
CAPITAL MARKET REACTIONS TO THE COVID 19 PANDEMIC

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ABSTRACT

This study aims to determine and analyze the capital market's reaction to the Covid 19 Pandemic in biotechnology companies listed on the Nasdaq. The method used in this study uses a type of quantitative method. This study uses an event study. The sampling method in this study was carried out using a non-probability random sampling approach. The announcement of the COVID-19 pandemic by the WHO and the commitment to produce a COVID-19 vaccine have had a significant impact on abnormal stock returns and trading volume activities of biotech companies listed on the NASDAQ stock market. However, there is no significant effect on the liquidity of biotech company stocks. In addition, the announcement of the COVID-19 pandemic also affected the volatility of biotech company stocks. In contrast, the announcement of a commitment to producing a COVID-19 vaccine did not significantly impact the volatility of biotech company stocks. So, it shows that the NASDAQ stock market reacts sensitively to announcements about the COVID-19 pandemic and efforts to produce COVID-19 vaccines by biotech companies. This shows that the COVID-19 pandemic has significantly impacted the stock market, especially in the biotechnology sector. The event study approach is used to test the market with a semi-strong form of market efficiency by demonstrating that the stock price reflects all published information (all publicly available information).

Keywords: biotechnology, capital, covid-19, stocks, vaccines.

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INTRODUCTION

The World Health Organization (WHO), or the world health organization, on March 11, 2020, declared the outbreak of the new coronavirus COVID 19 a global pandemic (Sohrabi et al., 2020). At the press conference, WHO Director-General Dr. Tedros Adhanom Ghebreyesus stated that over the past two weeks, the number of cases outside China has increased 13-fold, and there has been a three-fold increase in cases in several countries. WHO asks the countries in the world to take precautionary measures against the virus (Cucinotta & Vanelli, 2020).

Protecting communities and health systems from spreading virus outbreaks requires widespread isolation, containment, and closure measures. The increase in COVID-19 cases in China resulted in the closure of factories in the Wuhan area and the dismissal of many workers aimed at reducing the harmful effects of the virus. This impacts economic losses in China (Ozdurak et al., 2020).

Apart from China, a high number of cases of COVID-19 have been reported worldwide, especially in the United States (US), Italy, and Spain. Every country worldwide has imposed lockdowns and social restrictions to minimize the transmission of this deadly virus. The social restriction policy adopted has hampered the economic activities of the global community (Indrayono, 2021).

The global economy is projected to contract sharply by 3% in 2020 as a result of the pandemic. Data from the Organization for Economic Co-operation and Development (OECD) (Ozdurak et al., 2020) states that the world economy is facing its lowest growth rate since 2009 due to the coronavirus outbreak.

Figure 1.1 shows stock indices in several countries dropping to their lowest level on March 23, 2020. Charts of the main stock indices of the US, UK, Germany, France, Russia, Japan, Hong Kong, China, Singapore, Australia, India, South Korea, Brazil, and Mexico for the period January 1 to mid-May 2020, when the COVID 19 pandemic was still occurring throughout the world (Indrayono, 2021).



Figure 1. Stock Indices in several Countries During the Financial Crisis (Indrayono, 2021)

The consequence of the pandemic event was increased panic and market downturns. The situation is deteriorating due to the spread of the disease beyond geographical boundaries between countries and continents. Returns on relatively safe commodities, such as gold (albeit the most volatile), turned negative as the coronavirus spread across the US (Indrayono, 2021).

Consumer and corporate panic in all markets disrupts consumption habits and creates anomalies. The decline in global stock indices showed the global financial market response. Decisions made by investors on the spread of bad news show financial contagion like the contagion phenomenon. Adverse effects on the financial sector are the reaction of several sectors and regions to an economic shock. The previous global financial crisis showed that the financial sector was sensitive to shocks (Tiryaki & Ekin, 2015) (Ozdurak et al., 2020).

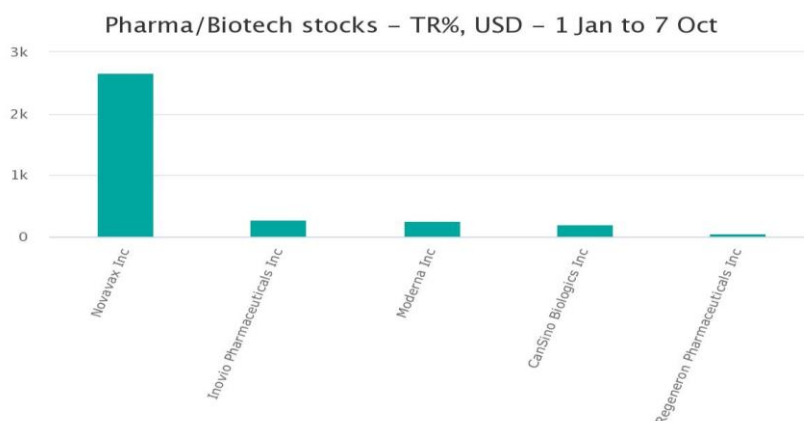
Panyagometh, K. (2020) shows that most of the securities in the Thai stock market have been affected by the pandemic, as reflected in the abnormal returns and stock volatility compared to the period before the COVID-19 outbreak. The same research results are also shown on the Turkish stock

exchange (GÖKER et al., 2020), China (Al-Awadhi et al., 2020): (Liu et al., 2020), Canada, and the United States. (Ozdurak et al., 2020) produced a similar study and adopted the EGARCH method to examine the volatility that varies over time for changes in cases of transmission of COVID-19.

Most countries impose movement restrictions (lockdowns) to contain the spread of the disease. This policy has a broad economic impact affecting trading volume activities. The COVID-19 pandemic has far-reaching economic consequences due to the highly contagious nature of the virus. At the start of the pandemic, the financial impact arose mainly due to the disruption of manufacturing issues on the supply side (Zaremba et al., 2021) (Khan et al., 2020).

