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Coronavirus Disease (COVID) -19 Vaccinations and Indonesian Capital Market

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Abstract. *This study aims to compare the Indonesian capital market responses in term of abnormal return, cumulative abnormal return, and trading volume activity due to Coronavirus disease (COVID)-19 Vaccinations. The event study method is used in this research to study Indonesia's capital market response during the event period. The event period is divided into 2, i.e. 10 days before and after the event and also 30 days before and after the event. The sample was selected by using the purposive sampling method and obtained from 10 pharmaceutical sub-sector companies listed on IDX. The secondary data used in this study are daily data of closing price for each stock, closing price JCI (IHSG), stock volume trading, and outstanding share. The market model is used to predict expected returns. The results found that there were differences in abnormal returns before and after the implementation of the first COVID-19 vaccination in Indonesia. However, there was no difference between cumulative abnormal returns before and after the event. In 10 days before and after the event, there was no difference in trading volume activity. The opposite result was obtained from the 30 days, there were differences between trading volume activity before and after the event.*

1. Introduction

Capital market could not be separated from influence of economic and non-economic condition. The scope economic condition covers the whole activity economy of a country, such as policy government [1] [2], announcement of dividend [3], changes in the foreign exchange rate [4], and others. Influence non-economic condition covers disclosure of Corporate Social Responsibility [5], political events [6], disaster [7], Ebola disease [8] as well as SARS disease [9]. The non-economic condition often triggers fluctuation in stock prices. Nowadays, a factor that most influence the Indonesian capital market (and also all capital market around the world) is Coronavirus disease (COVID)-19. The authors analyzed the specific event of COVID-19 through its first vaccination in Indonesia. This specific event never been studied before, and also the first COVID-19 vaccination has the exact date to differentiate the event to another event.

The first COVID-19 case originated in Wuhan, China, and onwards spread to various countries. Indonesia confirms the first case on March 2, 2020. Immediately, on March 11, 2020, the World Health Organization (WHO) officially defines COVID-19 as a pandemic [9]. According to WHO data [10], as of March 11, 2020, Indonesia has more than 1 million positive cases and 37 thousand cases of death. Besides the impact on the limited human mobility, COVID-19 impacts various sector, such as tourism, industry, construction, and capital market.

According to data from the Indonesia Stock Exchange [11], the Jakarta Composite Index (JCI) experienced a drop of -12.5% just in 2 weeks since the first case of COVID-19 was confirmed in Indonesia.

Not wanting affect farther away, on December 6, 2020, the government brings 1.2 million doses of the Sinovac, one of COVID-19 vaccine to Indonesia. Moreover, Indonesia's first COVID-19 vaccination will be held on January 13, 2020. This is an effort of government to push the spread of the COVID-19 virus. Information of vaccine's arrival was responded positively by pharmacy's stocks. Based on data from the Indonesia Stock Exchange or BEI [11], KLBF (one of the biggest pharmacy company in Indonesia) stock rose 1.69% on December 7, 2020. This fact is in line with study by [12]. Fluctuation in stock prices could be affected by information. The market will react if the events that happened contain information [1]. Investors as a market participants consider information from the event in the process of taking an investment decision [2]. The decision to buy or sell stock will affect price share [13].

After the positive vibe, according to IDX data [11], some pharmacy's stock experience drop at trading session on January 13, 2020, coincides with the implementation of the first COVID-19 vaccination in Indonesia. The study by [14] put forward that a dramatic changes in the service health will happen. In the end, it leads to massive investment in industry that provides prevention of disease. Implementation of COVID-19 vaccination will upgrade the company profitability. This profitability will influence investors to embed capital in the company and shown by change of trading volume activity. The increase in volume in tune with the increase of stock price and then affects the return received by investors [15]. If the return obtained is different from the normal return, then we could say there are abnormal returns. Accumulation of abnormal returns in some period will produce cumulative abnormal returns.

A number of studies that focused on the impact of COVID-19 on capital market in term of abnormal return and trading volume activity have been done by [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], and [26]. The results of those studies are varying. A number of study said there was a significant different between abnormal return before and after COVID-19 event [9], [16], [17], [21], [23], and [27]. Meanwhile other study said there was a significant different between abnormal return before and after COVID-19 event [15], [19].

