Firm Size, Leverage, Liquidity, and Profitability Effect on the Disclosure of Carbon Emissions

(Study on Non-Banking LQ-45 Index Stocks on the Indonesia Stock Exchange 2017-2021)

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Abstract

This study aims to examine and analyze the effect of firm size, *leverage* , liquidity, and profitability on carbon emissions. This type of research uses quantitative methods. The data in this study uses secondary data obtained from the annual financial report data of companies on the non-banking Indonesia Stock Exchange that are listed on the LQ-45 Index for 2017-2021. The sample companies used were 27 companies with a total data of 135 for 5 years of observation using *purposive sampling method* . The results of this research show that *leverage* , liquidity, and profitability have an effect on the disclosure of carbon emissions. Meanwhile, the firm size variable has no effect on the disclosure of carbon emissions.

Keywords: Firm size, leverage, liquidity, profitability, carbon emissions.

1. Introduction

Global warming is a problem that is of public concern besides the Covid-19 pandemic. Global warming is a special mechanism, namely the release of carbon dioxide into the earth's atmosphere (Kelvin et al., 2017). The Paris Agreement, which aims to reduce global warming by no more than 2°C until 2100. In addition, Indonesia participates in efforts to reduce greenhouse gas emissions on a world scale by ratifying the Paris Agreement through Law no. 16 of 2016. Another form of Indonesia's commitment can be seen in Presidential Decree No. 61 of 2011 concerning the National Action Plan for Reducing Greenhouse Gas Emissions (RAN-GRK) and Presidential Decree no. 71 of 2011 concerning the Implementation of a National Greenhouse Gas Inventory (Rusmana and Purnaman, 2020).

Climate change is one of the issues that keeps popping up in various countries. Frequent climate change is caused by global warming which is getting worse and causing temperatures to rise due to the effectsof greenhouse gases such as carbon dioxide, methane, *ChloroFluoro Carbons* (CFCs), and dinitrooxides(Florencia &Handoko, 2021). This process allows the release of gases trapped in the Earth's atmosphere and radiates energy throughout the atmosphere, with most of the energy going to the bottom of the atmosphere to prevent chaos. The result can be extreme weather changes, the average surface temperature of the Earth has increased since the late nineteenth century to 1.62 degrees Fahrenheit (0.9 degrees Celsius).

According to Hail and Leuz (2009) found strong evidence that *cross-listing* in the United States caused significant losses for each company and caused the cost of *equity* to rise above the average value of the company. Reducing the cost *of equity* is another benefit that companies obtain from disclosure, particularly disclosure of carbon emissions. Booston and Plumlee (2002) explain that companies with strong beliefs will have a lower level of *cost of equity (COE).* Low *cost of equity when used as a tool to limit carbon emissions and has benefits for the value of each company.*

Deteriorating quality of environmental areas can be identified by quality status or by mutation. Greenhouse gases are divided into two types: industrial greenhouse gases and natural greenhouse gases. Unlike the greenhouse gas industry, which originates from industrial activities carried out by a group of people, natural greenhouse gases are products of natural cycles that can be easily accessed by land and air (Ferdinand et al., 2021). Industrial activities increase the concentration of carbon dioxide, so that it is impossible for the air to accommodate all of it and produce more carbon (Ministry of Environment, 2012). The company is obliged to notify the public about all incidents related to the environment in which the company operates. This situation can be informed by the company through disclosure in the company's annual report.

As firm size increases, the possibility to disclose carbon emissions also increases. Large corporations, sometimes known as public businesses, can be identified as having a greater responsibility for governments, lenders and investors than the general public (Suhardi and Purwanto, 2015). Therefore, companies with large sizes will continue to improve their ability to disclose company information, including in terms of their ability to disclose carbon emissions.

leverage will result in reduced disclosure of carbon emissions, as a result companies must be careful in using funds because disclosing carbon emissions will increase the company's operational costs (Zanra, et al 2020). As the company's *leverage increases, the level of stakeholder* anxiety increases, resulting in larger creditors. Compared to making disclosures, companies with high levels of *leverage* will have more resources needed to fulfill their creditor obligations because making disclosures, such as environmental disclosures, will only add to the burden on the company (Nugraha, 2015).

