that investors loss fewer negative stock returns on Friday, thus confirming the second hypothesis.

Table 5. The moderating effect on Friday

	(1) $Return_t$	(2) Ln_Return_t
New_Deaths_{t-1}	-0.0193***	-0.0222***
	(-3.99)	(-3.63)
$Friday_t$	0.0051***	0.0060***
	(3.64)	(3.80)
New_Deaths_{t-1} *X* $Friday_t$	-0.0126***	-0.0176***
	(-2.64)	(-2.88)
$Volume_{t-1}$	-0.0000	-0.0001
	(-0.08)	(-0.89)
$Return_{t-1}$	0.0029	0.0205
	(0.22)	(1.18)
$IHSG_{t-1}$	-0.0494***	-0.0768**
	(-2.62)	(-2.48)
$NYSE_{t-1}$	0.0887***	0.0983***
	(5.96)	(5.41)
Constant	-0.0042*	-0.0059**
	(-1.86)	(-2.24)
Control for:		
Day-FE	Yes	Yes
Month-FE	Yes	Yes
Firm-FE	Yes	Yes
N	20,617	20,617
Adjusted. R^2	0.0086	0.0069

Where $Return_t$ is the dependent variable and New_Deaths_{t-1} is the independent variable. The New_Deaths_{t-1} *X* $Friday_t$ is the moderating variable. Control for day, month, and firm fixed effects. Superscripts ***, **, and * represent the levels of significance at the 1%, 5%, and 10%.

Robustness tests I: The Coronavirus disease (COVID-19) proxy

To avoid the bias variable measurement of the Coronavirus disease (COVID-19) uses daily cases as a proxy. New_Cases_{t-1} is the one plus natural logarithm of a total number of daily new cases over million people. Table 6 replaces the New_Deaths_{t-1} with New_Cases_{t-1} as an independent variable, thus the coefficients are negative and significant on stock returns.

Table 6. Daily new cases on stock returns

	(1)	(2)
New_Cases$_{t-1}$	-0.0037**	-0.0034*
	(-1.99)	(-1.86)
Volume$_{t-1}$	0.0001**	0.0000
	(2.40)	(0.14)
Return $_{t-1}$	0.0074	0.0028
	(0.56)	(0.21)
IHSG $_{t-1}$	-0.0477**	-0.0451**
	(-2.52)	(-2.38)
NYSE $_{t-1}$	0.0915***	0.0916***
	(6.19)	(6.18)
Constant	-0.0041***	-0.0030
	(-3.41)	(-1.29)
Control for:		
Day-FE	Yes	Yes
Month-FE	Yes	Yes
Firm-FE	No	Yes
N	20,617	20,617
Adjusted. R^2	0.0090	0.0088

Where *Return*$_t$ is the dependent variable and *New_Cases*$_{t-1}$ is the independent variable. Control for day, month, and firm fixed effects. Superscripts ***, **, and * represent the levels of significance at the 1%, 5%, and 10%.

Robustness tests II: Control for LQ45 and IDX30

In this sub-section, the regression included the dummy variable of LQ45 and IDX30. LQ45 is the index that included 45 firm's performance with fundamental, larger market capitalization, and liquid stocks. IDX30 is the index that included 30 firm's performance with fundamental, larger market capitalization, and liquid stock. Both LQ45 and IDX30 are dummy variables and equals to one of the firm's stock fulfills the criteria on that period and zero is otherwise. Table 7, results-proven that firm's performance with fundamental, larger market capitalization, and liquid stocks is insignificant during the pandemic period. Furthermore, the daily new deaths are negative and significant on stock returns, thus supporting the hypothesis.

Table 7. Control LQ45 and IDX30

	LQ45		IDX30	
	(1)	(2)	(3)	(4)
New_Deaths$_{t-1}$	-0.0234***	-0.0233***	-0.0234***	-0.0233***
	(-4.97)	(-4.96)	(-4.97)	(-4.96)
Volume$_{t-1}$	0.0001**	0.0000	0.0001**	0.0000
	(2.42)	(0.01)	(2.42)	(0.01)
Return $_{t-1}$	0.0074	0.0030	0.0074	0.0030
	(0.57)	(0.23)	(0.57)	(0.23)
IHSG $_{t-1}$	-0.0437**	-0.0411**	-0.0437**	-0.0411**
	(-2.31)	(-2.17)	(-2.31)	(-2.17)
NYSE $_{t-1}$	0.0857***	0.0859***	0.0857***	0.0859***
	(5.78)	(5.78)	(5.78)	(5.78)
LQ45$_t$	-0.0010	-0.0012		
	(-0.85)	(-0.38)		
IDX30$_t$			-0.0010	-0.0012
			(-0.85)	(-0.38)
Constant	-0.0048***	-0.0036	-0.0048***	-0.0036
	(-4.15)	(-1.55)	(-4.15)	(-1.55)
Control for:				

Day-FE	Yes	Yes	Yes	Yes
Month-FE	Yes	Yes	Yes	Yes
Firm-FE	No	Yes	No	Yes
N	20,617	20,617	20,617	20,617
Adjusted. R^2	0.0099	0.0097	0.0099	0.0097

Where $Return_t$ is the dependent variable and New_Deaths_{t-1} is the independent variable. Control for day, month, and firm fixed effects. Superscripts ***, **, and * represent the levels of significance at the 1%, 5%, and 10%.

