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Influence of Palu Donggala Tsunami Earthquake in 2018 to Abnormal Return toward IDX (Case Study on IDX Insurance Company)

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Abstract: ***Palu Donggala tsunami earthquake in 2018 become one of natural disaster that happens in Indonesia. The event caused a negative effect to the stock price of the company that listed in IDX. Average abnormal return and cumulative abnormal return was used to measure and compare data before and after Palu Donggala tsunami earthquake happen. Market-adjusted model has been used for this research with 21 days event window. Data that used are secondary, and the data sample is nine insurance companies that listed in IDX. The data analysis technique is using normality test on Kolmogorov-Smirnov and Shapiro-Wilk. While Paired Sample Test were used for Hypothesis testing to know whether it has a significant difference. The result on Kolmogorov-Smirnov test has shown that average abnormal return and cumulative average abnormal return data is normally distributed. By Paired Sample Test, the result of average abnormal return shows that the phenomena are not significantly impacting because there is no significant difference on average abnormal return before and after Palu Donggala tsunami earthquake. However, the result of cumulative average abnormal return using Paired Sample Test shows that the phenomena are significantly impacting because there is a significant difference in cumulative average abnormal return before and after Palu Donggala tsunami earthquake.***

Keywords: Event Study, Abnormal Return, Average Abnormal Return, And Cumulative Average Abnormal Return

1. Introduction

The event of Palu Donggala tsunami earthquake in 2018 become popular international news at the time, which can trigger a change in the behavior of investors at IDX. One of the effects of investor behavior can trigger abnormal returns. Abnormal return is the difference from the actual return to the expected return called an abnormal return [4]. Abnormal return usually occurs when there is an event that occurs from within the company such as corporate actions or outside the company such as government policies that can affect company performance which ultimately affects the behavior of investors investing in the company concerned.

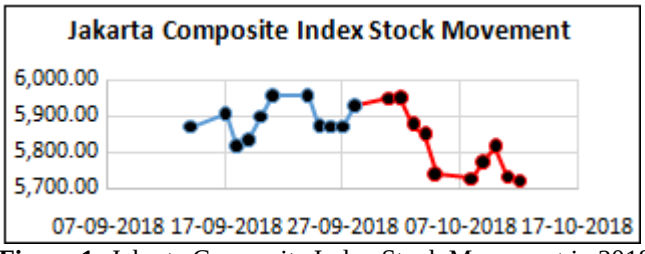

Figure 1: Jakarta Composite Index Stock Movement in 2018

Figure 1 is Jakarta Composite Index Stock Movement in 2018 from 14th September until 12th October 2018. The blue line is the day before the event, and the red line is the day after the event. Palu Donggala tsunami earthquake happen in 28th September 2018 between blue and red line in the graph, we can see from the graph that the movement of the stock tends to decrease after Palu Donggala tsunami earthquake happening. This event will undoubtedly influence the decision of investors to invest in IDX.

This study will examine stocks listed on IDX in the insurance sector because the insurance sector has a large potential for the influence of disaster compared to other sectors. The occurrence of natural disasters like this must be many losses experienced by the people, which ultimately will depend on insurance. For example, for those affected by natural disasters, it is very vulnerable for them to get sick because of the chaotic environment, there will be many people who use their health insurance to treat their diseases. Life insurance also can be one of the insurance that can be taken when there are relatives who die due to natural disasters. The increasing of the claim from the customer after the event can affect the asset of the stock price of the insurance company.

Average abnormal return and cumulative abnormal return will be used to measure the effect of Palu Donggala tsunami earthquake to the stock market with Market-adjusted model as the model to calculate the expected return for this research with 21 days event window. The data analysis technique is using normality test on Kolmogorov-Smirnov and Shapiro-Wilk. Paired Sample T-Test willbe used for Hypothesis testing if the data normally distributed, while Wilcoxon test is when the data not normally distributed to know whether it has a significant difference or not.

2. Literature Review

2.1 Capital Market

Capital market is a meeting between parties who have excess funds with those who need funds by trading securities, while the place where the sale and purchase of securities are called the stock exchange [8].