For cumulative abnormal return, a study by [20] used three event related to COVID-19: (i) the first two patients, Chinese nationality, were found infected with COVID-19; (ii) The 17th patient, an international student from the UK, started the wave of COVID-19 infection in the community in Vietnam; (iii) Vietnam announced the nationwide outbreak of COVID-19 and implemented economic lockdown. The article found that the impact of the three events on pharmaceutical stock prices was sign inconsistency. Cumulative abnormal return (CAR) is positive after the first and third event is declared but the CAR is negative after the second event is announced. Research by [27] found there was a significant different between CAR due to COVID-19 event.

The last response we try to observe is trading volume activity before and after COVID-19 event. Some study depict there was a significant different in trading volume activity [15], [16], [18], and [19], moreover another study cannot found a significant different [26], [27].

From previous study, we found a gap that the results were not fully consistent. Sometimes there was a significant different of capital market responses (in term of abnormal return, cumulative abnormal return, and trading volume) before and after the COVID-19 event, and sometimes was not. The authors extend the scope of study by combining all of the capital market responses (abnormal return, cumulative abnormal return, and trading volume) in one analysis. Previous study only analyzed the capital market responses used maximum two indicators. Another contribution in this paper is the authors use first COVID-19 vaccination implementation in Indonesia as the specific event of COVID-19, that never been studied before.

The problems that will be researched in this study are is there a significant difference between abnormal returns before and after the implementation first COVID-19 vaccination in Indonesia, is there a significant difference between cumulative abnormal returns before and after the implementation of the first COVID-19 vaccination in Indonesia, and is there a significant difference between trading volume activity before and after the implementation of the first COVID-19 vaccination in Indonesia.

To learn market reaction because of specific event, we could use the event studies method. An event study is a method to analyzed market reactions or market responses due to some event [1], [2]. The observed event is the implementation of the first COVID-19 vaccination in Indonesia. An event study studies investigating market reaction to content of information from specific event [28]. Fama in [24] put forward that event study generally related to how fast existing information could be reflected in stock price. Changes in stock price could be observed through abnormal return, cumulative abnormal return, and trading volume activity [15].

2. Research Methods

The method in this study is the event study method. An event study is a method of testing market reaction to specific event [1], [2]. The observed event is the implementation of the first COVID-19 vaccination in Indonesia. Object or variable in the study is abnormal return, cumulative abnormal return, and trading volume activity.

2.1. Variable

2.1.1. Abnormal Return. According to [15], abnormal return can be interpreted as a difference from the actual return (Ri,t) with an expected return (E[Ri,t]). Abnormal return can be formulated as follows:

$$\mathrm{ARi,t} = \mathrm{Ri,t} - \mathrm{E[Ri,t]} \tag{1}$$

Events that give abnormal returns reflect that the event contains information [6]. Before getting an abnormal return, we need to calculate the actual return, market return, and expected return. Actual return (Ri,t) is obtained from the ratio of difference stock price at time t (Pi,t) with stock price from previous time (Pi,t-1).

$$\mathrm{R_{i,t}} = \frac{\mathrm{P_{i,t}} - \mathrm{P_{i,t-1}}}{\mathrm{P_{i,t-1}}} \tag{2}$$

Market return (Rm) was calculated with compare difference Composite Stock Price Index or JCI at time t (IHSG t) with JCI at time t-1 (IHSGt- 1).

$$\mathrm{R_m} = \frac{\mathrm{IHSG_t} - \mathrm{IHSG_{t-1}}}{\mathrm{IHSG_{t-1}}} \tag{3}$$

This study used market model in the calculation of expected return (E[R]). Market models were chosen because it easily applied and strong for various conditions [2]. Besides that this model is also free from critics against the CAPM and provides valid results [21].

$$\mathrm{E[Ri,t]} = \alpha + \beta\mathrm{i}*\mathrm{Rm} + \varepsilon \tag{4}$$

2.1.2. Cumulative Abnormal Return. Cumulative abnormal return (CAR) is an accumulation of abnormal returns [5]. The definition is in line with Capron & Pistre in [19].

