The Stock Market Reaction of Energy Sector to The Regulations Approval and The Carbon Exchange Publishing in Indonesia

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Abstract. Social and environmental issues are significant concerns globally, as evidenced by the establishment of various financial institutions that have incorporated sustainable development practices. Indonesia has taken concrete steps carried out by the Financial Services Authority, by establishing a Carbon Exchange through Financial Services Authority Regulation Number 14 of 2023 concerning Carbon Exchange, which was approved on August 2, 2023. The Carbon Exchange itself was officially released on September 26, 2023. Research related to event study was first conducted by Ball and Brown in 1968. Given that event study research is still relevant today and the Carbon Exchange is still relatively new and related to companies operating in the energy sector, the author wants to conduct research on the reaction of the energy sector stock market to the Carbon Exchange. The result of this research is Average Abnormal Returns (AAR) and Trading Volume Activity (TVA) have a significant difference before and after the ratification of the regulation and weakens when the Carbon Exchange issuance event occurs. Additionally, non-event testing revealed a significant difference in AAR, potentially indicating information leakage, as several national press reported the plan to ratify the regulations in June 2023, while the launch of the Carbon Exchange occurred in September 2023.

Keywords: *Average abnormal return, trading volume activity, carbon exchange, event study.*

1 Introduction

Social and environmental issues are a major concern worldwide, as seen through the establishment of various financial institutions focusing on sustainable development. Some of these initiatives include the Global Reporting Initiative (GRI), which provides guidelines for preparing sustainability reports covering economic, social, and environmental aspects. Indonesia has also taken steps in this direction, with its Financial Services Authority establishing a Carbon Exchange through the Financial Services Authority Regulation Number 14 of 2023 concerning Carbon Trading. This regulation was approved on August 2, 2023, and the Carbon Exchange was officially launched on September *

26, 2023.

The introduction of carbon trading can be advantageous for companies with low carbon emissions. Research by [3] and [13] has shown a significant positive effect on stock returns. The implementation of regulations and the establishment

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of the Carbon Exchange are external events that can impact stock market reactions, aligning with the efficiency market hypothesis of [6].

The concept of event study research, initially explored by [2] in relation to corporate earnings announcements and stock price changes, remains relevant. Recent studies include research by [24] on market reactions to government policies determining the selling price of coal. [20] also examined the stock market effects of environmental regulation, showing both positive and negative reactions in AR and CAR.

Given the ongoing relevance of event study research and the novelty of the Carbon Exchange, particularly for companies in Indonesia's energy sector, the author aims to analyze the energy sector stock market's reaction to the Carbon Exchange. Additionally, this study will employ a non-event approach to test for similar stock reactions one month before the event period, aiming to establish the uniqueness of the Carbon Exchange event.

2 Literature Review

2.1 Efficient Market Hypothesis

The concept of efficiency market hypothesis was firstly introduced by [6] which states that a market is to be efficient if security prices in the market reflects all available information. [6] further defines the efficient market hypothesis in three forms, namely Weak, Semi-Strong, and Strong Form Efficient Market Hypothesis. Furthermore, [11] divides information groups into three, namely past stock price information, all public information, and all available information including insider information. [14] states that the current price of a stock reflects two types of information, namely already known information and information that still requires conjecture.

2.2 Signaling Theory

Signaling theory comes from the work of [1] who conducted research on the phenomenon of information imbalance regarding product quality between buyers and sellers in the used car market. [1] thinking was then developed by [23] on signal theory, which states that the owner of information provides a signal in the form of information that reflects the condition of a company that is beneficial to the investor.

2.3 Event Study

Event study research is widely associated with the semi-strong form efficiency market hypothesis, which was proposed by [6] and further clarified by [7]. The semi-strong form of the market implies that current stock prices not only reflect past stock prices but also encompass all relevant public information, including financial statements and other additional information. The purpose of event studies is to evaluate whether investors can achieve excess or abnormal stock returns from an event that carries new information content [22]. According to [9], the event studies goal is to assess the extent to which security price returns in the period surrounding an event become abnormal

2.4 Hypothesis Development

Carbon exchange refers to information or events that can cause reactions in the stock market. According to [15], companies with sustainable performance indicators tend to generate higher stock returns in the future. Similarly, [10] found evidence suggesting that companies with lower carbon emissions tend to produce bigger returns on assets and stock returns. These findings align with [6] semi-strong efficient market hypothesis, which posits that current stock prices reflect past stock prices and other public information. [17] also states that the impact of an event is usually reflected in the stock price and transaction volume. Furthermore, [16] noted significant differences in Average Abnormal Returns (AAR), while [21] found a significant difference in Trading Volume Activity (TVA).