This study aims to test and analyze firm size on disclosure of carbon emissions, *leverage* on disclosure of carbon emissions, liquidity on disclosure of carbon emissions, and profitability on disclosure of carbon emissions. This research is a development of research Wiratno&Muaziz, (2020)entitled Profitability, Firm Size, and Leverage Affecting Disclosure of Carbon Emissions, with the update adding an independent variable, namely liquidity. Research Wiratno&Muaziz, (2020)gives the result that the *leverage variable* has an influence on the disclosure of carbon emissions. Another difference lies in the update of the research period, this research was conducted on non-banking LQ-45 index stocks on the Indonesia Stock Exchange in 2017-2021.

The reason for the author taking the LQ-45 index as material for thesis research is because LQ-45 shares are one of the most actively traded stocks on the stock exchange so that they can continuously experience changes, then the time used for this research starts from 2017 to 2021 so it can be said that there will be a change of different companies on the LQ-45 index for five years.

2. Theoretical basis
Stakeholder Theory

Stakeholders can understand the conditions and perspectives of the company, as well as identify and reduce any business risks that may arise as a result of climate change, by implementing disclosure of carbon emissions. *Stakeholders* have the responsibility to fully understand the information relating to company activities. Environmental disclosure, like carbon emissions, indicates that a company has a responsibility towards the surrounding environment.

Stakeholder expectations for climate change vary, therefore in fulfilling their expectations they will directly or indirectly give pressure to companies to report disclosure of environmental information (including disclosure of carbon emissions) (Borghei-Ghomi& Leung, 2013).

Legitimacy Theory

Disclosure *of* carbon emissions uses the theory *of legitimacy* , because there are government regulations regarding the relationship between companies and communities . *Legitimacy* theory is a theory that is widely used to explain environmental disclosure. According to Dowling & Pfeffer (1975) organizational legitimacy is a key concept that develops into a legitimate theory.

In the opinion of O'Donovan (2002) that legitimacy theory states that if the possibility of social prejudice against organizations involved in harmful behavior, so does the need for organizational leadership to identify social prejudices that will have a negative impact on organizational *legitimacy*. Therefore, every company must understand how legitimacy can be established, maintained and terminated. If the general public sees no fault on the part of any organization, then the organization might just change course or use an alternative strategy to make the situation clearer. The specific steps of this strategy depend on management's perspective on threats to organizational *legitimacy* (Mäkelä&Näsi, 2010).

3. Hypothesis Development

1. Firm size influences the disclosure of carbon emissions

    Firm size can be seen from the number of resources owned by each particular company. The greater the company's daily income, the larger the firm size (Choi et al. 2013). The size of the company can also be seen from the volume of its operational activities. All company operations are not always connected directly to the environment. In addition to carrying out operational activities, a business must also monitor the environment in which these activities are carried out to support its performance (Septiwi, 2019).

    The company's operations as a whole seldom have a continuous relationship with the environment. Therefore, in addition to starting the company's operations, the company must also protect the environment by not disrupting ongoing operations. Companies with more resources will be more able and faster in providing information to external parties. Therefore, large businesses are more likely to disclose carbon emissions than small businesses.

    Sekarini and Setiadi (2021) explain that firm size affects the disclosure of carbon emissions. This research is in line with the research of Jannah and Muid (2014), Suhardi and Purwanto (2015). From the explanation above, the hypothesis can be formulated as follows:

    H1 :Firm size has an effect on disclosure of carbon emissions.

