Stock_price_volatility_during_the_COVID-19_pandemi

By RAZAK ALKADRI

WORD COUNT	6155	TIME SUBMITTED	24-MAY-2023 12:33AM
		PAPER ID	99913686

“Stock price volatility during the COVID-19 pandemic: The GARCH model”

AUTHORS	Endri Endri [1] Widya Aipama A. Razak Laynita Sari Renil Septiano

ARTICLE INFO	Endri Endri, Widya Aipama, A. Razak, Laynita Sari and Renil Septiano (2021). Stock price volatility during the COVID-19 pandemic: The GARCH model. *Investment Management and Financial Innovations*, *18*(4), 12-20. doi:10.21511/imfi.18(4).2021.02
DOI	http://dx.doi.org/10.21511/imfi.18(4).2021.02
RELEASED ON	Monday, 04 October 2021
RECEIVED ON	Thursday, 19 August 2021
ACCEPTED ON	Monday, 20 September 2021

JOURNAL	"Investment Management and Financial Innovations"
ISSN PRINT	1810-4967
ISSN ONLINE	1812-9358
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
45	2	6

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Endri Endri (Indonesia), **Widya Aipama** (Indonesia), **A. Razak** (Indonesia), **Laynita Sari** (Indonesia), **Renil Septiano** (Indonesia)

STOCK PRICE VOLATILITY DURING THE COVID-19 PANDEMIC: THE GARCH MODEL

Abstract

This study examined the response of stock prices on the Indonesia Stock Exchange (IDX) to COVID-19 using an event study approach and the GARCH model. The research sample is the closing price of the Composite Stock Price Index (JCI) and companies that are members of LQ-45 in the 40-day period before the COVID-19 incident, 1 day during the COVID-19 incident (March 2, 2020) and 10 days after, January 6, 2020 – March 16, 2020. Empirical findings prove that abnormal returns react negatively to COVID-19, JCI volatility fluctuates widely during the COVID-19 event, and the GARCH(1,2) model can be used to assess volatility and predict stock abnormal returns in IDX in market conditions infected with COVID-19. The practical implication of the study's findings for investors is that the COVID-19 event caused stock price volatility, which affects abnormal returns. Therefore, to face the conditions of uncertainty and increased volatility in the future, several lines of risk management are needed in managing a stock portfolio. In addition, it also opens up opportunities for speculators to profit in an inefficient market environment. This study is based on the empirical literature currently being developed to investigate the phenomenon of stock price volatility behavior during COVID-19 on the IDX. The GARCH model used proves that during the COVID-19 pandemic, stock price volatility increases and leads to a decrease in abnormal returns. The empirical findings also validate the efficient market hypothesis theory related to the study of events and the theory of financial behavior related to uncertainty.

Keywords COVID-19, stock price volatility, event study, GARCH, abnormal return

JEL Classification E22, G11, G14

Received on: 19th of August, 2021
Accepted on: 20th of September, 2021
Published on: 4th of October, 2021

Endri Endri, Ph.D, Associate Professor, Faculty of Economics and Business, Universitas Mercu Buana, Indonesia. (Corresponding author)

Widya Aipama, Post Graduate Student, Faculty of Economics and Business, Universitas Mercu Buana, Indonesia.

A. Razak, Ph.D, Associate Professor, Politeknik Negeri Pontianak, Indonesia.

Laynita Sari, Lecturer, Sekolah Tinggi Ilmu Ekonomi KBP, Indonesia.

Renil Septiano, Assistant Professor, Sekolah Tinggi Ilmu Ekonomi KBP, Indonesia.

Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

The COVID-19 pandemic has not only infected many people, but has also caused the world economy to go into recession. According to the International Monetary Fund's (IMF) report, the world economy has experienced a drastic decline and is facing a crisis after around 95 percent of countries in the world experienced negative economic growth contractions. The IMF also reported that COVID-19 also caused the global economy to suffer a loss of US$12 trillion (IMF, 2020). The world's financial markets, especially the stock exchanges, have also been infected by COVID-19, since the announcement of positive cases in early 2020 caused securities prices to fall and volatility to become high. Especially for the stock market, there was a drastic decline, where the market value lost about 30% in a few weeks. COVID-19 has caused severe shocks in most stock markets, including Indonesia. For Indonesia, COVID-19 has caused negative economic growth of 2.19 percent, and the Composite Stock Price Index (JCI) was corrected by 5.09 percent in 2020. High JCI volatility continues to this day due to the rapid spread of COVID-19. High volatility indicates that stock prices are increasingly volatile.