$$\mathrm{CAR_{i,t}} = \sum_{t}^{n} \mathrm{AR_{i,t}} \tag{5}$$

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2.1.3. Trading Volume Activity. Market reaction to some incident or information can also be seen using trading volume activity [15]. Trading volume activity (TVA) is a measurement of changes in stock volume activity [29]. TVA can be calculated by counting the ratio between the volumes of stock traded with the volume of stock outstanding [30]. If there is an enhancement in trading volume activity so the event rated as good news by investors as well otherwise [20].

$$\mathrm{TVA}_{i,t} = \frac{\text{Volume of stock traded}_t}{\text{Volume of stock outstanding}_t} \quad (6)$$

2.2. Sample and Data

Population in this study is whole stock of sub-sector pharmacy listed on the Indonesia Stock Exchange. The authors choose these companies, because the COVID-19 vaccines are fully provided by the sub-sector pharmacy. Purposive sampling is used for taking the sample with criteria as follows:

a) Companies included in sub-sector pharmacy and have listed on the Indonesia Stock Exchange before the event period.
b) The company does not do stock splits, rights issues, or other corporate actions during the event period.

This study used secondary data of closing stock price, JCI, the volume of stock traded, and the volume of stock outstanding. The data was taken from idx.co.id and finance.yahoo.com.

2.3. Statistical Method

This study used Paired Sample T-test for normally distributed data and Wilcoxon Signed Rank Test if the data are not normally distributed. The sequences of statistical method used in this study depicted in Figure 1.

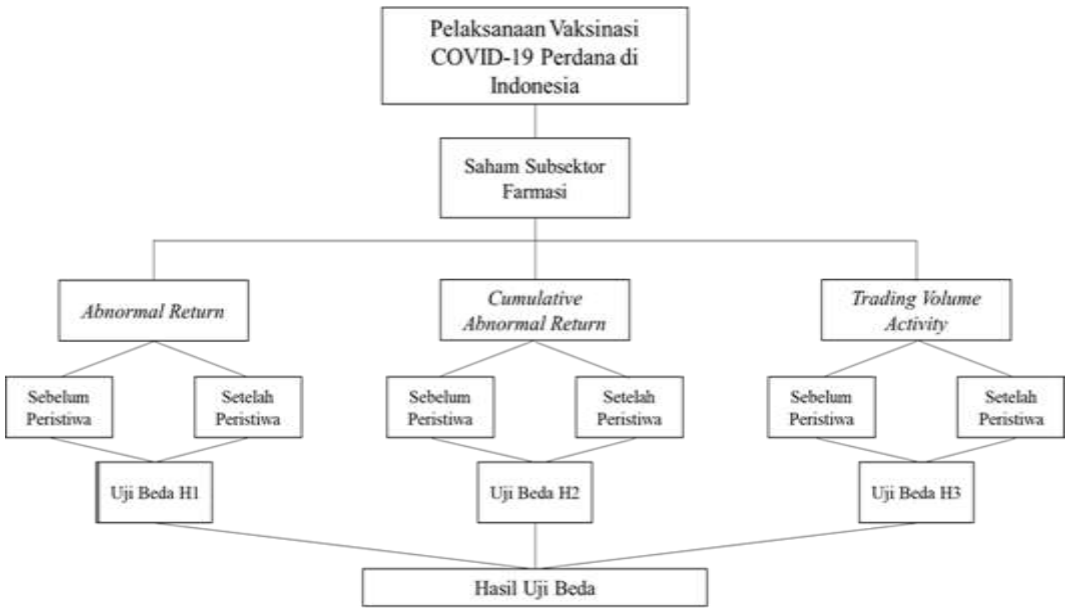

Figure 1. Research Method

2.4. Event Period

According to [31], the minimum limit of the estimation period is 10 days. In order to get better results and as a comparison, this study used two event periods with different timeframes. First, the event period is 10 days before and 10 days after the implementation of the first COVID-19 vaccination in Indonesia. The first period starts from 28 December 2020 (t-10) to 27 January 2021 (t+10).

Furthermore, the second event period uses a longer period of time, 30 days before and 30 days after the event. The second period starts from November 25, 2020 (t-30) to February 25, 2021 (t+30). Meanwhile, the implementation of the first COVID-19 vaccination in Indonesia itself falls on January 13, 2021 and is used as t0 or the day of the event. Figure 2 show the event period used in this study.

