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COVID-19 Outbreak and Stock Market Returns: International Evidence

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A B S T R A C T

This research aims to analyze the effect of a pandemic that hit the world: COVID-19, on returns of the international stock market from March 11, 2020, until March 11, 2022. COVID-19 is measured by the growth in cases and deaths. The novelty of this research is the use of 30 countries with the highest COVID-19 cases. Methods of analysis used in this research are Error Correction Model (ECM), Granger's Causality Test, and the Autoregressive Distributed Lag (ARDL). ECM's results on the impact of the growth of daily cases toward stock returns show a significant effect on 22 countries in the long-term and 22 countries in the short-term. The growth of daily deaths shows a significant effect on stock market returns in 23 countries for the long term and 26 countries for the short term. Two-way causality on the growth of daily cases and return occurred in 25 countries. The growth of daily deaths and returns showed two-way causality in 28 countries. This research was conducted to contribute to research and observation of the phenomenon currently engulfing the world, the COVID-19 pandemic. The findings of this research imply that how the government handles this situation plays an important role as the basis of decision-making for investors, and investors can optimize their portfolios in similar conditions with this pandemic.

A B S T R A K

Penelitian ini bertujuan untuk menganalisis pengaruh dari pandemi yang sedang melanda dunia (COVID-19) terhadap pengembalian pada international stock market dari 11 Maret 2020 hingga 11 Maret 2022. COVID-19 diukur dengan pertumbuhan kasus dan kematian. Keterbaruan dari penelitian ini adalah penggunaan 30 negara dengan jumlah kasus tertinggi sebagai sampel penelitian. Metode analisis data yang digunakan adalah Error Correction Model (ECM), Uji Kausalitas Granger, dan Autoregressive Distribution Lag (ARDL). Hasil pengujian ECM pada variabel pertumbuhan kasus harian terhadap pengembalian memperlihatkan pengaruh signifikan terjadi pada 22 negara sampel dalam jangka panjang dan 22 negara sampel dalam jangka pendek. Variabel pertumbuhan kematian harian dan pengembalian pada pengujian ECM memperlihatkan pengaruh signifikan pada 23 negara dalam jangka panjang dan 26 negara dalam jangka pendek. Hubungan kausalitas dua arah pada pengujian variabel pertumbuhan kasus harian dan pengembalian terjadi pada 25 negara. Pengujian pada variabel pertumbuhan kematian harian dan pengembalian memperlihatkan hubungan kausalitas dua arah terjadi pada 28 negara. Penelitian ini dilakukan untuk berkontribusi pada riset dan pengamatan atas fenomena yang sedang melanda dunia saat ini, yaitu pandemi COVID-19. Implikasi dari penelitian ini adalah penanganan pada wabah yang dilakukan pemerintah berperan penting sebagai dasar pengambilan keputusan bagi para investor dan memungkinkan investor untuk mengoptimalkan portofolio dalam kondisi serupa.

1. INTRODUCTION

The infectious disease that has hit the world for the past two years is known as coronavirus dis-ease (COVID-19), caused by the SARS-CoV-2 virus. This virus looked like a crown with spike protein covering its surface and was first discovered at the Wuhan Huanan Seafood Wholesale Market. Transmission of SARS-CoV-2 shows greater infectivity than other coronaviruses that caused SARS and MERS (WHO, 2021). The transmission

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and spread of the virus throughout the world caused this disease to be designated as a pandemic by the World Health Organization (WHO) on March 11, 2020. COVID-19, through its rapid spread, has caused panic and uncertainty in various sectors. This uncertainty is caused by various factors such as the availability of health facilities, test kits, vaccines, and the government's ability to deal with this pandemic through social restriction, lock-down, and other mitigation strategies (Baker et al., 2020).

This pandemic caused expectations for global growth in 2020 to fall by 3%, more severe than the global financial crisis (IMF, 2020). Returns to Russia, India, Brazil, and Peru were also more volatile during the COVID-19 pandemic compared to the global financial crisis period (Rakshit & Neog, 2021). Several previous studies have shown that high uncertainty will harm economic performance and affect the stock market (Arbatli et al., 2017), reduce returns (Baker, Bloom, Davis, & Terry, 2020), and increase volatility (Arouri et al., 2016). The stock market will respond to information from major events. It is shown from several studies on certain events such as disasters (Kowalewski & Śpiewanowski, 2020), political events (Bash & Alsaifi, 2019), diseases, and epidemics such as Ebola (Ichev & Marinč, 2018). The capital market plays an important role in economic activities (Mugiarni & Wulandari, 2021). One of the instru-ments traded in the capital market is stock. According to Younis et al. (2020), the stock market is one of the economic components closely or directly related to real economic conditions. COVID-19 pandemic brings various uncertainties such as the harmful effects and symptoms, the availability of vaccines, the impact of government policies, and the public's response to the conditions and re-strictions (Ramelli & Wagner, 2020). Investors' reactions to the stock market are also mixed with unprecedented volatility (Baker et al., 2020). Stock markets in several countries responded negatively to the WHO announcement that declared COVID-19 as a pandemic. The NASDAQ, FTSE 250, Topix Composite, DAX, JKSE, and KLSE indices showed declines compared to the previous month's date. The declines that occurred in the six indexes were -21,2133%, -24.8384%, -24.0907%, -30.5514%, -15.5274% and -7.4559%.

Previous research conducted on this phenomenon showed that confirmed cases of COVID-19 had a significant negative impact on stock returns (Al-Awadhi et al., 2020; Al-Qudah & Houcine, 2021; Amin et al., 2021; Anh & Gan, 2020; Ashraf, 2020; Baig et al., 2021; Kartal et al., 2021; Khan et al., 2020; Mugiarni & Wulandari, 2021). Hasan (2020) shows the different results and states that there is a significant positive relationship between confirmed cases of COVID-19 with the Shanghai Stock Exchange and New York Dow Jones from March 1, 2020, to March 25, 2020. Waheed et al. (2020) explained that Pakistani's Index: KSI-100 shows a contradicted result: a positive increase in returns on the COVID-19 period. Research with the death variable shows a significant negative effect on returns of the sample countries (Al-Awadhi et al., 2020; Baig et al., 2021; Kartal et al., 2021; Mugiarni & Wulandari, 2021), while Ashraf (2020) shows that the negative effect is not significant. Research conducted by Abu et al. (2021) stat-ed that the variable of death caused by COVID-19 had a significant positive effect on the stock mar-ket in Nigeria. However, Gherghina et al. (2020) stated there was no relationship between index (BET) and COVID-19's variables (new cases & new death).