H_1 : There is a significant difference in average abnormal returns before and after the event of the ratification of the regulation and the issuance of the Carbon Exchange.

H_2 : There is a difference in trading volume activity before and after the event of the ratification of the regulation and the issuance of the Carbon Exchange.

3 Research Method

3.1 Research Model

This research is a quantitative study using event and non-event approaches to test the consistency of the energy sector stock market reaction to the ratification and issuance of the Carbon Exchange in Indonesia in a certain event window. Events related to regulations usually involve a series of announcements, so that in this study 2 (two) events will be used, namely the ratification of the Carbon Exchange regulation on August 2, 2023 (± 10 days) and the issuance of the Carbon Exchange on September 26, 2023 (± 10 days). For the non-event approach, the research was conducted 1 (one) month before the first event, namely July 2, 2023 (± 10 days).

3.2 Population and Sample

The population in this research were all shares of energy sector companies listed on the Indonesia Stock Exchange (IDX) as many as 83 issuers. For sampling techniques using purposive sampling method. The samples used in this study were 47 samples with the criteria of being consistently listed on the Indonesia Stock Exchange and having complete data during the study period, not taking corporate action during the study period, and actively traded during the study period. The data processed and tested were obtained from [12] and [27].

3.3 Data Analysis Method

To calculate the AAR, it is necessary to calculate the actual return and expected return first and calculate the abnormal return using the following formula [24]:

$$\text{Actual return: } R_{i,t} = P_t - P_{t-1} P_{t-1} \quad (1)$$

(2)

Expected return: $E[Ri,t]=RMi,t-RMi,t-1RMi,t-1$

(3)

Abnormal return: $ARi,t= Ri,t- E[Ri,t]$

(4)

Average abnormal return using the market adjusted model (Brown and Warner, 1985)[4]: $AARt=t=ikARi,tn$

(5)

Trading volume activity (Foster, 1986)[8]: $TVAit=\sum trading\ shares\sum outstanding\ shares$

Before hypothesis testing, the data normality test was conducted first with the Shapiro-Wilk test to determine the next type of hypothesis test with a significance level of 5% (α). Data is said to be normal if the p-value > α and is said to be abnormal if the p-value < α. Hypothesis testing whether there is a significant difference in AAR and TVA when before and after the event of the ratification regulation and the issuance of Carbon Exchange is done with the Paired Sample t-test if the data is normally distributed and using the Wilcoxon Paired Sample Test if the data is not normally distributed. The significance level (α) used is 5%. H0 is accepted if p-value > α. H0 is accepted if p-value > α.

4 Results And Discussion

4.1 Results

Descriptive statistics of the AAR data for the first event and non-event describes the statistical value of the AAR data five days before and five days after the event and non-event presented in Table 1. Descriptive statistics of TVA for the first event and non-event describes the statistical value of TVA data five days before and five days after the event and non-event presented in Table 1.

Table 1. Statistic Descriptive

Variable	N	Min	Max	Mean	Stdv.
$AAR_{before\ E1}$	47	-0,027519	0,037643	0,002865	0,015312
$AAR_{after\ E1}$	47	-0,030369	0,024297	-0,002490	0,011016
$AAR_{before\ E2}$	47	-0,044079	0,037411	0,000246	0,015159
$AAR_{after\ E2}$	47	-0,019333	0,112643	0,008342	0,023232
$AAR_{before\ NonE}$	47	-0,026670	0,039806	0,006763	0,011931
$AAR_{after\ NonE}$	47	-0,021736	0,066263	0,000986	0,016597
$TVA_{before\ E1}$	47	0,000009	0,060352	0,004149	0,009919
$TVA_{after\ E1}$	47	0,000006	0,101018	0,004619	0,015054
$TVA_{before\ E2}$	47	0,000004	0,032431	0,003796	0,005949
$TVA_{after\ E2}$	47	0,000003	0,074840	0,006338	0,014926
$TVA_{before\ NonE}$	47	0,000003	0,021617	0,002771	0,005499

$TVA_{after\ NonE}$	47	0,000006	0,022501	0,002826	0,004672

Table 1 shows that the standard deviation of AAR before and after the non-event has a greater value when compared to the mean value where the deviation of AAR before is 0.011931, while the mean AAR before is 0.006763. For the deviation of AAR before and after the ratification regulation of Carbon Exchange, it has a greater value when compared to the mean value where the standard deviation of AAR before is 0.015312, while the mean AAR before is 0.02865. For the deviation of AAR before and after issuance of Carbon Exchange a value that is greater when compared to the mean value where the deviation of AAR before is 0.015159, while the mean AAR before is 0.000246. This shows that the data distribution is quite large because the prices and abnormal returns of stocks in the energy sector vary greatly.