2.2 Expected Return

[3] explain more about the market-adjusted model, for example there is an event that affecting 18% of the stock

market, with this model, the return expectation of all securities in the same day is same with the return of the market. The following market-market adjustment calculation based on IDX is shown on (1) as follows:

$$R_m = \frac{IHSG_t - IHSG_{t-1}}{IHSG_{t-1}} \quad (1)$$

2.3. Abnormal Return

Abnormal return is the difference between the real return and the expected return. Return is the return that occurs at time t-which is the difference between the current prices of the previous stock price. While the expected return is a return that must be estimated [4]. The formula of abnormal return by [3] is shown on (2) as follows:

$$RTNi,t = Ri,t - E[Ri,t] \quad (2)$$

2.4. Average Abnormal Return

Average abnormal return (ARR) is the average abnormal return of all types of stocks that are being analyzed daily. ARR can show the strongest reaction, both positive and negative, of all types of stocks on specific days during the window period [5]. The formula of average abnormal return by [6] is shown on (3) as follows:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \quad (3)$$

2.5. Cumulative Average Abnormal Return

Cumulative average abnormal return (CAAR) is the daily cumulative ARR starting from the first day to the following days. From daily CAAR graph, it can be seen that the increase or decrease trend that occurs during the window period, so that the positive or negative impact of the event on the overall type of stock understudy can also be known. However, to find out the impact of an event in general on the stock that is significant or not significant, CAAR different test needs to be held between the period before the event occurred and the period after the event occurred [5]. The formula of cumulative average abnormal return by [2] is shown on (4) as follows:

$$CAAR_t = \sum_{t=-t}^{t=+t}(AAR_{it}) \quad (4)$$

2.6. Efficient Market

[3] presents three main forms of market efficiency based on the three types of information, namely past information, current information that is being published and private information as follows:

1. The market is said to be efficient in a weak form if the prices of securities reflect in full the past information.
2. The market is said to be half-efficient if the securities prices fully reflect all published information including information that is in the financial statements of the issuer's company.
3. The market is said to be efficient in strong form if the securities prices fully reflect all available information including private information.

3. Research Methods

3.1 Data Sample

The secondary data used in this research is the stock price of 9 insurance company that lised on IDX with 21 event window from 14th September until 12th October 2018.

3.2 Data Analysis

The phase of data analysis of this research is stated as follows:

a) Define Event Period
The event period used in this study was 21 days, covering ten pre-event days, one day during the day event, and ten days post-event of Donggala tsunami earthquake event in 2018. The following is a picture of the event period used in the study.
b) Calculate Expected Return using (1) formula.
c) Calculate Abnormal Return using (2) formula.
d) Calculate Average Abnormal Return using (3) formula.
e) Calculate Cumulative Average Abnormal Return using (4) formula.
f) Null-Hypothesis (H_0) and Alternative Hypothesis (Ha) Formulation

H_{01}: There is no significant difference in average abnormal return between 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

H_1: There is a significant difference in average abnormal return between 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

H_{02}: There is no significant difference in cumulative average abnormal return between 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

H_2: There is a significant difference in cumulative average abnormal return between 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

g) Determining the Significance Level
The conclusions of the data to be sampled have the opportunity for errors and truths which are expressed as a percentage. This opportunity for error and truth is called the significance level. So significant is the ability to be generalized with specific errors [7]. The significance level (α) used is 5%, or with a confidence level of 95%.

h) Normality Distribution Testing
Normality distribution test purpose of knowing whether data of population well normally distribute or not. This test uses Kolmogorov-Smirnov (K-S testing) by comparing asymptotic significance (2-tailed) with a - 0.05. If data is

normally distributed, paired samples test. If data is not normally distributed, a non-parametric test that used is the Wilcoxon Test. Criteria to define normality to the data are:

1) If Asymp. Sig. (2-tailed) ≤ 0.05, data is not normally distributed.
2) If Asymp. Sig. (2-tailed) > 0.05, data is normally distributed.

i. Hypothesis Testing

The research using paired sample t-test if the result of normality test is typical or using Wilcoxon test if the result of normality test is abnormal to know whether Palu Donggala tsunami earthquake in 2018 event has a significant impact on abnormal return in the insurance company that lists on IDX in 2018.