Previous research that examined the COVID-19 phenomenon primarily focused on countries, regions, geographic areas, and major world indexes as research objects. Besides, several studies show contradictory results, including Abu et al. (2021), Hasan (2020), and Waheed et al. (2020), which state that there is a positive effect of this pandemic on market returns. Based on that, this research will fill the research gap using ECM, Granger's Causality Test, and ARDL to analyze the long-term and short-term relationship between the variables. The unexplored relationship will be carried out by using 30 countries with the highest number of cases as research samples, without focusing on specific regions and geographic areas as a novelty of this research. This research will contribute to significant events affecting the inter-national stock market. By knowing the impact of the COVID-19 pandemic on returns on the sample country market indexes, investors can make the right decisions for their investment portfolios.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

Efficient Market Theory

The efficient market theory explains the concept of the relationship between stock prices and information available in the market. An efficient market will react to the available information appropriately and accurately (Hartono, 2017). The information in the market can be in the form of all information that has happened, current information, or information in the form of rational opinions that can cause changes in stock prices (Tandelilin, 2017). According to Hartono (2017), efficiency can be

viewed in terms of the availability of information and based on decision-making.

An efficient market is based on information measured by the relationship between prices and the availability of information. Decisional market efficiency will be formed when all information is available and all market participants can make the right decisions. The difference between informed and decision-based market efficiency lies in the ability of market participants to make decisions (Hartono, 2017). The condition of the COVID-19 pandemic is part of the information available in the market and causes uncertainty in various fields, including the economy and the stock market. Previous research has shown that high uncertainty will affect the stock market (Arbatli et al., 2017) and result in a decreased return.

Signaling Theory

According to Hartono (2017), the publication of information will signal investors for decision-making. The information received will be interpreted and analyzed as a good signal (good news) or a bad signal (bad news). The condition of the COVID-19 pandemic is one form of information that will influence decision-making for various parties, including investors. The continuous increase in cases and deaths can indicate delays and failures in handling the pandemic. This condition can trigger ongoing uncertainty. According to Baker et al. (2020), COVID-19 has a stronger impact on the stock market than the Spanish Flu because there is more information about this pandemic and it spreads quickly compared to the situation during the Spanish Flu.

Information published through the media (print & electronic) will be considered in decision making. Investors will trust reports from the media with a good reputation as a valid signaler regarding the information about stock reactions during a crisis. The information will be used to evaluate the decision (OuYang et al., 2017). Response to the information received can be a positive or negative reaction. This theory explains the information as a signaler and the basis for decision-making by investors. The information in this study refers to conditions related to the COVID-19 pandemic, especially regarding cases and deaths caused by this pandemic.

COVID-19

The infectious disease that has engulfed the world over the past two years is known as coronavirus disease (COVID-19), caused by the SARS-CoV-2 virus. This virus looked like a crown with spike protein all around the surface and was discovered at Wuhan Huanan Seafood Wholesale Market. The transmission of SARS-Cov-2 shows greater infectivity than another coronavirus that caused SARS and MERS (WHO, 2021). The speed of transmission from this virus caused this disease to spread worldwide and was declared a pandemic by World Health Organization (WHO) on March 11, 2020. On September 9, 2021, the total number of COVID-19 cases reached 224,117,770, with a total death of 4,622,503. The ongoing spread of this virus mutation has caused the total cases to reach 426,624,859 cases, with total death reaching 5,899,578 on February 23, 2022. Governments worldwide take various ways to control and limit the spread of the disease, including restricting travel, social distancing, closing schools, cafes, restaurants, and other activities that can cause crowds (Toda, 2020). The government's policies and ways to control the virus have an impact and loss on the economy. However, they must be carried out because they are related to the outbreak. The Financial Stability Report published by the IMF in April 2020 revealed that the pandemic's significant impact on the financial system could affect global financial stability and the fastest equity market decline in history (IMF, 2020).

The impact of this pandemic has brought economic losses to stock markets in various countries. According to Younis et al. (2020), the stock market is one of the economic components that is closely related (directly) to real economic conditions. This condition is driven by investor concerns and pessimism about returns and future income. The worries and pessimism have created fluctuation in the stock market (Liu et al., 2020; OuYang et al., 2017). Several studies have shown the impact of this pandemic. Al-Awadhi et al. (2020) showed that the increase in cases and the death caused by the SARS-CoV-2 virus impacted the stock returns of all companies in China. Ashraf (2020) showed a negative correlation between the increase in COVID-19 cases and stock returns. According to Liu et al. (2020), there was a negative impact of the pandemic on stock returns in several countries. The impact of the spread of this virus varies depending on the sector and industry. Industries that have been worst affected by this pandemic include gas and oil, garments, automobiles, transportation, and hospitality (Schoenfeld, 2020). Meanwhile, according to Goodell (2020), the financial sector (banks and other financial institutions) was also affected by this pandemic due to an increase in non-

performing loans through debtors experiencing loss and withdrawal of depositors in large amounts in a short time.