Market volatility is also influenced by the global pharmaceutical and biotechnology sector related to health crises such as infectious diseases due to the COVID-19 pandemic. Therefore, it is important to measure the influence of market behavior and the stock performance of companies operating in the pharmaceutical and biotechnology sector. In the period following the announcement of the pandemic, companies in the pharmaceutical and biotechnology sectors, such as GlaxoSmithKline, Vir Biotechnology, Pfizer Inc., and BiNTech, decided to invest in the development of coronavirus drugs, including the creation of a COVID-19 vaccine (Ozdurak et al., 2020).

The latest data from Eikon, 2020 reveals that the market value of pharmaceutical and biotechnology stocks increased when President Trump was infected with COVID-19. Throughout the pandemic, most of the stock markets involved in vaccines or drugs for COVID-19 were still ahead in terms of stock returns. Figure 2. shows the five best-performing pharmaceutical and biotechnology stocks since the pandemic's start. Several biotechnology companies have benefited from the COVID-19 outbreak, such as Novavax, Moderna, Inovio Pharmaceuticals, and Gilead Sciences. Table 1. shows several stocks of pharmaceutical and biotechnology companies that have increased their stock performance during the pandemic.



**Figure 2. Stock Market for Pharmaceutical/Biotech Companies
 for the period January 1 - October 7, 2020**

Source: Eikon, 2020

Description: TR%: Total Revenue

Table 1. Market Value of Pharmaceutical/Biotechnology Company Shares

Pharma & Biotech Stock Market	TR%, USD
Novavax Inc	2663.8%
Inovio Pharmaceuticals Inc	281.2%
Moderna Inc	270.0%
CanSino Biologics Inc	198.4%
Regeneron Pharmaceuticals Inc	57.6%
Eli Lilly and Co	15.0%
AstraZeneca PLC	8.3%
Johnson & Johnson	3.4%
Gilead Sciences Inc	-0.4%
Pfizer Inc	-4.1%
GlaxoSmithKline PLC	-20.0%

Source: Eikon, 2020

Description: TR%: Total Revenue

Research shows that the COVID-19 pandemic has affected US biotechnology companies such as Pfizer and Moderna (Piñeiro-Chousa et al., 2022). The results show that the two companies' volatility changes from one period to the next. During the pre-COVID period, corporate volatility was higher than the effect of market volatility on the previous day, but during the COVID-19 period, the opposite was true. This research is in line with the study of Baker et al. (2020). This change could be caused by trading volume activity when there was a policy limiting individual mobility during COVID-19.

The current world economic turmoil is a secondary impact of the global health crisis caused by the COVID-19 pandemic. Obstacles in supply chains and consumer demand hamper national and global economic growth. The withdrawal of investor funds by selling shares from the stock exchange, causing the stock market index to drop drastically compared to the value of its closing price on the same exchange at the end of 2019. Data shows that world stock exchanges experienced a decline between December 31, 2019, and March 23, 2020, four days after the world health organization (WHO) declared the COVID-19 pandemic (Indrayono, 2021). A financial crisis in the stock market is considered to have occurred when the index declined by more than 20% in developing countries and 35% in emerging markets (Patel & Sarkar, 1998) (Indrayono, 2021). This phenomenon last occurred during the 2008-2009 global financial crisis. It originated on Wall Street and harmed investors, banks, and economies worldwide (Indrayono, 2021).

Research shows that the COVID-19 outbreak has negatively affected China's traditional industries, such as transportation, mining, electricity & heating, and the environment (Liu et al., 2020). However, the research results also show opportunities for developing high-tech industries such as manufacturing, information technology, education, and health that are unaffected significantly. The results align with research (Sayed & Eledum, 2021) on the average stock return for 21 industrial groups in Saudi Arabia. Three industry groups involving telecommunications, software, and healthcare moved from negative to positive, while food and staples retail, pharmaceuticals, and Biotechnology remained positive before and after the COVID-19 pandemic.

WHO and its partners are committed to accelerating the development of a COVID-19 vaccine while maintaining the highest safety standards. In the past, vaccines were developed through a series of steps that could take years. With the urgent need for a COVID-19 vaccine, unprecedented

financial investment and scientific collaboration are driving changes in vaccine development, such as concurrent clinical trials of several vaccines.

WHO, as one of the lead agencies along with the Global Alliance for Vaccines and Immunization (Gavi) and CEPI (Coalition for Epidemic Preparedness Innovations), are undertaking a global effort known as COVAX, which accelerates the discovery of safe and effective COVID-19 vaccines by pooling resources from various countries. Investing in vaccine research and development, COVAX helps increase vaccine manufacturing capabilities and commitment to purchase vaccine doses if the vaccine proves safe and effective, to distribute two billion doses in places around the world where these doses are expected to be most needed by the end of the year 2021.

COVAX is a vaccine pillar of the Access to COVID-19 Tools (ACT) Accelerator, a global collaboration to accelerate development, production, and equal access to COVID-19 tests, treatments, and vaccines. WHO provides global coordination and member country support in vaccine safety monitoring. WHO's task is to develop target product profiles for COVID-19 vaccines and provide R&D technical coordination with COVAX partners; WHO has developed compensation schemes as part of time-limited indemnification commitments and obligations.

WHO announced the first clinical trial of the COVID-19 vaccine on March 19, 2022. The first clinical trial is a form of vaccine production commitment by several institutions and companies to register the first COVID-19 vaccine and can later be used to receive emergency use validation from WHO. The list of biotechnology companies to carry out vaccine production opens the door for countries to accelerate the process of regulatory approval in their respective countries used as a condition for importing and administering vaccines. This activity also allows UNICEF to obtain vaccines for distribution to countries in need.

Investments in research and development carry risks for pharmaceutical and biotechnology companies, the results of clinical trials being a major inflection point in that process. The release of clinical trial results is an economically significant event and has a meaningful effect on the market value of biopharmaceutical companies (Hwang, 2013). Until now, there have not been many research results analyzing the impact of the pandemic and the announcement of a COVID-19 vaccine commitment, especially on the stock market in the pharmaceutical and biotechnology sector, especially on stock market reaction variables such as abnormal returns, liquidity, price volatility, trading volume.