Many previous studies have tested the impact of the COVID-19 event on stock price volatility, but conflicting empirical evidence is still found. Most of the empirical research findings confirm that stock market move-

http://dx.doi.org/10.21511/imfi.18(4).2021.02

ments decline due to cases of COVID-19 transmission (Rahman et al., 2021; Cao et al., 2020; Ahmar & del Val, 2020). Ashraf (2020) also found poor stock market performance in 64 countries due to being infected with COVID-19. The US stock market also corrected due to the increase in positive cases of COVID-19 (Alfaro et al., 2020). By using the event study method, several findings prove that during COVID-19, the global stock market experienced a decline (Heyden & Heyden, 2020; Liu et al., 2020a). Xu (2001) proved that the Canadian stock market experienced a decline as a result of an increase in confirmed COVID-19 cases.

Empirical findings that show a positive response to stock prices due to the COVID-19 event are proven (among others, Liu et al., 2020b; Brueckner & Vespignani, 2021; Yong et al., 2011). Liu et al. (2020b) found that the United States stock exchange (return) responded positively to COVID-19. Brueckner and Vespignani (2021) point out that the performance of the Australian stock exchange has improved due to the COVID-19 infection. Shahzad et al. (2001) show evidence of a time-varying and substantially intense impact of asymmetric volatility during COVID-19. Duttilo et al. (2001) revealed that the stock markets of European countries reacted differently to the COVID-19 events. For the most common risk measurements, volatility is usually used. Modeling uncertainty with volatility can evaluate a portfolio by considering two factors, namely investment opportunities and potential losses. Therefore, the measurement of volatility becomes an evaluation guide in determining investment decisions to assess assets and risks (Naik & Reddy, 2021). This study uses the event study method to measure the impact before and during the COVID-19 pandemic in Indonesia on volatility and abnormal returns on the IDX using the GARCH model.

1. LITERATURE REVIEW

Empirical research on how COVID-19 infects the stock market has recently increased significantly in various countries, including Indonesia. Many studies confirm that COVID-19 has caused stock market movements to decline sharply. Research involving many countries was carried out (among others, Khatatbeh et al., 2020; He et al., 2020; Alzyadati & Asfoura, 2021; Khan et al., 2020). Khatatbeh et al. (2020) empirically tested the direct reaction of eleven stock market indices of countries infected with COVID-19. The research findings prove that since the COVID-19 case was announced to the public, stock returns have become negative and have increased dramatically after COVID-19 spreads massively. Alzyadati and Asfoura (2001) identified the response of the Saudi Arabian stock exchange to the COVID-19 event. They concluded that stock price movements decreased dramatically after the growth of positive cases infected with COVID-19 increased during the pandemic.

Due to the weekly increase in the number of new COVID-19 cases, Khan et al. (2020) proved negative returns on stock exchanges of 16 countries, while He et al. (2020) proved that in the short term, stock exchanges in countries affected by COVID-19 show a decline in performance. The negative abnormal return observed during the period before and after the lock-down was proved by Alam et al. (2020). Topcu and Gulal (2020) reviewed the response of emerging market stock exchanges to COVID-19 for the period March 10, 2020 – April 30, 2020. The results show that COVID-19 has infected emerging market stock markets, which gradually declined and began to weaken in mid-2020. By region group, emerging markets in Asia are the highest, while emerging markets in Europe are the lowest.

Research in Indonesia, among others, was carried out by Herwany et al. (2021), Utomo and Hanggraeni (2021), and Ryandono et al. (2021). Herwany et al. (2001) tested changes in abnormal returns due to COVID-19 infection on sectoral stock indices listed on the IDX. Abnormal returns in the event study method is calculated in the period of 30 days before to 30 days after. The test results show that the property and real estate, construction, and financial sectors experienced a decline in abnormal returns (AR), while the infrastructure, utilities, and transportation sectors with AR tended to be constant, and other sectors experienced an increase in AR. Judging from the cumulative abnormal return value, the sectors most affected are finance, trade, services, and investment. Mining and consumer goods sectors did not have much influence, while other sectors showed negative sentiment. Overall, COVID-19 has caused stock

http://dx.doi.org/10.21511/imfi.18(4).2021.02

prices to drop drastically, where the cumulative value is negative from the average AR. Utomo and Hanggraeni (2021) studied the impact of COVID-19 on the daily stock returns of 272 companies listed on the IDX and concluded that stock prices declined during the pandemic. Ryandono et al. (2021) also prove the negative impact on Indonesian Islamic stocks.