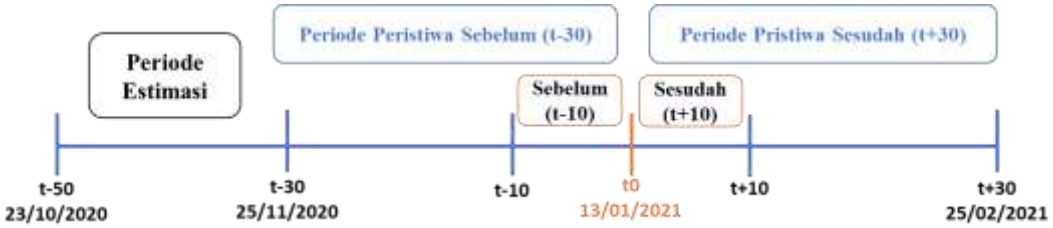

Figure 2. Event Period

The reasonfor determining the event period are 10 and 30 days because these periods are considered optimal. The study by [1] said, if the period is too long, it will give biased results. This opinion is also reinforced by [32] that argued if the range of the event period is too long will cause two problems. The first problem is it can reduce the power of statistical tests. Second, it will be difficult to prevent the observation period from having a confounding effect.

2.5. Development of hypothesis

Study by [21] showed that investor preferences change during lockdown period. Initially, investors assessed information as bad news because will limit operational of business. It was proven with existence of decreasing in abnormal return and cumulative abnormal return. Once executed, investors assess lockdown could slow down the rate of the spread of COVID-19 and will impact positively for business later. Abnormal returns and cumulative abnormal returns slowly experience an increase. On the other side, [22] found that there are abnormal returns before and after the existence of the COVID-19 announcement. The result is in line with [9], [16], [23], as well as [24]. However, the study has opposite results compared to [15] and [19].

Research results by [18] showed the emergence of COVID-19 provides positive sentiment for consumer goods stock. This occurred along with the increasing need for food during the enforcement policy to stay at home. It was showed by the difference in trading volume activity between before and after the event. Different results were found by [27] which focus on the sector of telecommunications which stays at home policy made trading volume decreased. Based on the results study, the difference in trading volume activity between before and after events were also found by [15], [16] as well as [19].

Refer to the description above, the hypotheses in this research are:

H1: There is a significant difference between abnormal returns before and after the implementation of the first COVID-19 vaccination in Indonesia.

H2: There is a significant difference between cumulative abnormal returns before and after the implementation of the first COVID-19 vaccination in Indonesia.

H3: There is a significant difference in trading volume activity before and after the implementation of the first COVID-19 vaccination in Indonesia.

3. Results and Discussion

3.1. Normality Test

In this study, Kolmogorov-Smirnov was used to test normality distribution. Based on Table 1, there is an only cumulative abnormal return after the event that has *p-value* < 0.05. This means that the data is not normally distributed and later to test the hypothesis for a cumulative abnormal return variable will use Wilcoxon Signed Rank Test. Moreover normality test results showed abnormal return and trading volume activity obtained *p-value* > 0.05. This means that the data are normally distributed and later to test the hypothesis for these variables will use Paired Sample T-test.

Table 1. Normality Test Results for 10 Days Period

Variable	Data Period	*p*	
Abnormal Return	Before	0.200	Normally distributed
	After	0.200	
Cumulative Abnormal Return	Before	0.200	Not Normally distributed
	After	0.021	
Trading Volume Activity	Before	0.055	Not Normally distributed
	After	0.200	

Table 2 presented normality test results for 30 days period before and after the event. There is an only trading volume activity that has *p-value* < 0.05. This means that the data are not normally distributed and later to test the hypothesis for a cumulative abnormal return variable will use Wilcoxon Signed Rank Test. Moreover normality test results showed abnormal return and cumulative abnormal return obtained *p-value* > 0.05. This means that the data are normally distributed and later to test the hypothesis for these variables will use Paired Sample T-test.