The defined criteria in paired sample t-test method if the data is normally distributed as follows:

1. If Sig. (2-tailed) < 0,05, so H_{01} rejected and H_1 accepted. It means there is a significant difference between the average abnormal return 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

2. If Sig. (2-tailed) > 0,05, so H_{01} accepted and H_1 rejected. It means there is no significant difference between the average abnormal return 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

3. If Sig. (2-tailed) < 0,05, so H_{02} rejected and H_2 accepted. It means there is a significant difference between the cumulative average abnormal return 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

4. If Sig. (2-tailed) > 0,05, so H_{02} accepted and H_2 rejected. It means there is no significant difference between the cumulative average abnormal return 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

However, if the data is not normally distributed, the defined criteria in using Wilcoxon test as follows:

1. If significance z count < z table at the 0,05 level of significance, so H_{01} accepted and H_1 rejected. It means there is no significant difference between average abnormal 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

2. If significance z count > z table at the 0,05 level of significance, so H_{01} rejected and H_1 accepted. It means there is a significant difference between the average abnormal return 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

3. If significance z count < z table at the 0,05 level of significance, so H_{02} rejected and H_2 accepted. It means there is a significant difference between the cumulative average abnormal return 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

4. If significance z count > z table at the 0,05 level of significance, so H_{02} accepted and H_2 rejected. It means there is no significant difference between the cumulative average abnormal 10 days before Palu Donggala tsunami earthquake in 2018 and 10 days after Palu Donggala tsunami earthquake in 2018.

4. Result

4.1. Descriptive Analysis

Table 1: Descriptive Analysis of Average Abnormal Return

	N	Minimum	Maximum	Mean
Before	10	-.0374	.0304	.00042
After	10	-.0088	.0248	.00502

Table 1. shows that the minimum value of average abnormal return before Palu Donggala tsunami earthquake was -0.0374 on (t-10). The maximum value of average abnormal return before Palu Donggala tsunami earthquake was 0.0304 on (t-9). After Palu Donggala tsunami earthquake happened, it made a bad effect on (t+10) that had -0.0088 of average abnormal return value after the event. In another hand (t+9) was affected positively by Palu Donggala tsunami earthquake with 0.0248 of the average abnormal return value. Before the event, the average abnormal return of the whole sample was 0.00042. It is increased on the average abnormal return after Palu Donggala tsunami earthquake with 0.00502 of the average abnormal return value. From Table 1., it can be concluded that after Palu Donggala tsunami earthquake give a positive effect on the insurance company that listed on IDX.

Table 2: Descriptive Analysis of Cumulative Average Abnormal Return

	N	Minimum	Maximum	Mean
CAAR_Before	10	-0.0374	0.0138	-0.00437
CAAR_After	10	-0.0051	0.0421	0.01868

Table 2. show that the minimum value of cumulative average abnormal return before Palu Donggala tsunami earthquake was -0.0374 on (t-10). The maximum value of cumulative average abnormal return before Palu Donggala tsunami earthquake was 0.0138 on (t-2). After Palu Donggala tsunami earthquake happened, the minimum value of the cumulative average abnormal return was -0.0051 on (t+1). In another hand, the maximum value of cumulative average abnormal return after Palu Donggala tsunami earthquake happened was 0.0421 on (t+9). Before the event, the cumulative average abnormal return of the whole sample was -0.00437. It is increased on the cumulative average abnormal return after Palu Donggala tsunami earthquake with 0.01868 of the cumulative average abnormal return value. From Table 2., it can be concluded that Palu Donggala tsunami earthquake gives a positive effect on the insurance company that listed on IDX.

4.2. Normality Test

Data is normally distributed if Sig. value is more than the significance level of (a =5%). If it is otherwise, Sig. value is less than the significance level of (a =5%) it means that the data is not normally distributed.

Table 3: Normality Test of Average Abnormal Return

	Kolmogorov-Smirnov[a]	Shapiro-Wilk
	Sig.	Sig.
AAR_Before	.200*	0.567
AAR_After	.200*	0.868

From Table 3., Sig. value both of Kolmogorov-Smirnov and Shapiro-Wilk for both variable (AAR_Before and AAR_After) are more than the significance level ($p < .05$). From the information above, it can be concluded that the data is normally distributed. Because the data is normally distributed so the hypothesis testing of average abnormal return will be conducted with Paired Simple Test.