Volatility is a barometer of measuring the risk of facing uncertainty that investors consider when purchasing financial assets. Risk considerations are the main parameter in making investment portfolio decisions (Suryadi et al., 2021). Stock price volatility is a systematic risk faced by investors holding market portfolios (Nurhayati et al., 2021a). Stock market volatility tends to increase drastically if there are important events that have a broad economic and financial impact, such as the 1997/98 Asian economic crisis, and most recently the health crisis due to COVID-19. Although the causes of stock market volatility are not well understood, higher stock market volatility can lead to pessimism about future economic developments (Razak et al., 2020). Schwert (1989) states that stock market volatility indicates that future cash flows and discount rates are uncertain. Mazur et al. (2020) found that extreme asymmetric volatility is inversely related to stock returns.

Studies examining stock price volatility due to the impact of COVID-19, among others, were carried out by Baker et al. (2020), Zaremba et al. (2020), Albulescu (2020), Sharma (2020), and Engelhardt et al. (2020). Baker et al. (2020) proved that stock price volatility increased after being infected with COVID-19. This finding is also supported by Albulescu (2020) and Zaremba et al. (2020) who conclude that stock price volatility has increased quite significantly. Bai et al. (2020) prove the persistent effect of COVID-19 on stock volatility. Sharma (2020) also proves that stock price volatility is infected by COVID-19, but the effect is different for each country, where the stock market belonging to the high-income country group initially overreacts and bounces back faster than the low-income country group. Engelhardt et al. (2020) revealed that stock price volatility trends in response to COVID-19 depend on confidence: low volatility occurs in high confidence countries. Stock volatility testing uses the traditional GARCH model with indicators based on stock price behavior and past volatility (Endri et al., 2020; Gokcan, 2000; Emenogu et al., 2020). The GARCH model is also used by Fakhfekh et al. (2021) to analyze dynamics of the Tunisian sectoral stock market index volatility during COVID-19.

Yong et al. (2021) apply various GARCH models, which consist of the GARCH, PGARCH, EGARCH, TGARCH and GARCH-M standards, to test return volatility on the Malaysian and Singapore stock exchanges. The event period is divided into two, namely before and during the COVID-19 pandemic, using daily closing price data from the stock market index between July 1, 2019 to August 31, 2020. Empirical findings prove that there is persistence in both stock markets, and the persistence has decreased during the pandemic. Empirical research evidence suggests that after COVID-19, volatility persistence increases across all series.

2. FRAMEWORK AND HYPOTHESES DEVELOPMENT

This paper introduces the GARCH model to forecast volatility and abnormal returns during COVID-19. The framework of this study can be stated in the diagram presented in Figure 1.

Hypotheses are as follows:

H1: Abnormal returns react negatively to COVID-19 events.

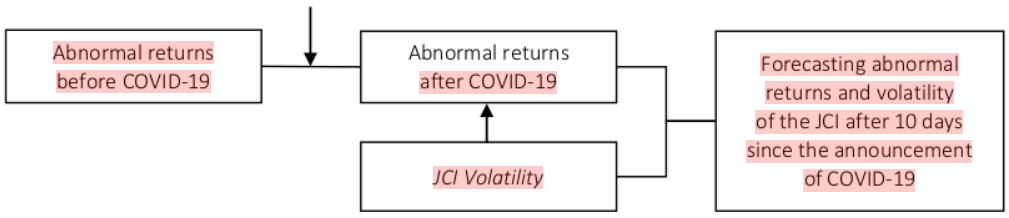

Figure 1. Framework

http://dx.doi.org/10.21511/imfi.18(4).2021.02

H2: Stock price index volatility has an impact on stock abnormal returns after the COVID-19 incident.

3. METHOD

3.1. Population and sample

The population in this study is the daily closing price of LQ45 shares and the Composite Stock Price Index (JCI). The sample of this study is the closing price of the JCI and companies that are members of LQ45 in the period of 40 days before the COVID-19 incident, 1 day during the COVID-19 incident (March 2, 2020) and 10 days after that, January 6, 2020 – March 16, 2020. LQ45 shares selected as the research sample based on the following criteria:

1. The companies are consecutively incorporated in the LQ45 share list during the observation period, namely August – February 2020 and February – July 2020. There are 42 companies that meet these criteria.

2. Do not perform corporate actions during the window period. Of the 42 companies, four companies conduct corporate actions, so the sample for this study is 38 companies.

3.2. Analysis models and variables

Hypothesis testing in this study uses a quantitative approach using the event study method and the GARCH model. The stages of the research carried out started from data collection and data processing, calculation and analysis of abnormal returns and JCI volatility, as well as forecasting abnormal stock returns and JCI price volatility. The research findings can provide both theoretical and practical implications. The following is a formula for calculating stock price volatility, abnormal returns and the GARCH model.

$$PV = \sqrt{\frac{1}{n}\sum \ln\left(\frac{H_t}{L_t}\right)^2}, \quad (1)$$

where PV – share price volatility, H_t – the highest share price in period t, L_t – the lowest stock price in period t, and n – the number of observations.