2. *Leverage* affects the disclosure of carbon emissions

    level of *leverage* causes the company to have greater obligations to its creditors because of the need to repay interest expenses and the potential to receive penalties from other parties

(Suhardi&Purwanto, 2015). Leverage causes creditor sensitivity to increase. With increasing leverage, the company's debt to equity ratio also increases. If the right disclosure of carbon emissions is carried out by the company, it can improve the company's image among the general public and reduce company risk.

stakeholder theory , if a company's *leverage* increases, its debt to equity ratio will also increase. Therefore, companies to use the amount of money available to pay off debts rather than disclose carbon emissions because it will result in higher costs and possibly losses for the company (Choi *et al* , 2013). Companies with high *leverage* have little available funds to implement a proactive carbon reporting system because of the high debt burden (Luo *et al* , 2013).

According to Wiratno and Muaziz (2020) stated that *leverage* has a positive effect on disclosure of carbon emissions. Research conducted by Jannah and Muid (2014) states that *leverage* affects the disclosure of carbon emissions. From the explanation above, the hypothesis can be formulated as follows:

H2 :*Leverage* affects the disclosure of carbon emissions.

3. Liquidity affects the disclosure of carbon emissions

According to Gultom, Agustina, and Wijaya (2013) liquidity is a company's ability to meet its short-term obligations. Liquidity can also be referred to as the ability used by individuals or companies to carry out tasks that must be completed immediately and paid for with their current assets. The liquidity ratio describes the company's ability to meet short-term needs (Thaib and Dewantoro, 2017). Liquidity presents the ability of a company to meet the needs of money that must be paid immediately, or the ability of a company to meet the needs of money when billed. The ratio in this case can be calculated by information about working capital, both current assets and liquid assets (Brigham and Houston, 2010).

Companies with high liquidity ratios are also expected to disclose more information to differentiate these companies from other companies with poor liquidity ratios (Aly et al, 2010). Companies with high liquidity ratios tend to choose detailed disclosure accounting policies to keep investors and creditors fully informed about their operating performance, including pollution performance (Freedman & Jaggi, 2005).

Kawedhar and Wardhani, (2019) stated that the independent variable Liquidity has a positive effect on the disclosure of carbon information. From the explanation above, the hypothesis can be formulated as follows:

H3 : Liquidity affects the disclosure of carbon emissions.

4. Profitability affects the disclosure of carbon emissions

Profitability is a policy and decision. Profitability is the company's main tool for generating significant net income from activities carried out during the agreed accounting period (Brigham and Houston, 2010). High profitability will indicate that the fund deposit is good enough to carry out its activities. Companies with stable financial conditions will be more likely to disclose environmental information.

According to Luo et al. (2013) in (Prafitri& Zulaikha, 2016)companies with stable working relationships have the necessary financial capabilities to carry out requests related to the

environment. Meanwhile, companies with weak financial performance will put more emphasis on achieving their financial goals and increasing the level of company performance so that every available capability limits within the company and to improve the prevention and reporting of carbon emissions.

In research (Suhardi and Purwanto, 2015) profitability has an influence on the disclosure of carbon emissions. Meanwhile, according to (Tana and Diana, 2021) in their research, the independent variable profitability affects the disclosure of carbon emissions. In his research proves that high profitability will tend to reveal the condition of the company. From the explanation above, the hypothesis can be formulated as follows:

H4 : Profitability affects the disclosure of carbon emissions.

4. Methodology

The type of research used in this research is quantitative research. Quantitative data is research that is compiled using the collection method in the form of numbers. In this study, causal relationships include disclosure of carbon emissions, firm size, *leverage* , liquidity, and profitability in non-banking LQ-45 index stocks in 2017-2021 . The sampling technique in this study used *purposive sampling* which aims to obtain samples according to the specified criteria. The sampling criteria in this study are as follows:

1. Companies listed on the LQ-45 stock index 2017-2021.
2. Non-banking companies listed on the LQ-45 stock index for 2017-2021.
3. The company has consistently been listed in the LQ-45 index for 2017-2021.
4. LQ-45 companies that do not experience losses during 2017-2021.
5. Companies that provide complete financial report data and *annual reports for 2017-2021*.