Hypotheses Development

The World Health Organization (WHO) states that the SARS-CoV2 virus shows greater infectivity than other coronaviruses (SARS and MERS) since it spreads more quickly. The COVID-19 infection rate is at 1.5-3.5%, while Ebola, MERS, SARS, and Seasonal Flu are in the range of 0.42-3% (Asian Development Bank, 2020). According to efficient market theory, the availability of information in the market will affect stock prices. Based on that theory, information in the form of the number of confirmed cases of COVID-19 is suspected to be a trigger for the market reaction. Research conducted on previous outbreaks such as the H7N9 influenza virus and stock performance in China shows that an increasing daily number of cases will have a negative impact on the market index (Sun, 2017). The Ebola outbreak significantly affected the relevant shares of the US market, the greatest impact of this outbreak being attributed to US companies operating domestically and in West Africa (Ichev & Marinč, 2018).

In research on COVID-19, Al-Awadhi et al. (2020) explained that the increase in cases and deaths from COVID-19 impacted the stock returns of all companies in China. Ashraf (2020) shows a negative correlation between the increase in COVID-19 cases and stock returns. Xu (2020) explained through his research that an increase in COVID-19 cases would have a negative effect on the stock market in general. Waheed et al. (2020) explained that Pakistani's Index: KSI-100 shows a contradicted result of a positive increase in returns on the COVID-19 period. Research conducted by Hasan (2020) explains a significant positive relationship between COVID-19 cases with the Shanghai Stock Exchange and the New York Dow Jones in the study period.

H_1: The growth of confirmed cases of COVID-19 negatively affects the return on the international stock market

The first death in the COVID-19 pandemic was reported on January 11, 2020, and reached 4,640,660 deaths on September 12, 2021. In 2022, to be exact, on February 23, 2022, the number of deaths caused by this pandemic reached 5,899,578 people. The death rate from COVID-19 is lower than in previous outbreaks, ranging from 1-3.4% higher than the seasonal Flu with a mortality rate of 0.05%, while Ebola, SARS, and MERS ranged from 10-50% (Asian Development Bank, 2020). Research on outbreaks that have occurred before shows that the mortality variable influences the stock market. Burdekin (2021), in his research, stated that the stock market in Europe and the United States reacted negatively, significant to the increase in the death rate that occurred during the period of the Spanish Flu. Research conducted by Barro et al. (2020) explained that the high mortality rate in the Spanish Flu significantly affected the US stock market and reduced stock returns. Information about the growth in deaths due to COVID-19 is suspected to influence the return on the stock market. In previous studies that have been carried out on this pandemic, several different results were found. According to Ashraf (2020), the stock market responded in a negative and insignificant way to the COVID-19 death cases. According to Al-Awadhi et al. (2020), stock returns are negatively significantly related to the daily growth in the total confirmed cases of COVID-19 and the daily growth in the total number of deaths caused by COVID-19. Hasan (2020) explains that the stock market's response to the growth in deaths from COVID-19 is weak. Abu et al. (2021) showed different results on the mortality variable. The research conducted on the Nigerian stock market showed that the mortality rate had a significant positive relationship with the stock market's long-term performance.

H_2: The growth of confirmed death of COVID-19 negatively affects the return on the international stock market

3. RESEARCH METHOD

Data and Sample

This study used secondary data obtained from the database. The data used are returns from the sample countries index and the number of cases and deaths due to COVID-19 taken from the Investing and Our World in Data websites. The sampling technique in this study was purposive sampling. The criteria are the 30 countries with the highest number of cases at the time of sampling (March 4, 2022), having a stock market, and completing daily data during the study period (March 11, 2020 – March 11, 2022). Countries in the list of the top 30 countries that do not have complete daily data on investing websites will be excluded from the research sample and replaced with countries in the next queue. The research period starts from March 11, 2020, when WHO officially declared COVID-19 as a global pandemic, until March 11, 2022 when this research was conducted.

Dependent Variable

The dependent variable (Y) used in this study is the return of the stock indexes of the sample countries. Returns are calculated from March 11, 2020 since COVID-19 was announced as a pandemic by WHO until March 11, 2022. The data used is daily data (trading days). The calculation of return is based on the following formula:

$$R_{i,t} = \frac{P_{i,t} - P_{i,(t-1)}}{P_{i,(t-1)}} \quad (1)$$

Note:

R : Return
P : Price
i : country
t : time

Independent Variable

The independent variable in this study is the growth of the confirmed cases of COVID-19 as CC and the growth of the total deaths due to COVID-19 as CD. The data on cases and deaths due to COVID-19 that will be used in this study are daily data during trading days (5 days) obtained from the Our World in Data's website.

Unit Root Test

Unit root testing is carried out on time-series data. The purpose of this test is to determine the stationarity of the data. Data containing unit roots (not stationary) will cause difficulty estimating the model because it tends to fluctuate. The unit root test used in this study is the Augmented Dickey-Fuller (ADF). The ADF test results are interpreted by comparing the probabilities with a significance level (α) of 0.05.

Cointegration Test

Cointegration indicates a long-term relationship. The cointegration test aims to determine the existence of a long-term equilibrium relationship between the variables used in the study. The main requirement for conducting a cointegration test is that the data must be stationary. It is intended to avoid spurious regression. This study uses the Johansen Cointegration Test. The cointegration test is interpreted by comparing the probability with a significance level (α) of 0.05 or comparing the trace statistic value with the critical value obtained from the Johansen Test. The trace statistic value greater than the critical value indicates a cointegration relationship between the variables used in the study.

Error Correction Model (ECM)

Error Correction Model (ECM) is a model used to correct short-term behavior toward long-term equilibrium. The use of the ECM can be done if the variables used in the study are cointegrated. The short-term ECM model is formed using the residuals from the long-term equation Error Correction Terms (ECT). The long-term equation used in this study is as follows (Gujarati & Porter, 2013):

$$Y = \alpha + \beta_1 CC + \beta_2 CD + \varepsilon \quad (2)$$

Note:

R : Return of sample's indices
CC : Growth of COVID-19 cases
CD : Growth of COVID-19 death
ε : White noise error term

The short-term equation used in this study is as follows (Gujarati & Porter, 2013):

$$\Delta R = \beta_0 + \beta_1 \Delta CCt + \beta_2 \Delta CDt + \beta_3 ECT + \varepsilon_t \quad (3)$$

Note:

R : Return of sample's indices
CC : Growth of COVID-19 cases
CD : Growth of COVID-19 death
ECT : Error Correction Terms
ε : White noise error term

Autoregressive Distributed Lag (ARDL)

ARDL is a model that includes the lag of the dependent and independent variables. This method examines the long-term and short-term effects on the dependent and independent variables. ARDL method in this study will be carried out in panel data. Panel data need to be stationary at level or first difference.