Abnormal Stock Return:

$$AR_{it} = R_i - E\left(R_i\right), \quad (2)$$

where AR_{it} – abnormal return for stock i on day t, R_i – actual return of stock i on day t, $E\left(R_i\right)$ – expected return of stock i on day t.

GARCH Model:

$$\sigma 2_t = \alpha_0 + \sum ai\varepsilon 2_{t-1} + \\ + \sum \lambda 1\sigma q_{t-1}, \quad (3)$$

where $\sigma 2_t$ – the residual variant at time t, α_0 – residual variant, $ai\varepsilon 2_{t-1}$ – residual volatility of the previous period (ARCH component), and $\lambda 1\sigma q_{t-1}$ – the residual variant in the previous period (GARCH component).

3.3. Event window and samples

The COVID-19 was announced on March 2, 2020. This was one of the variables that were chosen as the period event. The event window used in this study is 61 days, of which 30 days before the COVID-19 announcement, 30 days after the COVID-19 announcement and 1 event date on the COVID-19 announcement.

The observation period T_0–T_1 is the estimation window, T_1–T_2 is the event window, and T_2–T_3 is the post-event period.

Figure 2. Observation period

4. RESULTS

The Indonesian stock exchange's reaction to the COVID-19 event is indicated by significant abnormal returns during the event period. The results of measuring the average abnormal return are summarized in Table 1. The daily AAR stock return value can be positive or negative. A indicates that the average actual return of stocks during the event period is greater than the average return expectation predicted by investors (Suryanto, 2015). The AAR during the event period shows 61.90% or 13 trading days, which are positive, and 38.10% or 8 trading days, which are negative.

Table 1. Calculation of the daily AAR of shares during the observation period

Before the Event		Event		After the Event	
Days to–	AAR	Days to–	AAR	Days to–	AAR
t–10	–0.00836	*t* 0	0.363377	*t*+1	0.00563
t–9	0.03797			*t*+2	–0.02078
t–8	0.01583			*t*+3	–0.00492
t–7	0.00631			*t*+4	0.42429
t–6	–0.01828			*t*+5	0.60157
t–5	–0.02409			*t*+6	0.22986
t–4	0.00771			*t*+7	–0.05304
t–3	–0.02559			*t*+8	–0.05724
t–2	0.21252			*t*+9	0.19960
t–1	0.18855			*t*+10	0.13608

Table 2 shows that abnormal return testing during COVID-19 has been shown to significantly reduce Accumulative Abnormal Returns (AAR). The COVID-19 pandemic has made the Indonesian stock market corrected quite deeply. COVID-19 has resulted in negative economic growth and many companies have experienced declining revenues and profits, so many investors take the decision to sell due to high uncertainty in the future.

Table 2. Hypothesis testing results using the *t*test

Measurement	20	Sig (2-tailed)	0.027
Mean	0.0927	Std. Deviation	0.17351

To estimate the GARCH model, it is first necessary to determine the appropriate ARCH and GARCH pairs using the best model selection test based on the Akaike Information Criterion (AIC) and Schwartz Criterion (SC) test tools. Based on the test results, the GARCH (1,2) model was chosen to estimate stock price volatility. The results of the GARCH model (1,2) volatility test are shown in Table 3.

Table 3 Abnormal return results

Var.	Coeff.	Std. Er.	*z*-Stat.	Prob.
C	0.0058	0.0057	1.0225	0.3065
Volatility	1.05770	0.3315	3.1902	0.0014

The estimation results on proving the effect of volatility on abnormal returns using the GARCH (1,2) model are written in the following equation:

$$Abnormal\ Return = \\ = 0.0058 + 1.0577 Volatility. \quad (4)$$

The estimation results for the volatility measured by variance and residuals from the GARCH (1,2) model are shown in Table 4.

Table 4 Volatility results

Var.	Coeff.	Std. Err.	*z*-Stat.	Prob.
C	2.5400	0.0002	0.1047	0.9166
RESID(–1)^2	1.7293	0.8288	2.0865	0.0369
GARCH(–1)	0.1076	0.0873	1.2322	0.2179

From Table 4, the test estimation results from the GARCH (1,2) model can be written in the form of an equation as follows:

$$\sigma 2t = 2.5400 + 1.7293 \varepsilon 2_{t-1} + \\ + 0.10876 \sigma 2_{t-1}. \quad (5)$$

From the GARCH(1,2) model, estimation equation produces a constant value of 2.5400. The ARCH coefficient is 1.7293, indicating a fluctuating change in volatility that causes stock market movements to experience an unstable tendency. The GARCH(1,2) coefficient value of 0.10876 indicates that for every movement that occurs in a variable, it shows that the variable quickly returns to a stable condition.