Table 2. Normality Test Results for 30 Days Period

Variable	Data Period	*p*	
Abnormal Return	Before	0.200	Normally distributed
	After	0.200	
Cumulative Abnormal Return	Before	0.200	Normally distributed
	After	0.200	
Trading Volume Activity	Before	0.022	Not Normally distributed
	After	0.075	

3.2. Hypothesis Testing

Test first hypothesis testing was done with *Paired Sample T-test.* Based on Table 3, the 10 days and 30 days period before and after the event showed *p-value* < 0.05. Even though the author used different observation period, however hypothesis test results consistently reject H0. That is, there is a significant difference between abnormal return before and after the implementation of the first COVID-19 vaccination in Indonesia.

Table 3. Results of First Hypothesis

Data Pair	10 days period		30 days period	
	Mean	*p*	Mean	*p*
Abnormal Return Before and After	0.0496	0.007	0.0170	0.018

The second hypothesis in 10 days period before and after implementation Indonesia's first COVID-19 vaccination was tested using Wilcoxon Signed Rank Test. Based on table 4, the results showed *p-value* > 0.05. Moreover, to test the second hypothesis for 30 days period before and after the event obtained *p-value* > 0.05 which is the results from Paired Sample T-test. Again, even though the observation period was different, the results of hypothesis testing are also consistent accept H0. That means, there is no a significant difference between cumulative abnormal return before and after implementation of the first COVID-19 vaccination in Indonesia.

Table 4. Results of Second Hypothesis

Data Pair	10 days period		30 days period	
	Z-score	*p*	Mean	*p*
Cumulative Abnormal Return Before and After	-0.561	0.575	-0.050	0.175

The third hypothesis in 10 days period before and after implementation Indonesia's first COVID-19 vaccination was tested using Paired Sample T-test. Based on table 5, the results showed *p-value* > 0.05 then the decision is to accept H0. That means, there is no significant difference in trading volume activity 10 days before and after the implementation of the first COVID-19 vaccination in Indonesia. Meanwhile, for the 30 days period before and after the event, the third hypothesis used the Wilcoxon Signed Rank Test. Wilcoxon Signed-Rank Test results showed *p-value* < 0.05, so reject H0 and it means there is a significant difference in trading volume activity 30 days before and after the event.

Table 5. Results of Second Hypothesis

Data Pair	10 days period		30 days period	
	Mean	*p*	Z-score	*p*
Trading Volume Activity Before and After	0.005	0.109	-2.448	0.014

3.3. Discussion

To test the first hypothesis, the result consistently found that there is a significant difference between abnormal returns before and after the event. This means that the market and investors react to the event, implementation of the first COVID-19 vaccination in Indonesia. Since information about the event had published, investors start to observe and use it as a consideration for taking investments decisions. The decision could influence the demand of stock and in affect the return received by investors. The existence information related to the implementation of vaccination has given enhancement for abnormal returns in the majority pharmacy's stock. This result is in line with [9], [16], [17], [21], [23], and [27].

The result of second hypothesis is there is no difference significant among cumulative abnormal returns before and after implementation of the first COVID-19 vaccination in Indonesia. It was possible because investors have enough anticipated impact from the existing information implementation of COVID-19 vaccination. Information has been used in taking investments decision to get abnormal returns far before the period of observation started.

Next, there are different results for third hypothesis. In the 10 days period before and after events, investors give reaction to the information from implementation of the first COVID-19 vaccination in Indonesia. No prolonged reaction presence occurred along with increased uncertainty in investment during a pandemic. Investors become more careful in investing their money [19]. Different results were obtained from longer observation period (30 days before and after the event).

There is a significant among trading volume activity before and after the event occurred along with an increase in public demand of medicine during a pandemic. Information related to implementation COVID-19 vaccination assessed to be relevant and be good news that will give positive impact to pharmacy's stock. This result is in line with [15], [16], [18], and [19].

4. Conclusion

Based on the research conducted, several conclusions can be found. The first one is there is a significant difference between abnormal returns before and after the implementation of the first COVID-19 vaccination in Indonesia. The second one is there is no significant difference between cumulative abnormal returns before and after the implementation of the first COVID-19 vaccination in Indonesia. The last one is there is no significant difference in trading volume activity 10 days before and after the implementation of the first COVID-19 vaccination in Indonesia. While in the 30 days observation before and after the event, there is a significant difference in trading volume activity. In other word, the implementation of the first COVID-19 vaccination in Indonesia affects Indonesian capital market in term of abnormal return and trading volume activity within 30 days before and after the event.

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