Table 1
Research Sample Selection Results

No.	Criteria	Amount
1.	Companies listed on the LQ-45 stock index 2017-2021	335
2.	Non-banking companies listed on the LQ-45 stock index for 2017-2021	(35)
3.	Companies that are not consistently included in the list of stocks in the 2017-2021 LQ-45 index	(130)
4.	LQ-45 companies that experienced losses during 2017-2021	(30)
5.	Companies that do not provide complete financial report data and annual reports for 2017-2021	(5)
	Samples that meet the criteria for one year	27
	Total sample for five years	135
	Number of samples that can be processed	135

In this study the independent variables used were firm size, leverage, liquidity, and profitability, while the dependent variable used was disclosure of carbon emissions. Based on the description above, a research model can be proposed as presented in Figure 1
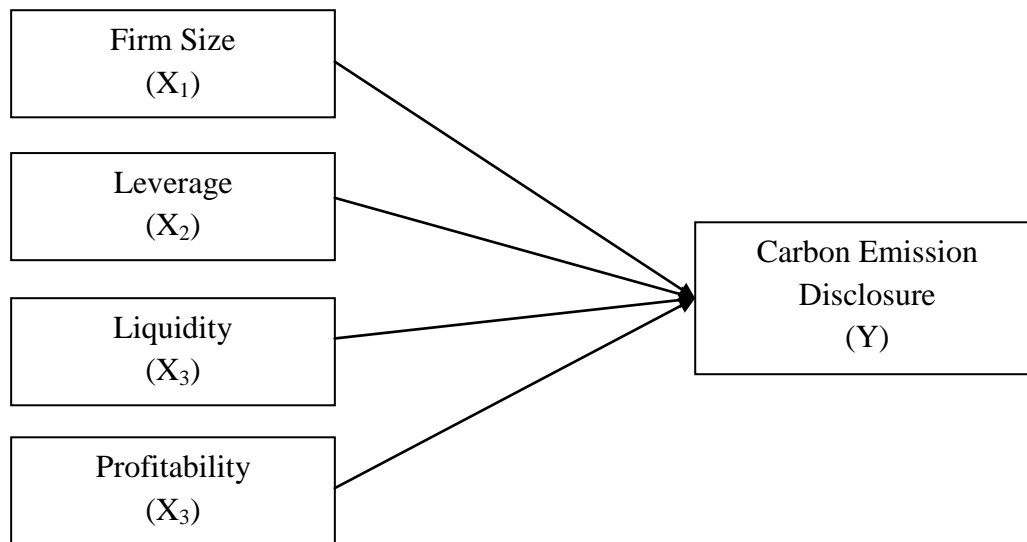

Figure 1 Research Medel

5. Variable Operational Definitions

Disclosure of Carbon Emissions

The dependent variable in this study is disclosure of carbon emissions. Disclosure of carbon emissions is a method used by companies to reduce the amount of carbon emissions produced by companies (Simanihuruk, 2018). The data analysis technique used in this study is multiple linear regression analysis with *dummy variables* .

The type of disclosure of carbon emissions is measured using an index developed by Choi, et al. (2013) which was constructed from *the request sheet of the Carbon Disclosure Project* (CPD). Companies that make disclosures according to the specified items will be given a score of 1 and those that do not disclose are given a score of 0. Then the score 1 is totaled and divided by the maximum number of items, which is 18, then multiplied by 100%. Thus the formula for disclosing carbon emissions used in this study is:

$$CED = \frac{\Sigma di}{M} \; x \; 100$$

Information:

CED $\quad$ = Disclosure of carbon emissions / *carbon emission disclosure*

Σdi $\quad$ = Total score 1 obtained by the company

M $\quad$ = Maximum total items that can be disclosed (18 *items*)