Testing the R^2 test to measure how much the independent variable's contribution can explain the variations that occur in the dependent variable changes is shown in the results of the GARCH model R^2 test (1,2) (Table 5).

The value of the R^2 termination coefficient of the GARCH model (1,2) shows the adjusted R^2 value of 0.0679, which indicates the ability of the independent variable; JCI volatility can explain the correla-

http://dx.doi.org/10.21511/imfi.18(4).2021.02

Table 5. Result of the determination coefficient test (*R*2 Test) of the GARCH (1,2) model

Measurement	Coeff.	Measurement	Coeff.
R^2	0.0679	Mean dep var	0.0542
Adjusted R^2	0.0489	S.D. dep var	0.1294
SER	0.1262	Akaike info crit	–2.0104
SSR	0.7813	Schwarz crit	–1.7831
Log likelihood	57.2665	Hannan–Quinn criterion	–1.9236
Durbin–Watson stat.	1.1592		

Table 6. T-statistical test results

Variable	Probability	Coefficient	Std. Error
JCI price volatility	0.0012	3.380048	0.9822

tion of data variations of 67.9%, while the remaining 32.1% (100% – 67.9% = 32.1%) is influenced by other factors outside the model. Statistical testing The t-test was conducted to prove the influence of the independent variables individually on the dependent variable. This test is based on a comparison between T-count with a 5% confidence degree. If the significance of T-count < 5%, then each explanatory variable affects the dependent variable, or vice versa, the GARCH model test (1,2) shows the dependent variable affects the independent variable.

The t-test statistic test concluded that the volatility of the JCI on abnormal returns has a probability (0.0012) < 5% with a coefficient value of 3.380048, so that the volatility of the JCI with abnormal returns has a positive effect.

5. DISCUSSION

The results of the event study test found that negative abnormal returns did not appear on *t*0 or the event date. This means the capital market does not react directly to government announcements about positive COVID-19 patients. Abnormal returns begin to appear when *t*2 and *t*3 show investors who are waiting and see, namely there are actions taken by investors to temporarily move their assets to safe heaven (safer instruments such as deposits and others). Negative and significant abnormal returns reappear at *t*7 and *t*8 or the seventh and eighth day after the event. This is because investors are still worried about the COVID-19 pandemic, which continues to claim victims, in addition to affecting several businesses of issuers.

The volatility of the JCI has an impact on abnormal returns, with the increasing risk of higher stock prices causing abnormal returns in IDX to experience pressure. The study by Herwany et al. (2021) also gives the same result that the COVID-19 pandemic has had a negative impact on the AR stocks in IDX. Nurhayati et al. (2021b) prove that COVID-19 has caused stocks to underperform. Khatatbeh et al. (2020) provide evidence of a lack of reaction to pandemic announcements, but significant CAR with a delayed stock market response. Baek et al. (2020) also prove that COVID-19 has had a significant impact on US stock market volatility. A different finding was revealed by Apergis and Apergis (2020) that COVID-19 had a positive effect on the volatility of stock market returns in China.

The increased volatility of the JCI and negative abnormal returns were evident in the Indonesian stock market based on the observation period after the 11th day since the COVID-19 incident. The GARCH (1,2) model can be used for forecasting in this study (Endri et al., 2020). This finding supports the study by Chaudhary et al. (2020), which also applies the GARCH model to the stock exchanges of the top 10 countries based on GDP that experience negative average daily returns. The volatility of the stock market indices in response to the key events of COVID-19 has led to much higher volatility than normal, and also indicates a bearish trend in the market that occurred in the second quarter of the COVID-19 period. In GARCH modeling with COVID-19 as an exogenous variance regressor, it was found that all market indices were infected. The study by Bai et al. (2021) with the developed GARCH model proves that within 24 months, COVID-19

has consistently had an impact on increasing volatility in most global stock exchanges. Gherghina et al. (2021), using the GARCH (1,1) model, prove that the daily return volatility in the Romanian stock market increases. Bora and Basistha (2021) using the GARCH model also prove that during COVID-19, stock market volatility in India increases.