Optimum Lag Test

The optimum Lag Test is intended to select the right lag length for Granger's causality test. The lag length used for Granger causality testing is made by selecting the lag that shows the smallest criterion value. The parameters used to select the optimum lag length are LR (Likelihood Ratio at 5% level), FPE (Final Prediction Error), AIC (Akaike Information Criterion), SC (Schwarz Information Criterion), and HQ (Hannan-Quinn Information Criterion). Based on the test using EViews 10, the optimal lag per parameter will be marked with an asterisk (*).

Granger's Causality Test

Granger causality is a test used to determine the relationship between variables. The relationship between the variables referred to in this study is the

relationship that occurs between the variables CC (Growth of COVID-19 cases), CD (Growth of COVID-19 death), and R (returns from the indices in the sample countries). The results of this test can determine the relationship between the research variables: a two-way relationship, a one-way relationship, and no relationship. The test results are determined by comparing the probability of the test results with a predetermined confidence level (α = 5%). The use of Granger's Causality was intended to test the interrelationship between variables, while regression can only see a one-way relationship. Rahman et al. (2021) used the pairwise panel Granger's Causality Test, which shows the unidirectional causality from the COVID-19 case to stock market returns. Panjwani & Riaz (2021) used this method which shows a one-way relationship between new cases & new deaths to returns of Saudi's Stock Market. A two-way relationship occurs between total cases & total deaths to returns of the Saudi Stock Market.

4. DATA ANALYSIS AND DISCUSSION

Unit Root Analysis

The result of the unit root test carried out on the sample countries shows that 26 countries are stationary at a level with a probability less than α (0.05). The sample countries are the United States, India, Brazil, France, United Kingdom, Germany, Turkey, Spain, Netherlands, Colombia, Poland, Indonesia, Mexico, Japan, Vietnam, Philippines, Czech Republic, Belgium, Malaysia, Peru, Austral-ia, Canada, Portugal, Chile, Thailand, and Switzerland. There are 4 (four) countries that require further testing of stationary at the first difference. The result of the first difference test shows that the data for the 4 (four) countries are stationary with a probability level less than α (0.05). The 4 (four) countries are Italy, Argentina, South Korea, and South Africa.

Cointegration Test

The cointegration test was carried out on station-ary variables. This study used the Johansen Sys-tem Cointegration Test on EViews 10 to observe and prove the existence of a long-term relationship between the independent and dependent variables used. The test results show the occurrence of cointegration at rank 0 (none) for India, Brazil, France, Germany, Turkey, Spain, Argentina, Colombia, Poland, Indonesia, Mexico, Japan, South Korea, Vietnam, South Africa, Philippines, Czech Republic, Belgium, Peru, Australia, Canada, Chile, and Thailand with trace statistic greater than critical value and probability less than α (0.05). The re-sults of the United States, United Kingdom, Italy, Netherlands, Malaysia, and Switzerland show a long-term relationship (cointegration) at rank 1. At the same time, cointegration in Portugal is at rank 2 with a trace statistic > critical value and a probability less than (0, 05). Cointegration in all sam-ple countries in this study proves the existence of a long-term equilibrium relationship between the independent and dependent variables.

Error Correction Model (ECM)

The ECM model can be used if the variables used in the study are cointegrated or have a long-term relationship. This model is tested by utilizing the residuals from the long-term equation. These residuals are called Error Correction Terms (ECT) and must be stationary at a level to be used. The negative ECT coefficient indicates that the regres-sion equation has a short-term relationship. ECM will explain the long-term and short-term rela-tionships that occur in the sample in this study.

ECM test results in the long and short term that will be displayed are in the United States. The test results from other countries will be presented as conclusions and summaries. Table 1 displays the long-term test result for the United States.

Table 1. United states' long-term test result

Country	Variable	Coefficient	Std. Error	t-Statistic	Prob.	Adj. R-squared
USA	CC	-0.1026	0.0281	-3.6461	0.0003***	0.0235
	CD	0.0916	0.0288	3.1807	0.0016***	
	C	0.0016	0.0008	2.0395	0.0419	
F-statistic			7.2732			
Prob. (F-statistic)			0.0008			

*** significant at α=1%; ** significant at α=5%

Source: processed data

The results of the United States long-term test in Table 1 show that the CC variable has a significant negative effect of -0.1026 on the return of the NASDAQ index with a probability of 0.0003. The variable CD has a significant positive effect of 0.0916 on the return of the NASDAQ index with a probability of 0.0016. Based on the estimated long-term results, this research found negative &

significant effects among the variables on NASDAQ Index. Adj. R-squared of 0.0235 or 2.3515% shows the ability of the growth of cases (CC) and deaths (CD) due to COVID-19 to explain the long-term return of the NASDAQ index (R). Other variables outside the research model will do the remaining 97.6485%.

The long-term t-test shows t-statistic values are -3.6461 and 3.1807, with a probability smaller than α (0.05). The results of the t-test show that the variables X1 and X2 partially have a significant effect on the long-term return of the NASDAQ index. The F-test shows an F-statistic value of 7.2732 with a probability smaller than α (0.05), which is 0.0008. The results of the F test indicate that the independent variables in this study simultaneously have a significant effect on the long-term return of the NASDAQ (Y) index. The residuals in the long-term equation have been tested and found stationary at the level. Therefore, all the residuals can be used for short-term testing. Table 2 shows the results of the short-term test carried out for the United States.