For the deviation of TVA before and after the non-event has a greater value when compared to the mean value where the deviation of TVA before is 0.005499, while the mean TVA before is 0.002771. For the deviation of TVA before and after the first event, it has a greater value when compared to the mean value where the standard deviation of TVA before is 0.009919, while the mean TVA before is 0.004149. For the deviation of TVA before and after issuance of Carbon Exchange, it has a greater value when compared to the mean value where the deviation of TVA before is 0.005495, while the mean TVA before is 0.003796. Similar to the AAR, this shows that the spread of the data is quite large because the trading volume of energy sector stocks varies greatly.

Judging from the mean AAR value, the first event tends to decrease as seen from the mean AAR of the first event before the ratification of the Carbon Exchange regulation of 0.002865 to -0.002490. This indicates that the energy sector stocks reacted negatively to the ratification of the Carbon Exchange regulation. An increase in the mean value occurs in the TVA variable in the first event and non-event due to many energy sector stock investors who make transactions in energy sector stocks but are more dominated by selling, considering that the AAR of the Carbon Exchange ratification event and non-event has decreased.

Table 2. Hypothesis Test

Variable	N	Data Normality	α	Sig.	Results
$AAR_{before\text{-}after\ E1}$	47	Normal	*0,05*	0,026	Significant
$AAR_{before\text{-}after\ E2}$	47	Abnormal	*0,05*	0,052	Not Significant
$AAR_{before\text{-}after\ NonE}$	47	Abnormal	*0,05*	0,004	Significant
$TVA_{before\text{-}after\ E1}$	47	Abnormal	*0,05*	0,028	Significant
$TVA_{before\text{-}after\ E2}$	47	Abnormal	*0,05*	0,505	Not Significant
$TVA_{befora\text{-}afte\ NonE}$	47	Abnormal	*0,05*	0,06	Significant

In Table 2, it is seen from the results of hypothesis testing on the first event using the Paired Sample t-test that the value of sig. is 0.026 or smaller than the predetermined significance level of 0.05. If the p-value < α, it can be concluded the null hypothesis (H_0) is rejected or there is a significant difference in AAR before and after the ratification of Carbon Exchange in energy sector stocks. In the second event, the value of sig. is 0.052 or greater than the predetermined significance level of 0.05. If the p-value > α, it can be concluded that the null hypothesis (H_0) is accepted or the difference of AAR is not significant before and after the issuance of the Carbon Exchange on energy sector stocks. In the non-event period, the sig. value is 0.004 or smaller than the predetermined significance level, which is 0.05 so that H_0 is rejected or the difference of AAR is not significant.

Seeing the results show that the AAR in the non-event is significantly different and the AAR in the second event is not significant, it is estimated that there is an early information leakage around the non-event period. Non-event hypothesis testing is carried out to see whether the event of the ratification of the regulation and the issuance of the Carbon Exchange is a unique event or not. Given that this research is a multi-event study and the two events are interrelated and see whether the Carbon Exchange is a unique event or not, it can be concluded that from the results of the first hypothesis test, H_0 is rejected or there is a significant difference in AAR before ratification regulation of Carbon Exchange and after ratification regulation of Carbon Exchange and than weakens in the Carbon Exchange issuance event and the Carbon Exchange event is not thought to be a unique event because it is caused by information leakage.

In Table 2, it can be seen that the results of hypothesis testing on the first event show that the sig. value is 0.028 or smaller than the predetermined significance level of 0.05. If the p-value < α, it can be concluded the null hypothesis (H_0) is rejected or there is a significant difference in TVA before and after the ratification of the Carbon Exchange in energy sector stocks. The second event shows the result of the sig. value is 0.505 or greater than the predetermined significance level of 0.05. If the p-value > α, it can be concluded that the null hypothesis (H_0) is accepted or there is no significant difference in TVA before and after the issuance of the Carbon Exchange on energy sector stocks. In the non-event period, the sig. value is 0.006 or smaller than the predetermined significance level, which is 0.05 so that H_0 is rejected or there is a significant difference in TVA. The results of this second hypothesis test are also in line with the results of the first hypothesis test. This means that significant changes in AAR are also followed by significant changes in TVA. Given that this research is a multi-event research and the two events are interrelated, it can be concluded that from the results of the second hypothesis test, H_0 is rejected or there is a significant difference in TVA before and after ratification of Carbon Exchange regulation and weakening in the Carbon Exchange issuance event. The Carbon Exchange event is suspected not to be a unique event because it is caused by information leakage.