CONCLUSION

COVID-19 has infected most of the world's stock markets, including Indonesia, as evidenced by the high volatility that has an impact on the decline in stock prices, with many investors suffering losses. In the current state of uncertainty, research related to the volatility of stock price movements has begun to emerge and the debate about these results has become an interesting discussion. This study provides theoretical and empirical benefits of testing the efficient market hypothesis in the context of Indonesia, which is still an emerging stock market, to test an event originating from the COVID-19 outbreak by measuring stock price volatility using the GARCH model. The test results prove that COVID-19 has made stock prices drop drastically. Investors responded directly to COVID-19 by selling their shares so that abnormal returns became negative. JCI volatility has been shown to have a unidirectional relationship with abnormal returns during the COVID-19 period, meaning that if JCI volatility increases, abnormal returns will increase. The GARCH model can be used to assess volatility and predict abnormal returns on Indonesian stocks when the COVID-19 incident occurs. The model that can be used is GARCH (1,2). The empirical findings of the study have implications related to the possibility that the crisis in the stock market caused by the COVID-19 pandemic outbreak in the context of market inefficiency opens up opportunities for speculators to profit.

AUTHOR CONTRIBUTIONS

Conceptualization: Endri Endri, Widya Aipama.
Data curation: A. Razak.
Formal analysis: Endri Endri, Renil Septiano.
Funding acquisition: Laynita Sari.
Investigation: A. Razak, Laynita Sari, Renil Septiano.
Methodology: Endri Endri, Widya Aipama.
Project administration: Renil Septiano.
Resources: A. Razak, Laynita Sari.
Software: Renil Septiano.
Supervision: Laynita Sari.
Validation: Endri Endri.
Visualization: Widya Aipama, A. Razak.
Writing – original draft: Widya Aipama.
Writing – review & editing: Endri Endri.

REFERENCES

1. Ahmar, A. S., & Del Val, E. B. (2020). SutteARIMA: Short-term forecasting method, a case: Covid-19 and stock market in Spain. *Science of the Total Environment, 729,* 138883.
2. Alam, M., Alam, S., & Chavali, K. (2020). Stock Market Response during COVID-19 Lockdown Period in India: An Event Study. *Journal of Asian Finance, Economics, and Business, 7*(7), 131-137. https://doi.org/10.13106/jafeb.2020.vol7.no7.131
3. Albulescu, C. T. (2020). COVID-19 and the United States financial markets' volatility. *Finance Research Letters,* 101699. https://doi.org/10.1016/j.frl.2020.101699
4. Alfaro, L., Chari, A., Greenland, A. N., & Schott, P. K. (2020). *Aggregate and firm-level stock returns during pandemics in real time, CEPR Covid Economics Review* (NBER Working Paper No. w26950). Retrieved from https://ssrn.com/abstract=3569414
5. Alzyadati, J. M., & Asfoura, E. (2021). The Effect of COVID-19

http://dx.doi.org/10.21511/imfi.18(4).2021.02

Pandemic on Stock Market: An Empirical Study in Saudi Arabia. *Journal of Asian Finance, Economics, and Business, 8*(5), 913-921. https://doi.org/10.13106/jafeb.2021.vol8.no5.0913

6. Apergis, N., & Apergis, E. (2020). The role of Covid-19 for Chinese stock returns: evidence from a GARCHX model. *Asia-Pacific Journal of Accounting & Economics*. https://doi.org/10.1080/16081625.2020.1816185

7. Ashraf, B. N. (2020). Stock markets' reaction to COVID-19: cases or fatalities. *Research International Business Finance, 54,* 101249. https://doi.org/10.1016/j.ribaf.2020.101249

8. Baek, S., Mohanty, S. K., & Glambosky, M. (2020). COVID-19 and stock market volatility: An industry level analysis. *Finance Research Letters, 37,* 101748. https://doi.org/10.1016/j.frl.2020.101748

9. Bai, L., Wei, Y., Wei, G., Li, X., & Zhang, S. (2021). Infectious disease pandemic and permanent volatility of international stock markets: A long-term perspective. *Finance Research Letters, 40,* 101709. https://doi.org/10.1016/j.frl.2020.101709

10. Baker, S. R., Bloom, N., Davis, S. J., Kost, K. J., Sammon, M. C., & Viratyosin, T. (2020). *The unprecedented stock market impact of COVID-19* (Working Paper). Massachusetts: National Bureau of Economic Research. Retrieved from https://www.nber.org/system/files/working_papers/w26945/w26945.pdf

11. Bora, D., & Basistha, D. (2021). The outbreak of COVID-19 pandemic and its impact on stock market volatility: Evidence from a worst-affected economy. *Journal of Public Affairs,* e2623. https://doi.org/10.1002/pa.2623

12. Brueckner, M., & Vespignani, J. (2021). COVID-19 Infections and the Performance of the Stock Market: An Empirical Analysis for Australia. *Economic Papers*. https://doi.org/10.1111/1759-3441.12318

13. Cao, K. H., Li, Q., Liu, Y., & Woo, C. K. (2020). Covid-19's adverse effects on a stock market index. *Applied Economics Letters,* 1-5. https://doi.org/10.1080/13504851.2020.1803481