Based on the description explained above, this study aims to analyze the reaction of the capital market to the Covid 19 Pandemic by studying biotechnology companies listed on the Nasdaq). So this research can provide an overview of the influence of the COVID-19 pandemic on the capital market, especially on biotechnology companies listed on NASDAQ. In this study, researchers were able to identify factors that influenced the stock price movements of biotechnology companies during the COVID-19 pandemic and explain the impact of the COVID-19 pandemic on the capital market as a whole.

METHODS

The method used in this study uses a type of quantitative method, namely research or method based on empirical and concrete data, objective, observable, measurable, rational, and systematic. This research uses an event study. The type of data that will be used in this study is in

the form of quantitative data. The sampling method in this study was carried out using a non-probability random sampling approach. This research focuses more on the announcement of the COVID-19 pandemic outbreak issued by WHO and the announcement of the commitment to produce the COVID-19 vaccine for the period from October 2019 to December 2021, especially its effect on changes in stock prices, stock trading volume on the capital market, liquidity, and volatility due to announcements. The COVID-19 pandemic and the announcement of the commitment to produce a COVID-19 vaccine are some pieces of information that contain economic value for the market. This research period was chosen because it is the latest data and has complete information. The data analysis method used in this research is a statistical analysis method using multiple regression equations.

RESULTS AND DISCUSSION

The WHO's announcement of the COVID-19 pandemic affected the abnormal return (AR) of Biotech companies on the NASDAQ stock market.

H1 in this study is: "There are differences in the abnormal returns on the stock returns of biotech companies listed on the NASDAQ stock market between before and after the announcement of the COVID-19 pandemic by WHO". If using a 95% confidence level, the AR value does not have a significant value or is greater than 0.05, but if using a 90% confidence level, the AR value has a significant value or less than 0.10 during the announcement of the COVID-19 pandemic by WHO. This shows that the H1 hypothesis can be accepted, so it can be concluded that there is a significant AR around the occurrence of the announcement of the COVID-19 pandemic by WHO and indicates investors are responding to the announcement of the COVID-19 pandemic. Figure 3 shows investors obtaining abnormal returns inconsistently. In several periods before and after investors obtained negative abnormal returns, things like this indicated that investors were more inclined to sell securities, as indicated by most observations that the value of abnormal returns was negative throughout the observation period.

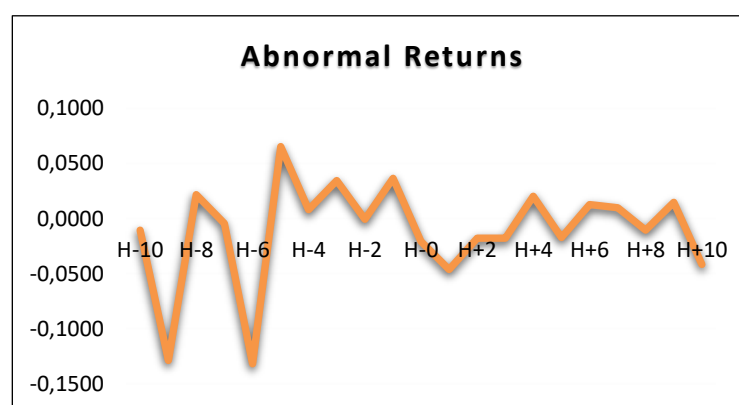


Figure 3. Graph of Abnormal Returns for Biotech Companies during the Announcement Period of the COVID-19 Pandemic by WHO

Source: Processed data (2022)

The study results show that the H1 hypothesis is accepted. There is a difference in abnormal stock returns of biotech companies listed on the NASDAQ stock market between before and after the announcement of the COVID-19 pandemic by WHO. The study results show that the abnormal

return value after being lower than before the announcement of the COVID-19 pandemic by WHO. This shows that the market is responding to the announcement of the COVID-19 pandemic by WHO. At the time of the announcement, investors did not trust biotech companies that could provide returns or profits with predictions of future profits, especially during the health crisis period. This is also because investors can see or predict that the return they will get will not be higher than the expected return. Apart from that, it can also be caused because investors do not anticipate the announcement of the COVID-19 pandemic by WHO.

Previous similar findings by (Alam et al., 2020). The results of this study are also consistent with those (of Liu et al., 2020); the results showed a significant abnormal return. In other words, investors think that outbreaks of infectious diseases benefit the stock performance of biotechnology companies, but a health crisis can affect the stock performance of biotechnology companies; This shows that the health crisis events change investors' judgments and can explain why there are significant abnormal returns.

The announcement of the commitment to produce the COVID-19 vaccine affected the abnormal return of Biotech companies on the NASDAQ stock market.

H2 in this study, namely: "There is a difference in abnormal stock returns for biotech companies listed on the NASDAQ stock market between before and after the announcement of the commitment to produce the COVID-19 vaccine". The abnormal return has a significant value of less than 0.05 during the announcement of the commitment to vaccine production, which can be seen in most of the period. This shows that the H2 hypothesis can be accepted, so it can be concluded that there are differences in the abnormal returns on the stock returns of biotech companies listed on the NASDAQ stock market between before and after the announcement of the commitment to produce the COVID-19 vaccine. Figure 4 shows investors obtaining abnormal returns inconsistently. There were several periods when investors obtained negative abnormal returns; something like this indicated that investors were more inclined to sell securities, but it was also observed that there were positive abnormal returns during some periods of the announcement of the commitment to produce the COVID-19 vaccine.