4.2 **Discussion**

Testing the first hypothesis (H_{a1}) uses the Paired Sample t-test to test the difference in AAR before and after the ratification of the Carbon Exchange regulation on August 2, 2023. While the Wilcoxon Paired Sample Test was used to test the difference in AAR before and after the issuance of the Carbon Exchange on September 26, 2023 due to non-normally distributed data. As a comparison to the results of the first hypothesis, testing was also carried out on the difference in AAR for the non-event period on July 2, 2024 or 1 (one) month before the event of the ratification of the Carbon Exchange regulation to see whether the Carbon Exchange event was a unique event or not.

Based on the results of the first and second hypothesis tests on the event of the ratification of the Carbon Exchange regulations on August 2, 2024, it is stated that there are significant differences in AAR and TVA before and after the ratification of the Carbon Exchange regulations. The results of the first and second hypothesis tests on the event of the issuance of the Carbon Exchange on September 26, 2024 stated that there were no significant differences in AAR and TVA before and after the issuance of the Carbon Exchange. So it can be concluded that H_{a1} and H_{a2} are accepted or there is a significant difference in AAR and TVA before and after the ratification of the Carbon Exchange regulation and weakens when the Carbon Exchange issuance event occurs.

In testing the non-event hypothesis, it was found that there were significant differences in AAR and TVA before and after July 2, 2023 or a month before the Carbon Exchange regulation was passed. When viewed as a whole and comparing the results of the first hypothesis test with the non-event hypothesis test, the event of the ratification of the Carbon Exchange regulations and issuance is not a unique event.

The significant difference in AAR and TVA around July 2, 2023 may be due to the leakage of information about the planned ratification of the POJK Carbon Exchange in June 2023 and the issuance or operational launch of the Carbon Exchange by OJK in September 2023 reported by [5], [19], and [26] on May 8, 2023. In the end, the market responded to the event of the ratification of the regulations and the issuance of the Carbon Exchange earlier considering that when the event of the issuance of the Carbon Exchange on September 26, 2023 showed that there was no significant AAR and TVA. Meanwhile, when the event of the ratification of the Carbon Exchange regulation, the market was surprised by the ratification of the Carbon Exchange regulation, which was delayed in August from the initial plan in June. Based on the results of the first hypothesis test, it shows that the energy sector stock market reacts significantly negatively to the event of the ratification of the Carbon Exchange regulation even though it starts to weaken when the Carbon Exchange issuance event occurs, and this is in accordance with the semi-strong efficient market hypothesis theory which shows that an event contains information and can affect market conditions but there is an early information leakage.

The results of this study are in line with research conducted by Kulal, et al. (2020)[16] which states that there is a significant difference in AAR on an event. This research is also in line with that conducted by [18] where AAR reacts to an event but in a short period of time where in this study at the event of the

ratification of the Carbon Exchange regulation there was a significant difference and while when the next event, namely the issuance of the Carbon Exchange, the results obtained there was no significant difference in AAR. Other research results on trading volume activity are conducted by [21], which state that there is a significant difference in TVA before and after the event. [13] added that companies that have high carbon emissions are more vulnerable to the risk of implementing environmental regulations by the government and tend to have negative abnormal returns.

5 Conclusion And Recommendation

5.1 Conclusion

The results of research on the energy sector market reaction to the ratification of regulations and the issuance of the Carbon Exchange showed that there were significant differences in AAR and TVA before and after the event of the ratification of the Carbon Exchange regulations and weakened in the event of the issuance of the Carbon Exchange. In testing the non-event period, it was found that there was a significant difference in AAR and TVA. This may be due to information leakage because some press have reported the plan to pass the Carbon Exchange regulation in June and the issuance of the Carbon Exchange in September, which affects the results of hypothesis testing on the event of the issuance of the Carbon Exchange on September 26, 2023 and which is not significant.

5.2 Recommendation

The results of this study are expected to influence stock trading decisions when specific events occur, such as the approval of regulations and the launch of the Carbon Exchange. Investors can consider including green investments in their portfolio. Given the negative response of the energy sector stock market to the Carbon Exchange, energy sector issuers should consider transitioning to the green energy industry. Future researchers are encouraged to explore research on other sectors that are not closely related to carbon emissions (such as the financial sector), expand the research area to the Asia Pacific region, extend the research period by comparing non-events one year earlier, and estimate abnormal returns using alternative models such as the OLS market model to see whether the final results obtained are the same or different.

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