Robustness tests III: Subsample analysis

Finally, the daily new deaths variable was divided into three and four groups. For three groups take top 33% and bottom 33% and for four groups take 25% top and 25% bottom as a sample. Further, the sample is reduced because of the top and bottom groups. Following the equation model in Appendix B, Table 8 presents similar results that daily new deaths are negative and significant on stock returns.

Table 8. Subsample analysis

	3 Groups		4 Groups	
	(1)	(2)	(3)	(4)
New_Deaths_{t-1}	-0.0462***	-0.0464***	-0.0735***	-0.0734***
	(-6.20)	(-6.23)	(-8.07)	(-8.07)
$Volume_{t-1}$	-0.0001	-0.0002*	-0.0001	-0.0001
	(-1.03)	(-1.96)	(-1.12)	(-1.26)
$Return_{t-1}$	0.0161	0.0117	0.0163	0.0095
	(1.00)	(0.73)	(0.90)	(0.52)
$IHSG_{t-1}$	-0.0307	-0.0284	-0.0076	-0.0041
	(-1.44)	(-1.33)	(-0.34)	(-0.18)
$NYSE_{t-1}$	0.0744***	0.0742***	0.0779***	0.0774***
	(4.81)	(4.78)	(4.40)	(4.38)
Constant	-0.0033***	-0.0026	-0.0046***	-0.0040
	(-2.71)	(-0.87)	(-3.60)	(-1.04)
Control for:				
Day-FE	Yes	Yes	Yes	Yes
Month-FE	Yes	Yes	Yes	Yes
Firm-FE	No	Yes	No	Yes
N	13,634	13,634	10,034	10,034
Adjusted. R^2	0.0131	0.0116	0.0154	0.0147

Where $Return_t$ is the dependent variable and New_Deaths_{t-1} is the independent variable. Control for day, month, and firm fixed effects. Superscripts ***, **, and * represent the levels of significance at the 1%, 5%, and 10%.

Conclusion

Prior studies discuss the effect of Coronavirus disease (Covid-19). The proxy for the Coronavirus disease (COVID-19) is: (1) the one plus natural logarithm of a total number of daily new deaths over million people and (2) the one plus natural logarithm of a total number of daily new cases over million people. The results show that increases of daily new deaths and daily new cases decreases stock returns. Furthermore, during the pandemic period, investors still lose fewer negative stock returns when trading on Friday. In addition, the results are consistent when controlling the firm fixed effect and subsample analysis. Overall, the Coronavirus disease (COVID-19) harms the stock market returns in Indonesia.

Appendix A: Variable definition

Variable	Definition	Data source
Independent variable		
New_Death	The one plus the natural logarithm of a total number of daily new deaths over million people.	Oxford COVID-19
New_Cases	The one plus the natural logarithm of a total number of daily new cases over million people.	Oxford COVID-19
Dependent variables		
Return	The current stock price minus the previous stock price and over the previous stock price.	Yahoo Finance
Ln_Return	The natural logarithm of the current stock price over previous stock price.	Yahoo Finance
Control variables		
Volume	The one plus the natural logarithm of a total daily stock trading volume.	Yahoo Finance
Return	The previous day of stock returns.	Yahoo Finance
IHSG	The daily market return of Indonesia composite index.	Yahoo Finance
NYSE	The daily market return of the New York Stock Exchange composite index.	Yahoo Finance
Other variables		
Friday	A dummy variable and equals one if the day is Friday and zero otherwise.	Calendar
LQ45	The index that included 45 firm's performance with fundamental, larger market capitalization, and liquid stocks	Indonesia Stock Exchange
IDX30	The index that included 30 firm's performance with fundamental, larger market capitalization, and liquid stocks	Indonesia Stock Exchange

Appendix B

$$Return_{i,t} = \alpha_0 + \alpha_1 New\_Deaths_{i,t-1} + \boldsymbol{\theta}' \boldsymbol{X}_{i,t-1} + \gamma_i + \mu_t + \varepsilon_{i,t}, \quad (1)$$

$$Return_{i,t,j} = \alpha_0 + \alpha_1 New\_Deaths_{i,t-1,j} + \boldsymbol{X}' \boldsymbol{Z}_{i,t-1,j} + \gamma_i + \mu_t + \delta_j + \varepsilon_{i,t,j}, \quad (2)$$

Notes:

$Return_{i,t}$ / $Return_{i,t,j}$ = the current stock price minus the previous stock price and over previous stock price.

$New\_deaths_{i,t-1}$ / $New\_deaths_{i,t-1,j}$ = the one plus natural logarithm of a total number of daily new deaths over million people.

$X_{i,t-1}$ / $X_{i,t-1,j}$ = the control variables that include trading volume, previous stock return, Indonesia Composite Index, and NYSE Composite Index.

γ_i = the day fixed effect.

μ_t = the month fixed effect.

δ_j = the firm fixed effect.

$\varepsilon_{i,t}$ /$\varepsilon_{i,t,j}$ = the error of the regression.

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