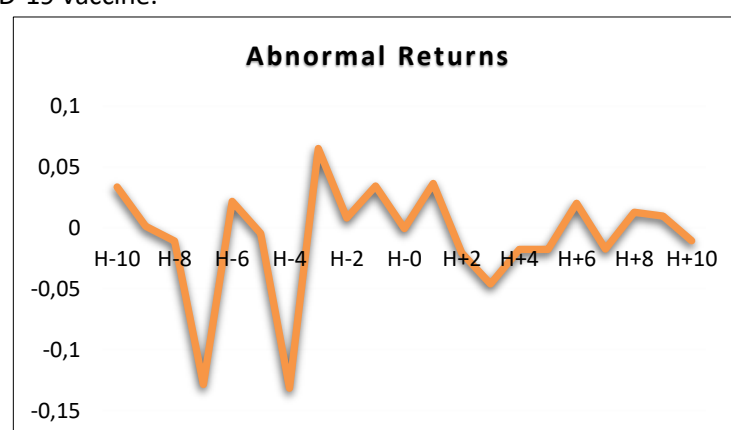


Figure 4. Graph of Abnormal Returns of Biotech Companies in the Commitment Announcement Period for COVID-19 Vaccine Production

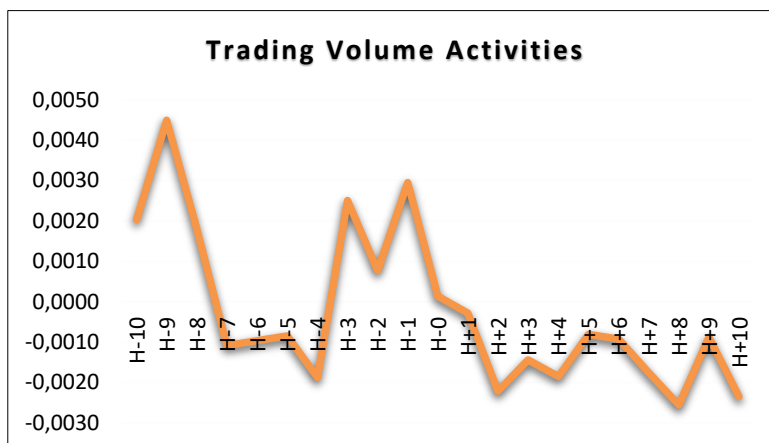
The results of the study show that the H2 hypothesis can be accepted, and it can be said that there is a difference in the abnormal return on the shares of biotech companies listed on the NASDAQ stock market between before and after the announcement of the commitment to produce

the COVID-19 vaccine. The results show that the abnormal return value after is lower than before the announcement of the vaccine production commitment to COVID-19. This shows that the market is responding by announcing a commitment to producing a COVID-19 vaccine. Investors do not trust biotech companies that can provide returns or profits with predictions of profits to be obtained in the future, especially during a health crisis. This is also because investors can see or predict that the return they will get will not be higher than the expected return. It can also be caused because investors do not anticipate the announcement of the COVID-19 vaccine commitment.

The data from this study are partially similar to previous research (Wang et al., 2013). Studies show significantly positive abnormal returns before the announcement and significantly negative abnormal returns after the announcement (Wang et al., 2013). This may be due to reactions from news announcements by investors that biotech companies are considered an alternative stock investment because biotech companies can act as defensive stocks when market conditions are experiencing unfavorable conditions such as COVID-19. While infectious diseases spread, the demand for products, medical supplies, and consumables increases, and investors expect the company's operating income to increase significantly. It is still being determined whether it will benefit the market performance of the pharmaceutical category when the infectious disease spreads; investors consider the risk of holding shares too high and start selling shares; the share price started significantly lower after the third day. The results of this study are the following (Wang et al., 2013) revealed that the abnormal return hypothesis was responded to or significant around the announcement of the commitment to produce the COVID-19 vaccine. Medical products related to the COVID-19 pandemic, with investors selling their shares significantly.

The WHO's announcement of the COVID-19 pandemic affected the Trading Volume Activity (TVA) of Biotech companies on the NASDAQ stock market.

H3 in this study is: "There is a significant TVA around the event of the announcement of the COVID-19 pandemic by WHO". The influence of the COVID-19 pandemic can be seen in most periods having a significant value of less than 0.05. This shows that the H3 hypothesis can be accepted, so it can be concluded that there was a significant TVA during the announcement of the COVID-19 pandemic and indicated that investors responded to the announcement of the commitment to produce a COVID-19 vaccine. Figure 4. shows investor activity experiencing a significant decrease in stock transaction volume due to the announcement of the COVID-19 pandemic by WHO, and this decline was indicated before the announcement. The results showed that the TVA decreased significantly at the time of the announcement, and there was an increase in TVA on the 3rd, fifth, and ninth days. When the WHO announced COVID-19, expectations for medical products increased, and investors expected the company's operating income to increase significantly. Investors need to be clearer about whether the COVID-19 pandemic will benefit the performance of the biotech stock market; therefore, as the infectious disease continues to spread, investors perceive the risk of conducting stock transactions as too high; Stock transaction volume began to fall after the announcement. These results align with research conducted by (Onali, 2020), which examined the impact of news of the deaths of COVID-19 victims in the US on transaction volume on the Dow Jones stock market. The decline in share transaction volume occurred due to decreased share buying and selling activity.



**Figure 5. Graph of the Company's Trading Volume Activities
Biotech in WHO COVID-19 Pandemic Announcement Period**

Source: Processed data (2022)

Hypothesis H3 in this study is: "There are differences in Trading Volume Activities of biotech companies listed on the NASDAQ stock market between before and after the announcement of the COVID-19 pandemic by WHO." The effect of the WHO's announcement of the COVID-19 pandemic can be seen in most periods having a significant value of less than 0.05. The results of the study show that the H3 hypothesis is accepted. It can be said that there are differences in the Trading Volume Activities of biotech companies listed on the NASDAQ stock market before. After the announcement of the COVID-19 pandemic by WHO, H3 can be accepted, shown by the significant differences in TVA before and after the announcement. This was due to the market response to the announcement of the COVID-19 pandemic by WHO. Investors believe biotech companies can provide alternative stocks to obtain returns or profits with predicted profits. However, research results show that the WHO's announcement of the COVID-19 pandemic caused the company's actual return to be lower than expected by investors. The company does not see an expected stock price compared to the stock price before the announcement, so investors are not interested in the biotech company's shares. This could also be due to information on the announcement of the COVID-19 pandemic by WHO, causing investment in biotech companies to be considered less prospective by investors in the future, so investors did not want to invest in the shares of these biotech companies; this was what caused the effect of a decrease in trading activity during the announcement period. COVID-19 pandemic by WHO.