Table 4: Normality Test of Cumulative Average Abnormal Return

Tests of Normality		
	Kolmogorov-Smirnov[a]	Shapiro-Wilk
	Sig.	Sig.
CAAR_Before	.200*	0.15
CAAR_After	.200*	0.605

From Table 4., Sig. value both of Kolmogorov-Smirnov and Shapiro-Wilk for both variable (CAAR_Before and CAAR_After) are more than the significance level ($p < .05$). From the information above, it can be concluded that the data is normally distributed. Because the data is normally distributed so the hypothesis testing of average abnormal return will be conducted with Paired Simple Test.

4.3. Hypothesis Testing

Palu Donggala tsunami earthquake will give significant difference to insurance company that listed IDX if Sig. (2-tailed) less or equal than significant value ($p \leq .05$). Otherwise, it will give no significant difference if Sig. (2-tailed) more than significant value ($p > .05$).

Table 5. Paired Sample T-Test of Average Abnormal Return

		Sig. (2-tailed)
Pair 1	AAR_Before AAR_After	0.514

From Table 5., hypothesis testing of average abnormal return shows that AAR_After and AAR_Before variable shown Sig. (2- tailed) more than significant level ($0.514 > 0.05$). It means that Palu Donggala tsunami earthquake have no significant difference in the insurance company that listed on IDX during the event window.

Table 6. Paired Sample T-Test of Cumulative Average Abnormal Return

		Sig. (2-tailed)
Pair 1	CAAR_Before - CAAR_After	0.00025

From Table 6., hypothesis testing of cumulative average abnormal shows that CAAR_After and CAAR_Before variable shown Sig. (2- tailed) less than significant level ($0.00025 < 0.05$). It means that Palu Donggala tsunami earthquake have a significant difference in the insurance company that listed on IDX during the event window.

4.4. Discussion

By the research, it can be concluded that Indonesia capital market (IDX) is a semi-strong efficient market model since there is an abnormal return that reflected on as the price rapidly adjusted to the infusion of new information. The result of average abnormal return and cumulative average abnormal return also has a positive impact to the insurance company that listed on IDX, even though there is no significant difference between average abnormal return before and after Palu Donggala tsunami earthquake, however, there is a significant difference between the cumulative average abnormal return before and after Palu Donggala tsunami earthquake. [1] explain that abnormal return can create bias in the result, which is why we need a cumulative abnormal return to see for the further result. Based on the statement, the suggestion that given from this research only adopts from the cumulative average abnormal return result because it is more accurate than average abnormal return result.

5. Conclusion and Suggestion

5.1 Conclusion

This research is aimed to analyze abnormal return difference ten days before and ten days after Palu Donggala tsunami earthquake during the event window toward Indonesia Stock Exchange (IDX). Sample of the research is the insurance company listed on the Indonesia Stock Exchange (IDX). Based on the result of the research, it can be concluded as follows:

1. The mean of average abnormal return increase from 0.00042 before Palu Donggala tsunami earthquake to 0.00502 after Palu Donggala tsunami earthquake and The mean of cumulative average abnormal return increase from -0.00437 before Palu Donggala tsunami earthquake to 0.01868 after Palu Donggala tsunami earthquake, it shows that Palu Donggala tsunami earthquake has a positive effect on the nine stock of insurance company that listed in Indonesia Stock Exchange (IDX).

2. Hypothesis test for average abnormal return and cumulative average abnormal return using Paired Sample Test result show that average abnormal return with no significant statistical difference result, however it is has significant statistical difference result for cumulative average abnormal return on nine insurance company stock that listed in Indonesia Stock Exchange (IDX) before and after Palu Donggala tsunami earthquake during the event window. Information that contained in the event gave no significant effect on the stock market based on average abnormal return. However, it is given a significant effect on the stock market based on the cumulative average abnormal return.

5.2. Suggestion

5.2.1. Theoretical Aspects

For further research, the author suggests that other researchers use another index with different kinds of a disaster event and event window. Based on the previous research there are other variables that can be used in this kind of research, such as Abnormal short selling, Trading Volume Activity and Volatility of Stock. Based on the previous research, this kind of research can be conducted and compare with another model such as Market Model and Mean Adjusted Model.

5.2.2. Practical Aspects

To the investor, consider a natural disaster as it affects the insurance company that listed on the Indonesia stock market. After the natural disaster happens, the investor who has already had stock in an insurance company that listed on Indonesia stock market should hold their stock, or even consider buying more the stock, for the investor who does not have stock in an insurance company that listed on Indonesia stock market should buy the stock.

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