Table 2. United states' short-term test result

Country	Variable	Coefficient	Std. Error	t-Statistic	Prob.	Adj. R-squared
USA	D(CC)	-0.1362	0.0280	-4.8584	0.0000***	0.6719
	D(CD)	0.0898	0.0296	3.0324	0.0025***	
	ECT(-1)	-1.2791	0.0406	-31.5396	0.0000***	
	C	0.0001	0.0007	0.2167	0.8285	
F-statistic			355.9353			
Prob. (F-statistic)			0.0000			

*** significant at α=1%; ** significant at α=5%

Source: processed data

The short-term equation shows the CC variable has a significant negative effect of -0.1362 with a probability of 0.0000. Variable CD shows a significant positive effect of 0.0898 with a probability of 0.0025. The value of the Error Correction Terms (ECT) is -1.2791 shows that the previous period's disequilibrium was corrected in the current period and significant with a probability of 0.0000. Adj. R-squared of 0.6719 or 67.1884% shows the ability of the growth of cases (CC) and death (CD) to explain the NASDAQ index's return (Y). The explanation for the remaining 32.8116% is done by other variables that are not included in the research model.

The results of the t-test show that the growth of cases (CC) and death (CD) due to COVID-19, respectively, has a significant effect on the rate of return on the NASDAQ index with probabilities of 0.0000 and 0.0025. The F test on the results produces an F-statistic of 355.9353 with a probability of 0.00000. The results of the F test indicate a significant effect of growth cases (CC) and deaths (CD) due to COVID-19 on the NASDAQ index's return (R) simultaneously in the short term.

Table 3 will summarize the long, and short-term ECM tests carried out in this study.

Table 3. Summary of ECM test results

Country	Variable	Long-term	Short-term	Country	Variable	Long-term	Short-term
USA	CC	Negative***	Negative***	Japan	CC	Positive**	Positive
	D	Positive***	Positive***		CC	Negative***	Negative**
India	CC	Negative***	Negative***	South	CC	Negative	Positive
	CC	Positive***	Positive***	Korea	CC	Negative**	Negative***
Brazil	CC	Positive***	Positive***	Vietnam	CC	Negative***	Negative***
	CC	Negative***	Negative***		CC	Positive***	Positive***
France	CC	Negative***	Negative	South	CC	Negative***	Negative***
	CC	Positive**	Positive.	Africa	CC	Positive	Positive
UK	CC	Negative	Negative***	Philippines	CC	Negative	Negative**
	CC	Negative***	Negative**		CC	Negative***	Negative
Germany	CC	Negative***	Negative***	Czechia	CC	Negative***	Negative
	CC	Positive***	Positive***		CC	Positive***	Positive***
Turkey	CC	Negative	Positive	Belgium	CC	Negative***	Negative
	CC	Positive	Negative***		CC	Positive**	Negative***
Italy	CC	Negative	Negative***	Malaysia	CC	Negative***	Negative***
	CC	Positive	Positive		CC	Negative	Negative***
Spain	CC	Positive**	Positive***	Peru	CC	Positive	Negative

Argentina	CC	Negative***	Negative***	Australia	CC	Negative**	Negative***
	CC	Negative	Negative		CC	Negative***	Negative***
	CC	Positive***	Positive***		CC	Positive***	Positive***
Netherlands	CC	Negative***	Negative***	Canada	CC	Negative***	Negative***
	CC	Positive***	Positive***		CC	Positive***	Positive***
Colombia	CC	Negative***	Negative***	Portugal	CC	Negative	Negative***
	CC	Positive***	Positive***		CC	Positive	Negative***
Poland	CC	Negative***	Negative***	Chile	CC	Negative***	Negative***
	CC	Positive***	Positive***		CC	Positive***	Positive***
Indonesia	CC	Negative***	Negative***	Thailand	CC	Negative***	Negative***
	CC	Positive	Positive***		CC	Positive**	Negative***
Mexico	CC	Positive**	Positive***	Switzer-land	CC	Positive***	Positive
	CC	Negative	Negative***		CC	Negative***	Negative***

*** significant at α=1%; ** significant at α=5%
Source: processed data

Autoregressive Distributed Lag (ARDL)

The data that will be analyzed using ARDL has been tested, and the unit root test result for panel data is reported in Table 4. The results show stationary at a level with a probability of less than 1%.

Table 4. Unit root test for panel data

Method	CC		CD		R	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
ADF - Fisher Chi-square	1433.44	0.0000***	1196.45	0.0000***	2551.55	0.0000***
ADF - Choi Z-stat	-28.0519	0.0000***	-27.7257	0.0000***	-48.5095	0.0000***

*** significant at α=1%; ** significant at α=5%
Source: processed data

Table 5 shows the cointegration test results carried out on the panel data. The test results indicate the occurrence of cointegration (long-run relationship) among variables and significant at 1%.

Tables 4 and 5 show the test results that are stationary and cointegrated into the panel data so that the ARDL method can estimate the relationship between variables in the long and short term.

Table 6 will display the results of the ARDL test performed on the panel data with the model selected by AIC as ARDL (3, 4, 4).

Table 5. Pedroni residual cointegration test

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	36.25101	0.0000***	4.449409	0.0000***
Panel rho-Statistic	-375.4914	0.0000***	-371.1093	0.0000***
Panel PP-Statistic	-118.4346	0.0000***	-116.8632	0.0000***
Panel ADF-Statistic	-74.25673	0.0000***	-73.29762	0.0000***

*** significant at α=1%; ** significant at α=5%
Source: processed data

Table 6. Long Run Result of ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
	Long Run Equation			
GROWTHCASE	-0.013932	0.002327	-5.987910	0.0000***
GROWTHDEATH	0.011034	0.001837	6.006942	0.0000***

*** significant at α=1%; ** significant at α=5%
Source: processed data

Table 6 shows an estimation of the long-run equation from the ARDL method. The result indicates that the growth case of COVID-19 has a significant negative effect on stock market returns in the long run. An increase in COVID-19 cases by 1% will cause a decrease in returns of 0.0139. On the other hand, the growth of death shows a significant positive effect in the long run. An increase in the growth of deaths due to COVID-19 will also cause an increase in returns of 0.0110. Table 7 shows COVID-19 variables: growth of cases & deaths do not affect market return in the short run. The value of the COINTEQ01 is -0.9911 shows that the previous period's disequilibrium was corrected in the current period and significant with a probability of 0.0000.