According to research, the impact of the COVID-19 announcement by the WHO lowered the value of market capitalization during the study period (Indrayono, 2021). However, investors prefer to trade with companies whose market influence has solid long-term value in several financial factors. In this study, trading volume aligns with WHO's announcement of the COVID-19 pandemic, which is considered a trend. Significant trading activity when the market is in an uptrend. This means that the announcement of the COVID-19 pandemic by WHO has affected trading volume, which shows biotech stock market investors reacting to the news of the announcement due to consideration of biotech companies being an alternative for stock investment in the temporary period during the pandemic even though biotech companies have publicly stated that they do not plan to get benefit from this COVID 19 pandemic.

The announcement of the commitment to produce a COVID-19 vaccine has affected the Biotech company's TVA on the NASDAQ stock market.

Hypothesis H4 in this study is: "There are differences in Trading Volume Activities of biotech companies listed on the NASDAQ stock market between before and after the announcement of the commitment to produce the COVID-19 vaccine". The effect of the announcement of the commitment to produce the COVID-19 vaccine can be seen in that most periods have a significant value of less than 0.05. This shows that the H4 hypothesis can be accepted, so it can be concluded that there was a significant TVA during the announcement of the commitment to produce the COVID-19 vaccine and indicated that investors responded to the announcement of the commitment to produce the COVID-19 vaccine. Figure 4.4 shows that investor activity experienced a significant increase in stock transaction volume on day one after the announcement of the commitment to produce the COVID-19 vaccine. The results showed that TVA decreased from day 2 to day 10. When the announcement of the commitment to produce a COVID-19 vaccine occurred, expectations for medical products increased, and investors expected the company's operating income to increase significantly. It is unclear whether the COVID-19 pandemic will benefit the performance of the biotech stock market; therefore, as the infectious disease continues to spread, investors perceive the risk of trading in stocks as too high. These results align with research conducted by (Onali, 2020), which examined the impact of news of the deaths of COVID-19 victims in the US on transaction volume on the Dow Jones stock market. The decline in share transaction volume occurred due to decreased share buying and selling activity.

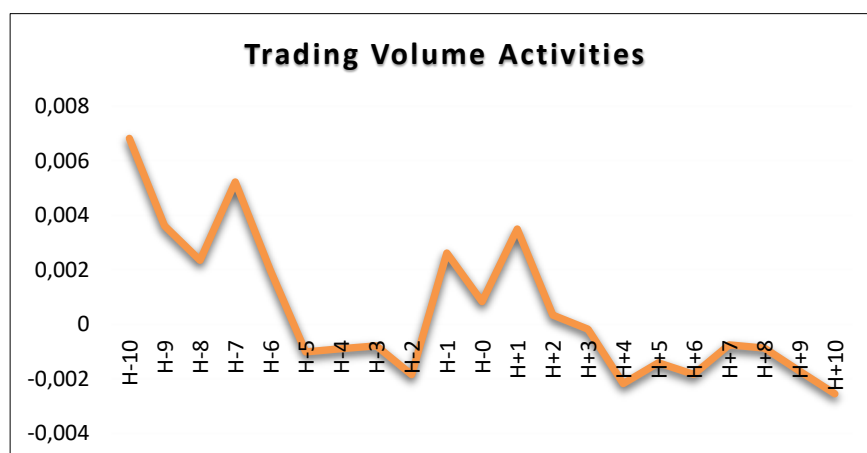


Figure 6. Graph of the Company's Trading Volume Activities Biotech during the Commitment Announcement Period to produce COVID-19 Vaccines

Source: Processed data (2022)

The effect of the WHO's announcement of the COVID-19 pandemic can be seen in that most of the period has a significant value of less than 0.05. The results of the study show that the H4 hypothesis is accepted, and it can be said that there is a significant TVA between before and after the announcement; this is because the market responds to the announcement of the COVID-19 vaccine commitment, investors do not trust biotech companies that can provide returns or profits with predictable profits. Obtained in the future. This is also because the actual return given by the company is like what investors expect. The company sees no expected stock price compared to the stock price before the announcement. Hence, investors are not interested in the biotech company's

shares; this can also be caused because the prospects for biotech companies during the COVID-19 pandemic are not convincing, so investors do not want to invest in biotech company stocks. This causes the effect of trading volume activity before and after the announcement that there is a TVA to decrease significantly.

According to research, the impact of the COVID-19 announcement by the WHO lowered the value of market capitalization during the study period (Indrayono, 2021). However, investors prefer to trade with companies whose market influence has solid long-term value in several financial factors. This study indicates that some investors respond to announcements, and there are several considerations for investing in biotech companies as an alternative to stock investment. Trading activity will increase when the market is in an uptrend, and trading activity will decrease when the market is in a downtrend. This means that trading volume can be used to predict the trend at that time. Trading activity can measure the enthusiasm of buyers and sellers in the biotech stock market. During an uptrend market, a trading volume that does not increase can be caused by an increase in sellers not in line with the enthusiasm of buyers.

The announcement of the COVID 19 pandemic by WHO affected the liquidity of Biotech company shares on the NASDAQ stock market.

H5 in this study is: "There are differences in the Liquidity of the Shares of biotech companies listed on the NASDAQ stock market between before and after the announcement of the COVID-19 pandemic by WHO." The effect of the announcement of the COVID-19 pandemic by WHO can be seen in that most of the period does not have a significant value or is greater than 0.05. This shows that the H5 hypothesis cannot be accepted, so it can be concluded that there was insignificant stock liquidity during the announcement of the commitment to produce the COVID-19 vaccine. Figure 4.5 shows the lowest stock liquidity owned by Orogenics, Inc. (OGEN), while Johnson & Johnson (JNJ) has the highest liquidity.