14. Chaudhary, R., Bakhshi, P., & Gupta, H. (2020). Volatility in International Stock Markets: An Empirical Study during COVID-19. *Journal of Risk and Financial Management, 13*(9), 208. https://doi.org/10.3390/jrfm13090208

15. Duttilo, P., Gattone, S. A., & Di Battista, T. (2020). Volatility Modeling: An Overview of Equity Markets in the Euro Area during COVID-19 Pandemic. *Mathematics, 9,* 1212. https://doi.org/10.3390/math9111212

16. Emenogu, N. G., Adenomon, M. O., & Nweze, N. O. (2020). On the volatility of daily stock returns of total Nigeria Plc: Evidence from GARCH models, value-at-risk and backtesting. *Financial Innovation, 6,* 18. https://doi.org/10.1186/s40854-020-00178-1

17. Endri, E., Abidin, Z., Simanjuntak, P., T., & Nurhayati, I. (2020). Indonesian Stock Market Volatility: GARCH Model. *Montenegrin Journal of Economics, 16*(2), 7-17. https://doi.org/10.14254/1800-5845/2020.16-2.1

18. Engelhardt, N., Krause, M., Neukirchen, D., & Posch, P. N. (2021). Trust and stock market volatility during the COVID-19 crisis. *Finance Research Letters, 38,* 101873. https://doi.org/10.1016/j.frl.2020.101873

19. Fakhfekh, M., Jeribi, A., & Salem, M. B. (2021). Volatility dynamics of the Tunisian stock market before and during the COVID-19 outbreak: Evidence from the GARCH family models. *International Journal of Finance & Economics,* 1-14. https://doi.org/10.1002/ijfe.2499

20. Gherghina, S. C., Armeanu, D. S., & Joldes, C.C. (2021). COVID-19 Pandemic and Romanian Stock Market Volatility: A GARCH Approach. *Journal of Risk and Financial Management, 14,* 341. https://doi.org/10.3390/jrfm14080341

21. Gokcan, S. (2000). Forecasting volatility of emerging stock markets: Linear versus non-linear GARCH models. *Journal of Forecasting, 19*(6), 499-504. http://dx.doi.org/10.1002/1099-131X(200011)19:6%3C499::AID-FOR745%3E3.0.CO;2-P

22. He, Q., Liu, J., Wang, S., & Yu, J. (2020). The impact of COVID-19 on stock markets. *Economic and Political Studies, 8*(3), 275-288. https://doi.org/10.1080/20954816.2020.1757570

23. Herwany, A., Febrian, E., Anwar, M., & Gunardi, A. (2021). The Influence of the COVID-19 Pandemic on Stock Market Returns in Indonesia Stock Exchange. *Journal of Asian Finance, Economics, and Business, 8*(3), 39-47. https://doi.org/10.13106/jafeb.2021.vol8.no3.0039

24. Heyden, K. J., & Heyden, T. (2020). Market reactions to the arrival and containment of COVID-19: an event study. *Finance Research Letters.* Retrieved from https://ssrn.com/abstract=3587497

25. International Monetary Fund. (2020). *A crisis like no other, an uncertain recovery*. Retrieved from https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020

26. Khan, K., Zhao, H., Zhang, H., Yang, H., Shah, M. H., & Jahanger, A. (2020). The impact of COVID-19 pandemic on stock markets: An empirical analysis of world major stock indices. *Journal of Asian Finance, Economics and Business, 7*(7), 463-474. https://doi.org/10.13106/jafeb.2020.vol7.no7.463

27. Khatatbeh, I. N., Hani, M. B., & Abu-Alfoul, M. N. (2020). The Impact of COVID-19 Pandemic on Global Stock Markets: An Event Study. *International Journal of Economics and Business Administration Volume, 8*(4), 505-514. https://doi.org/10.35808/ijeba/602

28. Liu, H., Manzoor, A., Wang, C., Zhang, L., & Manzoor, Z. (2020a). The COVID-19 Outbreak and affected countries stock markets response. *International Journal Environmental Research and Public Health, 17*(8), 2800. https://doi.org/10.3390/ijerph17082800

29. Liu, L., Wang, E. Z., & Lee, C. C. (2020b). Impact of the COVID-19 pandemic on the crude oil and stock markets in the US: A time-varying analysis. *Energy Research Letters, 1*(1), 13154. https://doi.org/10.46557/001c.13154

30. Mazur, M., Dang, M., & Vega, M. (2020). Covid-19 and the March 2020 stock market crash. Evidence from S&P1500. *Finance Research Letters, (March),* 1-8. https://doi.org/10.1016/j.frl.2020.101690