Table 7. Short run result of ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Short Run Equation				
COINTEQ01	-0.991098	0.022642	-43.773060	0.000000***
D(RETURN(-1))	0.004523	0.013783	0.328184	0.742800
D(RETURN(-2))	0.029142	0.011339	2.570044	0.010200**
D(GROWTHCASE)	-0.016738	0.014231	-1.176177	0.239500
D(GROWTHCASE(-1))	-0.014956	0.012941	-1.155650	0.247800
D(GROWTHCASE(-2))	-0.004461	0.010619	-0.420112	0.674400
D(GROWTHCASE(-3))	-0.011515	0.010154	-1.133994	0.256800
D(GROWTHDEATH)	-0.015156	0.013252	-1.143684	0.252800
D(GROWTHDEATH(-1))	0.002919	0.007736	0.377389	0.705900
D(GROWTHDEATH(-2))	-0.011520	0.008136	-1.415876	0.156800
D(GROWTHDEATH(-3))	-0.002412	0.006872	-0.351010	0.725600
C	0.000933	9.54E-05	9.776300	0.000000***

*** significant at α=1%; ** significant at α=5%
Source: processed data

Optimum Lag Test

Based on testing using EViews 10, the optimal lag per parameter will be marked with an asterisk (*). The test results show that lag 7 was selected for two countries, South Korea and Vietnam. The number of lags selected for the other sample countries is lag 8. The lag selected will be used to do the Granger's causality test.

Granger's Causality Test

Granger's causality test tests are intended to determine the causal relationship between variables. The causal relationship is categorized into one-way and two-way and has no relationship between the variables used in the test. The variable referred to in this study is the relationship that occurs between the variables X1 (growth cases of COVID-19), X2 (growth deaths due to COVID-19), and Y (return of the index of the sample country). The results of the Granger's causality test that will be displayed are the United States. However, the overall test result will be summarized in a table that presents the relationship between variables.

Table 8. United States' granger causality test result

Country	Null Hypothesis	Obs	F-Statistic	Prob.
United States	US_Growth_Case does not Granger Cause US_Return	514	6.82972	2.00E-08***
	US_Return does not Granger Cause US_Growth_Case		4.27858	5.00E-05***
	US_Growth_Death does not Granger Cause US_Return	514	5.46541	1.00E-06***
	US_Return does not Granger Cause US_ Growth_Death		3.24666	1.30E-03***

*** significant at α=1%; ** significant at α=5%
Source: processed data

Table 8 shows the results of the tests carried out for the Granger's causality test in the United States. The causality test shows a two-way causality between the COVID-19 growth case (CC) and the NASDAQ index's return (R) with probabilities of 0.00000002 and 0.00005. The growth in death due to COVID-19 (CD) shows a two-way causality with the NASDAQ index's return (R) which is indicated by probabilities of 0.000001 and 0.0013. The result of the overall test is smaller than α (0.05).

Appendix 1 summarizes the results of the Granger's causality test in all sample countries. The summary will show the relationship between the independent and dependent variables.

Effect of Growth in COVID-19 Cases on 30 Stock Market Returns

Research on 30 sample countries with the highest COVID-19 cases as of March 4, 2022, showed mixed results. Tests conducted with ECM (Error Correction Model) produce equations in the long-term and short-term. The results of the long-term test in the sample countries show that there is a significant effect between the growth of COVID-19 cases (CC) on the return of the index (R) in 22 countries. The significant results have a different effect on the dependent variable. Significant negative effects occurred in 17 countries studied: the United States, India, France, Germany, Netherlands, Colombia, Poland, Indonesia, Vietnam, South Africa, Czech Republic, Belgium, Malaysia, Australia, Canada, Chile, and Thailand. Five (5) countries showed a significant positive effect, including Brazil, Spain, Mexico, Japan, and Switzerland. The long-term test results show that the variable growth of COVID-19 cases (CC) has no significant effect on the index's returns of the eight (8) sample countries. Seven (7) countries showed an insignificant negative effect: the United Kingdom, Turkey, Italy, Argentina, South Korea, the Philippines, and Portugal, while the positive effect was not significant in Peru.

The short-term test results conducted in the sample countries showed a significant effect in the 22 countries studied. Significant negative effects occurred in 19 countries, namely the United States, India, France, United Kingdom, Germany, Italy, Netherlands, Colombia, Poland, Indonesia, Vietnam, South Africa, Philippines, Malaysia, Australia, Canada, Portugal, Chile, and Thailand. A significant positive effect occurred in three (3) countries: Brazil, Spain, and Mexico. The insignificant effect occurred in eight (8) sample countries, with four (4) countries having an insignificant negative effect, namely Argentina, Czech Republic, Belgium, and Peru. In contrast, Turkey, Japan, South Korea, and Switzerland had an insignificant positive effect.

The Granger causality test conducted in 30 sample countries shows a two-way relationship between the variable growth of COVID-19 cases (CC) and the return of the index (R) in 25 countries. The countries are the US, India, Brazil, France, United Kingdom, Germany, Turkey, Italy, Spain, Argentina, Netherlands, Colombia, Indonesia, Mexico, Vietnam, Philippines, South Africa, Czech Republic, Belgium, Malaysia, Australia, Canada, Chile, Thailand, and Switzerland. The one-way relationship between the CC to R occurs in Portugal, while the one-way relationship from R to CC occurs in Poland and Japan. The results of causality testing in South Korea and Peru show no relationship between the growth of COVID-19 cases (CC) and the return of the index (R).