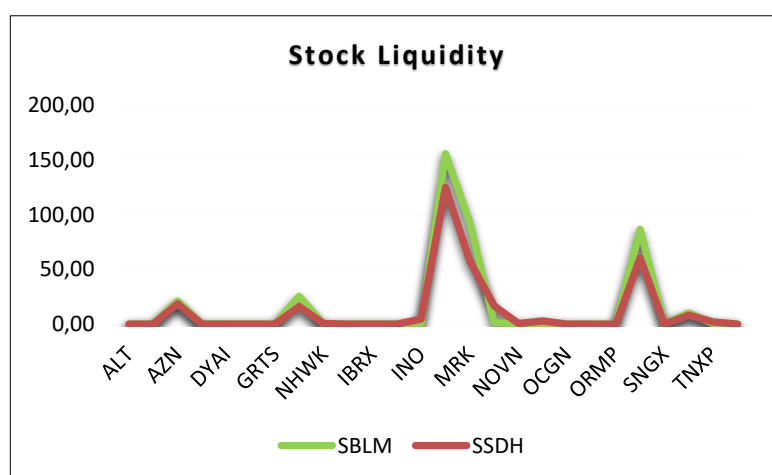


Figure 7. Graph of Liquidity of Biotech Companies during the Announcement Period of the COVID 19 Pandemic by WHO

Source: Processed data (2022)

The research results related to the effect of the announcement of the COVID-19 pandemic by WHO on stock liquidity are in line with those carried out by (Chebbi et al., 2021) and (Ingale & Paluri, 2022). The stock markets studied were the S&P 500 and the MENA stock markets; the results

indicated that the announcement significantly impacted the stock market. The study covers stock markets in the S&P 500 representing stocks traded on the New York and NASDAQ stock markets and 314 listed companies operating in six Middle East and North Africa (MENA) countries. It is not specific to stock markets operating in the biotechnology sector. This study shows that the WHO's announcement of the COVID-19 pandemic has no effect on the biotech stock market, as indicated by the liquidity value. The biotech stock market seems to be giving signals to investors, stating that the company has the same liquidity value both before and after the announcement, so it can be said that the information regarding the announcement of the COVID-19 pandemic by WHO, which was reported had no effect on the liquidity of the biotech stock market on the stock market. NASDAQ.

The announcement of the commitment to produce the COVID-19 vaccine affected the liquidity of the Biotech company's shares on the NASDAQ stock market.

H6 in this study, "There is a difference in the liquidity of shares of biotech companies listed on the NASDAQ stock market between before and after the announcement of the commitment to produce the COVID-19 vaccine. " from 0.05. This shows that the H6 hypothesis cannot be accepted, so it can be concluded that there was insignificant stock liquidity during the announcement of the commitment to produce the COVID-19 vaccine. Figure 8 shows the lowest stock liquidity owned by Orogenics, Inc. (OGEN), while Johnson & Johnson (JNJ) has the highest liquidity.

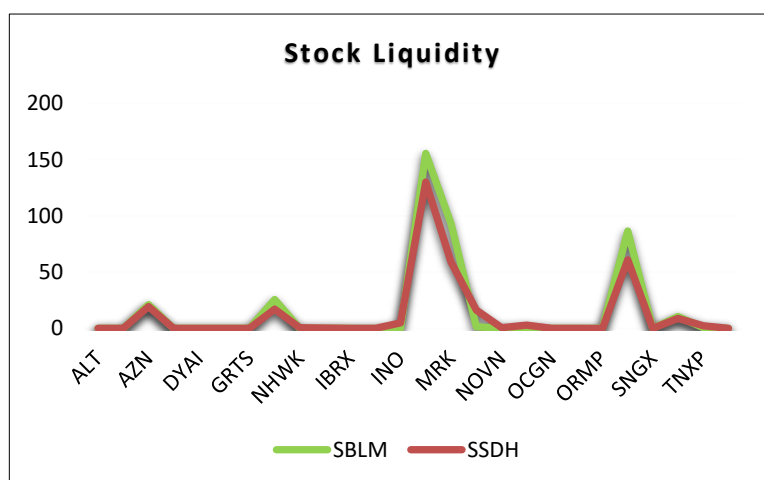


Figure 8. Graph of Biotech Company Liquidity at Announcement Period for COVID 19 Vaccine Production Commitment

Source: Processed data (2022)

The results of research related to the effect of the announcement of the COVID-19 pandemic by the WHO on stock liquidity were carried out by (Chebbi et al., 2021) and (Ingale & Paluri, 2022). The stock markets studied were the S&P 500 stock market and the MENA stock market, and the results showed that the stock market was significantly negatively affected by the announcement. The study covers stock markets in the S&P 500 representing stocks traded on the New York and NASDAQ stock markets and 314 listed companies operating in six Middle East and North Africa (MENA) countries. It is not specific to stock markets operating in the biotechnology sector. The results of this study indicate that research specifically on the stock market engaged in the biotechnology sector was not negatively affected during the pandemic period, possibly due to information related to the announcement of a commitment to producing a COVID-19 vaccine.

The results also showed no difference in the average liquidity of biotech company stocks on the NASDAQ stock market before and after the announcement, indicating that these results are the same as previous studies. Has been conducted by (Vaverková et al., 2020) on US stock market liquidity (S&P500) with a short period (30 days) of information on total confirmed cases and deaths in twelve countries and market movements. This study, based on a longer time series, verified the robustness of this finding.

The WHO's announcement of the COVID-19 pandemic affected the volatility of Biotech company shares on the NASDAQ stock market.

Volatility Pattern Analysis

H7 in this study is: "There is a difference in the volatility of the stock volatility of biotech companies listed on the NASDAQ stock market between before and after the announcement of the COVID-19 pandemic by WHO." The effect of the announcement of the COVID-19 pandemic can be seen in that most periods have a significant value of less than 0.05. This shows that the H7 hypothesis can be accepted, so it can be concluded that there was significant stock volatility during the announcement of the COVID-19 pandemic WHO. Figure 4.7 shows the volatility of stocks before and after the announcement of the COVID-19 pandemic WHO.