31. Naik, M. S., & Reddy, Y. V. (2021). India VIX and Forecasting Ability of Symmetric and Asymmetric GARCH Models. *Asian Economic and Financial Review, 11*(3), 252-262. https://doi.org/10.18488/journal.aefr.2021.113.252.262

32. Nurhayati, I., Endri, E., Aminda, R. S., & Muniroh, L. (2021a). Impact of COVID-19 on Performance Evaluation Large Market Capitalization Stocks and Open Innovation. *Journal of Open Innovation: Technology, Market, and Complexity, 7*(1), 56. https://doi.org/10.3390/joitmc7010056

33. Nurhayati, I., Endri, E., Suharti, T., Aminda, R. S., & Muniroh, L. (2021b). The impact of COVID-19 on formation and evaluation of portfolio performance: A case of Indonesia. *Investment Management and Financial Innovations, 18*(3), 63-73. https://doi.org/10.21511/imfi.18(3).2021.06

34. Rahman, M. L., Amin, A., & Al Mamun, M. A. (2021). The COVID-19 outbreak and stock market reactions: Evidence from Australia. *Finance Research Letters, 38,* 101832. https://doi.org/10.1016/j.frl.2020.101832

35. Razak, A., Nurfitriana, F. V., Wana, D., Ramli, R., Umar, I., & Endri, E. (2020). The Effects of Financial Performance on Stock Returns Evidence of Machine and Heavy Equipment Companies in Indonesia. *Research in World Economy, 11*(6), 131-138. https://doi.org/10.5430/rwe.v11n6p131

36. Ryandono, M. N., Muafi, M., & Guritno, A. (2021). Sharia Stock Reaction Against COVID-19 Pandemic: Evidence from Indonesian Capital Markets. *Journal of Asian Finance, Economics and Business, 8*(2), 697-710. https://doi.org/10.13106/jafeb.2021.vol8.no2.0697

37. Schwert, G. W. (1989). Business Cycles, Financial Crises, and Stock Volatility. *Carnegie-Rochester Conference Series on Public Policy, 31*(0), 83-126.

38. Shahzad, S. J. H., Naeem, M. A., Peng, Z., & Bouri, E. (2021). Asymmetric volatility spillover among Chinese sectors during COVID-19. *International Review of Financial Analysis, 75,* 101754. https://doi.org/10.1016/j.irfa.2021.101754

39. Sharma, S.S. (2020) A note on the Asian market volatility during the COVID-19 pandemic. *Asian Economic Letters.* https://doi.org/10.46557/001c.17661

40. Suryadi, S., Endri, E., & Yasid, M. (2021). Risk and Return of Islamic and Conventional Indices on the Indonesia Stock Exchange. *Journal of Asian Finance, Economics, and Business, 8*(3), 23-30. https://doi.org/10.13106/jafeb.2021.vol8.no3.0023

41. Suryanto. (2015). Analysis of Abnormal Return Before and After the Announcement of Investment Grade Indonesia. *International Journal of Business and Management Review, 3*(1), 11-23.

42. Topcu, M., & Gulal, O. S. (2020). The impact of COVID-19 on emerging stock markets. *Finance Research Letters, 36,* 101691. https://doi.org/10.1016/j.frl.2020.101691

43. Xu, L. (2021). Stock Return and the COVID-19 pandemic: Evidence from Canada and the US. *Finance Research Letters, 38,* 101872. https://doi.org/10.1016/j.frl.2020.101872

44. Yong, J. N. C., Ziaei, S. M., & Szulczyk, K. R. (2021). The Impact of Covid-19 Pandemic on Stock Market Return Volatility: Evidence from Malaysia and Singapore. *Asian Economic and Financial Review, 11*(3), 191-204. https://doi.org/10.18488/journal.aefr.2021.113.191.204

45. Zaremba, A., Kizys, R., Aharon, D. Y., & Demir, E. (2020). Infected markets: Novel coronavirus, government interventions, and stock return volatility around the globe. *Finance Research Letters, 35,* 101597. https://doi.org/10.1016/j.frl.2020.101597

http://dx.doi.org/10.21511/imfi.18(4).2021.02

Stock_price_volatility_during_the_COVID-19_pandemi

ORIGINALITY REPORT

38%
SIMILARITY INDEX

PRIMARY SOURCES

1	pdfs.semanticscholar.org Internet	1621 words — 36%
2	www.businessperspectives.org Internet	100 words — 2%

EXCLUDE QUOTES	OFF	EXCLUDE SOURCES	< 2%
EXCLUDE BIBLIOGRAPHY	ON	EXCLUDE MATCHES	< 20 WORDS