Research conducted in 17 countries in the long term and 19 countries in the short term with significant negative effects, supporting the results of research conducted by Al-Awadhi et al. (2020), Al-Qudah & Houcine (2021), Amin et al. (2021), Ashraf (2020), Khan et al. (2020), Liu et al. (2020), which states that there is a negative effect of the growth of COVID-19 cases on index's return in the sample countries used for each study. The finding of significantly positive effect in five (5) countries in the long term and three (3) countries in the short term supports the research conducted by Hasan (2020) and Waheed et al. (2020), which states that there is a significant positive relationship between confirmed cases of COVID-19 and the sample in-dex used in the research. Waheed et al. (2020) ex-plained that the positive influence was caused by the steps taken by the government at that time, such as the economic package and changes in interest rates. The government's actions at that time provide a positive signal to the investors. Government policy is considered one of the indi-cators that cause the emergence of this positive influence. Policies regarding the COVID-19 pan-demic condition that lasted during the research period could not only control the uncertainty that occurred but also suppress the spread of the virus. In their research, Narayan et al. (2021) explained that the government's response to the pandemic positively affected the stock market. Besides that, although some sectors experienced a negative im-pact from this pandemic (tourism, transportation, mining, real estate, hospitality), other sectors (technology, health) have been rising (Alzyadat & Asfoura, 2021; Schoenfeld, 2020). This research also uses ARDL on panel data, and the result in-dicates that the growth case of COVID-19 has a significant negative effect on stock

market returns in the long run.

The causality test carried out in this study supports the research of Panjwani & Riaz (2021), which states that there is a two-way relationship between cases on the return of the sample country's index. The test results from 25 countries show a two-way relationship between COVID-19 cases (CC) growth and the index's return (R). The results of this study on Portugal support the research conducted by (Rahman et al., 2021), which states that there is a one-way relationship between COVID-19 cases to stock returns. However, the research conducted by Gherghina et al. (2020) showed different results from this study. Gherghina et al. (2020), through research, stated that there was no relationship between the BET index and the COVID-19 cases.

Effect of Growth in COVID-19 Deaths on International Stock Market Returns

The long-term test results in the sample countries show a significant effect between the growth of COVID-19's death (CD) on the return (R) in 23 countries. The significant test results have a different effect on the dependent variable (R). Eight (8) countries showed a significant negative effect, including Brazil, the United Kingdom, Spain, Japan, South Korea, the Philippines, Peru, and Switzerland. Significant positive effects occurred in 15 countries: the United States, India, France, Germany, Argentina, Netherlands, Colombia, Poland, Vietnam, Czech Republic, Belgium, Australia, Canada, Chile, and Thailand. The long-term test results show that the growth of COVID-19 death (CD) has no significant effect on returns from the seven (7) sample countries. Two (2) countries show an insignificant negative effect: Mexico and Malaysia. The countries of Turkey, Italy, Indonesia, South Africa, and Portugal showed insignificant positive effects.

The short-term test results conducted in the sample countries showed a significant effect in 26 countries between the growth of COVID-19's death (CD) on the index's returns (R). Significant negative effects occurred in 13 countries, including Brazil, the United Kingdom, Turkey, Spain, Mexico, Japan, South Korea, Belgium, Malaysia, Peru, Portugal, Thailand, and Switzerland. Significant positive effects occurred in the US, India, Germany, Argentina, Netherlands, Colombia, Poland, Indonesia, Vietnam, Czech Republic, Australia, Canada, and Chile. The insignificant effect occurred in four (4) sample countries with one (1) insignificant negative effect, namely the Philippines, while France, Italy, and South Africa had an insignificant positive effect.

The Granger causality test conducted on 30 sample countries shows a two-way relationship that occurs between the growth of COVID-19's death (CD) and the return of the index (R) in 28 countries: United States, India, Brazil, France, United Kingdom, Germany, Turkey, Italy, Spain, Argentina, Netherlands, Colombia, Poland, Indonesia, Mexico, Japan, South Korea, South Africa, Czech Republic, Belgium, Malaysia, Peru, Australia, Canada, Portugal, Chile, Thailand, and Switzerland. The one-way relationship of the variable CD to R occurs in the Philippines, while the one-way relationship from R to X2 occurs in Vietnam.

Research conducted in eight (8) countries in the long term and 13 countries in the short term found significant negative test results on the growth of COVID-19's death (CD) to the index's return (R). This result supports the research conducted by Al-Awadhi et al. (2020), Baig et al. (2021), Kartal et al. (2021), and Mugiarni & Wulandari (2021), which stated that there was a significant negative effect that occurred between the variables of death due to COVID-19 (CD) on stock index returns (R). The study results in 15 countries in the long term and 13 countries in the short term showed a significant positive effect on the growth of COVID-19's death (CD) on the index's returns (R). It is in line with the study conducted by Abu et al. (2021), which stated that deaths due to COVID-19 significantly affected the Nigerian stock market. Based on data from the Asian Development Bank (2020) and Abu et al. (2021), the death rate of COVID-19 is considered low compared to the number of COVID-19 cases. The low death rate is considered a positive sentiment that reduces uncertainty and leads to better market performance. Apart from the low fatality rate, the government's handling through various policies and procurement of health facilities that have succeeded in minimizing the death rate also weakened the uncertainty that arises from COVID-19 deaths. Alber (2020) also stated that stock market returns are more sensitive to COVID-19 cases when compared to deaths. The results of the study with an insignificant negative effect on two (2) countries in the long term and one (1) country in the short term, in line with the results of research conducted by Ashraf (2020), which states that the stock market has an insignificant negative response to death due to COVID-19. ARDL method shows a similar result on panel data. The result indicates a significant positive effect in the long run.