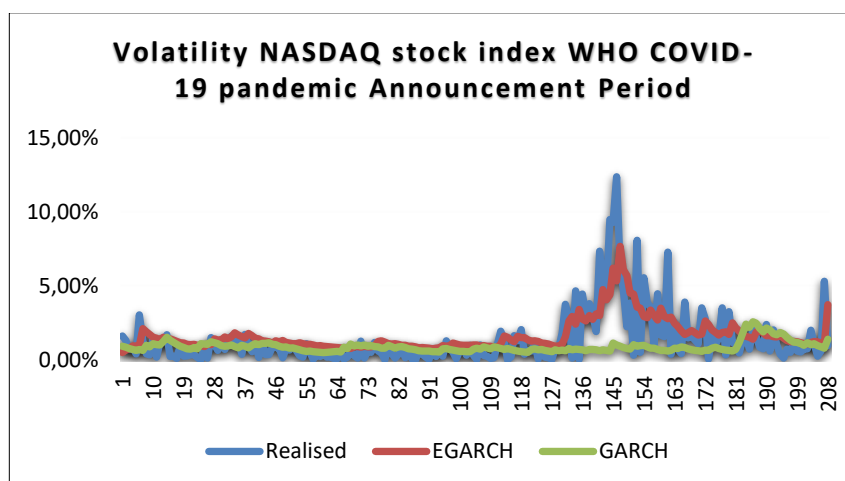


Figure 8. Graph of Return Volatility during the Announcement Period of the COVID 19 Pandemic by WHO

Source: Processed data (2022)

The results of the study show that volatility after it is lower than before the announcement of the COVID-19 pandemic by WHO. The study results show that the announcement of the COVID-19 pandemic influences changes in the market price of biotech stocks on the NASDAQ. This can be caused by market prices that tend to be lower than the price of the shares previously offered so that price fluctuations occur on the stock exchange.

Good news causes less volatility when compared to bad news. This pattern of response doubled during the COVID-19 pandemic. When the health crisis is considered a bad event, market players wait for good news about the response to the health crisis by biotech companies to minimize volatility in the stock market. This study's results align with research that has been conducted (Onali, 2020).

The announcement of the commitment to produce the COVID-19 vaccine affected the volatility of the Biotech company's shares on the NASDAQ stock market.

Volatility Pattern Analysis

The coefficient λ is negative except for the moment after the announcement of the commitment to produce a COVID-19 vaccine with a significance level of 10%, indicating that the good news indicated by the announcement of the commitment to produce a COVID-19 vaccine causes less volatility when compared to bad news. This response pattern doubled during a crisis but did not apply to biotech company stocks. This means that when a crisis occurs, market players are waiting for good news about the announcement of the COVID-19 vaccine as an effort to overcome the health crisis by biotech companies to minimize volatility in the stock market.

The coefficient β on the index is not high, indicating that the volatility in the biotech stock market does not last long. This condition is not much different in the period before the announcement and at the time of the announcement. When the announcement period took place in biotech stocks, it showed a persistence that was slightly below the NASDAQ index stocks. This means that the volatility of stock returns for biotech companies will stabilize more quickly than stocks on the NASDAQ index. This is very likely related to the composition of biotech stocks which are companies in the health sector. During a pandemic, biotech stocks were considered to have the most up-to-date information regarding policies to respond to health crises such as vaccine production.

A high coefficient α in the biotech stock market represents the magnitude of the symmetric effect of a shock. The coefficient α did not increase during the announcement period for vaccine production commitments. This illustrates that the biotech stock market is classified as insensitive and does not become more sensitive during a recession or crisis. Nevertheless, from a comparison of the parameters of the symmetric effect of the shock, biotech stocks are consistently more careful in responding to a shock, both in the period before and during the announcement. In addition, according to the relative scale between the coefficients, an asymmetric effect of a shock on the market or a leverage effect occurs in the biotech stock market.

In addition, according to the relative scale between the coefficients, an asymmetric effect of a shock on the market or a leverage effect did not occur in the biotech stock market during the COVID-19 vaccine announcement period. It is said that there is no leverage effect because the return volatility is not significant, and there is no price reduction.

The H8 in this study is: "There is a difference in the volatility of the shares of biotech companies listed on the NASDAQ stock market between before and after the announcement of the commitment to produce the COVID-19 vaccine." The effect of the announcement of the commitment to produce the COVID-19 vaccine can be seen in that most periods have a significant value of less than 0.05. This shows that the H8 hypothesis can be accepted, so it can be concluded that there was significant stock volatility during the announcement of the commitment to produce the COVID-19 vaccine. Figure 9 shows the volatility of stocks before and after the announcement of the COVID-19 pandemic WHO.

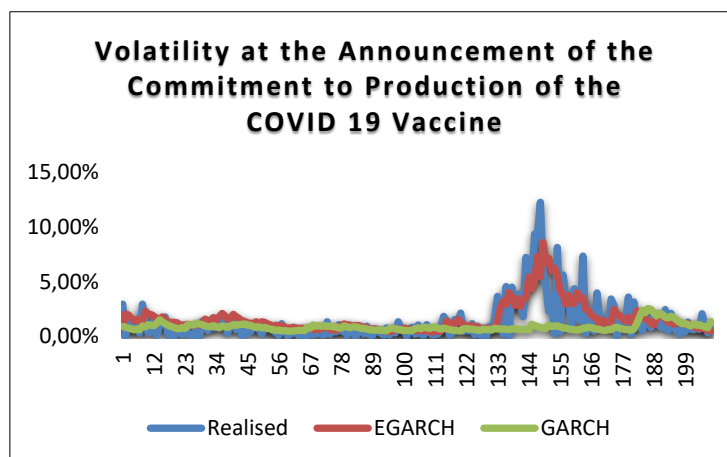


Figure 9 . Graph of Return Volatility in Announcement Period of Commitment to Production of COVID-19 Vaccines

Source: Processed data (2022)

The results show that the volatility after it is lower than before the announcement of the commitment to produce the COVID-19 vaccine. Good news causes less volatility when compared to bad news.

When the COVID-19 pandemic occurs, the good news about the announcement of a commitment to producing a COVID-19 vaccine as an effort to overcome the health crisis by biotech companies can affect volatility in the stock market. This study supports prospect theory. Based on the theory that people are more afraid of failure than benefiting, if investors are given two choices, they will choose the minimum loss opportunity even though the other alternative is for the opportunity to make more profit. Likewise, during a pandemic, investors will participate in stocks that show a lower level of volatility due to good news information in the form of a commitment to producing a COVID-19 vaccine.

Research on the impact of COVID-19 on the stock market has focused heavily on identifying the spread and impact of the disease. Abnormal fluctuations in stock returns — factors that reflect investor behavior directly to economic changes.

The behavioral theory explains phenomena related to market trust, one of the factors that cause stock price volatility or even the risk of transmitting information related to an epidemic, which then causes a financial crisis. Matters such as the WHO's announcement of the COVID-19 pandemic and the announcement of the commitment to produce a COVID-19 vaccine have caused increased attention to profit predictions that should influence stock prices. Moreover, in theory, signals can give good or bad signals to investors. In this study, it is in line that the announcement of the COVID-19 pandemic by WHO during the crisis period affected volatility returns and at the time of the announcement of the commitment to produce the COVID-19 vaccine. This shows that the announcement of the commitment to produce the COVID-19 vaccine is considered good news information that is of concern to investors so that volatility return reflects stock fluctuations in the period in question because it gives a signal to investors.

CONCLUSION

Based on research conducted on biotech companies listed on the NASDAQ stock market, it can be concluded that the announcement of the COVID-19 pandemic by WHO and the announcement of the commitment to produce a COVID-19 vaccine have a significant effect on abnormal stock returns and Trading Volume Activities of biotech companies. The announcement of the COVID-19 pandemic caused a decrease in abnormal stock returns and trading activity. At the same time, the announcement of a commitment to producing a COVID-19 vaccine also caused a decrease in abnormal stock returns. However, it did not have a significant effect on stock liquidity. From a theoretical point of view, the influence of these events is related to signaling theory and market efficiency, as well as market reactions to published information.

REFERENCES

- Al-Awadhi, A. M., Alsaifi, K., Al-Awadhi, A., & Alhammadi, S. (2020). Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. *Journal of Behavioral and Experimental Finance*, 27, 100326. <https://doi.org/10.1016/j.jbef.2020.100326>
- Alam, M. N., Alam, M. S., & Chavali, K. (2020). Stock market response during COVID-19 lockdown period in India: An event study. *The Journal of Asian Finance, Economics and Business*, 7(7), 131–137.
- Chebbi, K., Ammer, M. A., & Hameed, A. (2021). The COVID-19 pandemic and stock liquidity: Evidence from S&P 500. *The Quarterly Review of Economics and Finance*, 81, 134–142. <https://doi.org/10.1016/j.qref.2021.05.008>
- Cucinotta, D., & Vanelli, M. (2020). WHO declares COVID-19 a pandemic. *Acta Bio Medica: Atenei Parmensis*, 91(1), 157. doi: 10.23750/abm.v91i1.9397
- Göker, İ. E. K., Eren, B. S., & Karaca, S. S. (2020). The impact of the COVID-19 (coronavirus) on the borsa İstanbul sector index returns: an event study. *Gaziantep University Journal of Social Sciences*, 19(COVID-19 Special Issue), 14–41. <https://doi.org/10.21547/jss.731980>
- Hwang, T. J. (2013). Stock market returns and clinical trial results of investigational compounds: an event study analysis of large biopharmaceutical companies. *PloS One*, 8(8), e71966. <https://doi.org/10.1371/journal.pone.0071966>
- Indrayono, Y. (2021). What Factors Affect Stocks' Abnormal Return during the COVID-19 Pandemic: Data from the Indonesia Stock Exchange: Data from the Indonesia Stock Exchange. *European Journal of Business and Management Research*, 6(6), 1–11.
- Ingale, K. K., & Paluri, R. A. (2022). Financial literacy and financial behaviour: A bibliometric analysis. *Review of Behavioral Finance*, 14(1), 130–154.
- 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. *The Journal of Asian Finance, Economics and Business*, 7(7), 463–474.
- Liu, H., Wang, Y., He, D., & Wang, C. (2020). Short term response of Chinese stock markets to the outbreak of COVID-19. *Applied Economics*, 52(53), 5859–5872.
- Onali, E. (2020). Covid-19 and stock market volatility. *Available at SSRN 3571453*.
- Ozdurak, C., Alcan, G., & Guvenbas, S. D. (2020). The impact of Covid-19 to global pharmaceuticals and biotechnology company stocks returns. *Journal of Business Economics and Finance*, 9(2), 68–79. <https://doi.org/10.17261/Pressacademia.2020.1215>
- Piñeiro-Chousa, J., López-Cabarcos, M. Á., Quiñoá-Piñeiro, L., & Pérez-Pico, A. M. (2022). US biopharmaceutical companies' stock market reaction to the COVID-19 pandemic. Understanding the concept of the 'paradoxical spiral' from a sustainability perspective. *Technological Forecasting and Social Change*, 175, 121365.

- <https://doi.org/10.1016/j.techfore.2021.121365>
- Sayed, O. A., & Eledum, H. (2021). The short-run response of Saudi Arabia stock market to the outbreak of COVID-19 pandemic: An event-study methodology. *International Journal of Finance & Economics*. <https://doi.org/10.1002/ijfe.2539>
- Sohrabi, C., Alsafi, Z., O'Neill, N., Khan, M., Kerwan, A., Al-Jabir, A., Iosifidis, C., & Agha, R. (2020). World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *International Journal of Surgery*, 76, 71–76. <https://doi.org/https://doi.org/10.1016/j.ijsu.2020.02.034>
- Vaverková, M. D., Paleologos, E. K., Dominijanni, A., Koda, E., Tang, C.-S., Małgorzata, W., Li, Q., Guarena, N., Mohamed, A.-M. O., & Vieira, C. S. (2020). Municipal solid waste management under COVID-19: challenges and recommendations. *Environmental Geotechnics*, 8(3), 217–232. <https://doi.org/10.1680/jenge.20.00082>
- Wang, Y.-H., Yang, F.-J., & Chen, L.-J. (2013). An investor's perspective on infectious diseases and their influence on market behavior. *Journal of Business Economics and Management*, 14(sup1), S112–S127. <https://doi.org/10.3846/16111699.2012.711360>
- Zaremba, A., Aharon, D. Y., Demir, E., Kizys, R., & Zawadka, D. (2021). COVID-19, government policy responses, and stock market liquidity around the world: A note. *Research in International Business and Finance*, 56, 101359. <https://doi.org/10.1016/j.ribaf.2020.101359>



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