The Granger causality test in 28 countries shows a two-way relationship between the growth of COVID-19's death (CD) and the index's return on the sample country (R). It supports the results of Panjwani & Riaz's (2021) research, which states that

there is a two-way relationship between cases of death and the study's return of the sample index. This study also supports other findings from Panjwani & Riaz (2021) regarding the one-way relationship between new cases and new deaths on the return of the sample index. In this study, there is a one-way relationship between death growth (CD) and the return of the index (R). occurred in the Philippines, while the one-way relationship of index return (R) to death growth (CD) occurred in Vietnam. This research shows different results conducted by Gherghina et al. (2020). Gherghina et al. (2020) stated there was no relationship between the BET index and COVID-19 death.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This research aims to investigate and analyze the effect of COVID-19 on returns in the 30-stock market return with the highest COVID-19 cases. COVID-19 is measured by the growth in cases and deaths. The variables used are based on research in previous outbreaks and previous research on this pandemic that shows the effect of cases and death on stock market returns. The growth in cases and deaths from COVID-19 is considered information that signals the market for making and evaluating decisions based on pandemic conditions. In short, 22 countries in the long term also 22 countries in the short term prove and support the first hypothesis (H1) based on ECM. Based on the Granger causality test, 28 countries show a relationship between Covid cases and stock return, 25 countries show a two-way relationship, 1 country show one-way causality from Covid cases to stock return, and 2 countries show a one-way causality from a stock return to Covid case. The data of 23 countries in the long term and 26 countries in the short term prove and support the second hypothesis (H2). Granger's causality test also shows that 28 countries have a two-way relationship between Covid death and stock return, 1 country has a one-way relationship from Covid death to stock return, and 1 country has a one-way relationship from a stock return to Covid death.

This research implies that the effect of the COVID-19 pandemic, measured by the growth of cases and deaths, depends on some conditions in each country. Negative effects arise from various uncertainties in the market. The growth in cases and deaths that occurred had a significant negative impact on the stock indexes of several countries; this was due to the high uncertainty that would impact business continuity, productivity, and efficiency, decreased sales, revenues, and profits. Meanwhile, the positive influence in several countries was assessed due to the government's accuracy in taking steps and policies related to this pandemic (both on cases and deaths, even though the low fatality rate also became one of the reasons). Lockdowns & travel bans in some countries positively affect the stock market. The government's efforts, such as changes in interest rates and economic packages, positively impact the stock market. Interest rates will facilitate business operations, and economic packages will help people make consumption that will trigger economic activities and investment opportunities.

Practical implications for investors will depend on their risk profile. This study has shown the impact of the pandemic on the 30 countries with the highest number of cases. Each country's impact will differ depending on the conditions, policies, and the government's ability to deal with this pandemic. Investors need to analyze the impact of policies taken by the government in their respective countries on stock price movements so that investors can build and adjust their portfolios during some situations. On the other hand, policymakers must make proactive prevention and handling efforts against this pandemic. It can reduce various uncertainties that arise in the economy, especially the stock market.

This study contributed to research and observation of the disease COVID-19. However, this study has several limitations. This study did not divide the period of COVID-19 based on virus mutations. Second, this study did not consider the handling efforts made by the country's government in dealing with this pandemic. Third, this study did not include and analyze the impact of vaccination as an indicator of handling the pandemic on the stock market.

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APPENDIX 2

Sample List

No.	Country	Indices
1.	US	NASDAQ
2.	India	S&P BSE All Cap
3.	Brazil	BOVESPA
4.	France	CAC All Share
5.	UK	FTSE 250
	Russia	Incomplete data
6.	Germany	DAX
7.	Turkey	BIST All Share
8.	Italy	FTSE Italia All Share
9.	Spain	IBEX 35
10.	Argentina	S&P/BYMA Argentina General
	Iran	Not available in Investing
11.	Netherlands	AEX All Share
12.	Colombia	COLCAP
13.	Poland	WIG
14.	Indonesia	JKSE
15.	Mexico	S&P BMV IPC
16.	Japan	Topix Composite
	Ukraine	Incomplete data
17.	South Korea	KOSPI
18.	Vietnam	VN Index
19.	South Africa	South Africa Top 40
20.	Philippines	PHS All Share
	Israel	Incomplete data
21.	Czechia	PX
22.	Belgium	BEL 20
23.	Malaysia	KLCI
24.	Peru	S&P Lima General
25.	Australia	ASX All Ordinaries
26.	Canada	S&P/TSX
27.	Portugal	PSI 20
28.	Chile	S&P CLX IGPA
29.	Thailand	SET
30.	Switzerland	SMI

Source: Worldometer dan Investing

APPENDIX 2

Summary of Granger Causality Test

Country	Variable	Relationship
USA	CC	⇄
	CD	⇄
India	CC	⇄
	CD	⇄
Brazil	CC	⇄
	CD	⇄
France	CC	⇄
	CD	⇄
UK	CC	⇄
	CD	⇄
Germany	CC	⇄
	CD	⇄
Turkey	CC	⇄
	CD	⇄
Italy	CC	⇄
	CD	⇄
Spain	CC	⇄
	CD	⇄
Argentina	CC	⇄
	CD	⇄
Netherlands	CC	⇄
	CD	⇄
Colombia	CC	⇄
	CD	⇄
Poland	CC	←
	CD	⇄
Indonesia	CC	⇄
	CD	⇄
Mexico	CC	⇄
	CD	⇄
Japan	CC	←
	CD	⇄
South Korea	CC	No relationship
	CD	⇄
Vietnam	CC	⇄
	CD	←
South Africa	CC	⇄
	CD	⇄
Philippines	CC	⇄
	CD	→
Czechia	CC	⇄
	CD	⇄

Country	Variable	Relationship
Belgium	CC	⇄
	CD	⇄
Malaysia	CC	⇄
	CD	⇄
Peru	CC	No relationship
	CD	⇄
Australia	CC	⇄
	CD	⇄
Canada	CC	⇄
	CD	⇄
Portugal	CC	→
	CD	⇄
Chile	CC	⇄
	CD	⇄
Thailand	CC	⇄
	CD	⇄
Switzerland	CC	⇄
	CD	⇄

Note: ⇄ shows two-way relationship; → shows one-way relationship from COVID 19 to Return; ← shows one-way relationship from Return to COVID 19
Source: processed data