Firm Size

The independent variable firm size is calculated using the natural logarithm of total assets (Ln Assets) both current assets and non-current assets in the context of annual financial reporting. The more total assets owned by a company, the greater the dimensions of the company (Gayatri and Suputra, 2013). Information regarding total assets can be seen in the consolidated statements of financial position. Firm size can be calculated by the following formula:

$$Size = \text{Ln (Total Assets)}$$

leverage

Leverage is a comparison between total debt to total assets of a company (Choi et al, 2013). The management of a company with a high level of *leverage* will reduce the disclosure of environmental responsibility related to carbon emissions so that it does not become a topic for debtholders .(Suhardjanto&Choiriyah, 2010). *Leverage* is measured using *the Debt to Asset Ratio* (DAR). *Leverage* can be calculated using the following formula:

$$Debt\ to\ Asset\ Ratio = \frac{\text{Total Hutang}}{\text{Total Asets}}$$

Liquidity

In analyzing the current ratio there are important things that must be considered, namely what causes the current ratio to be high. If the cause of the high current ratio is accounts receivable or inventory, then the company must take quicker action to address the cause of the receivables or sell inventory to be replaced with cash to pay current liabilities (Thaib& Dewantoro, 2017). The formula is as follows:

$$Current\ Ratio = \frac{\text{Current Asets}}{\text{Current Liabilities}}$$

Profitability

Profitability can be measured using *the ratio of return on assets* . The higher the value of *Return On Assets* , it can be said that the better the company's performance. Companies that have good financial condition are likely to disclose information on carbon emissions. Information on net income can be seen in the company's comprehensive income statement and information on total assets can be seen in the company's consolidated financial statements. *Return On Assets* can be measured by comparing the company's net profit after tax with the company's tital assets. *Return On Assets* can be calculated using the following formula:

$$Return\ On\ Asset = \frac{\text{Net Profit After Tax}}{\text{Total Aset}}$$

6. Data Analysis Technique

The technique used in this study is by using descriptive statistics and multiple linear regression analysis using SPSS (*Statistical Package for Social Science*). Measurements in this study were carried out using statistical values such as mean, standard deviation, variance, maximum, sum, rage, kurtosis, and *skewness* (Ghozali, 2018). The classic assumption tests used in this study are normality, multicollinearity, heteroscedasticity, and autocorrelation tests. Hypothesis testing tests the effect of the independent variables on the dependent variable. This study uses multiple linear regression equations as follows:

$$CE\_Disc = \alpha + \beta_1 SIZE + \beta_2 LEV + \beta_3 LIK + \beta_4 PROF + e$$

Information :

CE_Disc	= Carbon Emission Disclosure
α	= Constant
$\beta_1 - \beta_4$	= Regression Coefficient
SIZE	= Firm Size
LEV	= *Leverage*
LIK	= Liquidity
PROF	= Profitability
e	= Error

7. Results and Discussion
Descriptive Statistics Test

Table 2
Results of Descriptive Statistical Analysis

Variable	N	Minimum	Maximum	Means	std. Dev
Firm Size	135	29,119	33,537	31.23589	0.977684
Leverage	135	0.126	0.876	0.44482	0.181291
Liquidity	135	0.138	8,525	2.22519	1.717552
Profitability	135	0.003	0.467	0.09970	0.080807
CED	135	5,556	88,889	49.05361	22.362143
Valid N (listwise)	135				

Source: Data Analysis Results, 2023

Based on the descriptive results presented in table 2, it can be explained that the number of samples (N) of LQ-45 companies listed on the Indonesia Stock Exchange in 2017-2021 was 135. From the results of the data above it can be seen that disclosure of carbon emissions has the highest standard deviation of 22 , 362143 which means that disclosure of carbon emissions has the highest data standard while profitability has the smallest deviation of 0.080807.

Normality test

Table 3
Normality Test Results

Variable	Kolmogorov-Smirnov	Sig	Information
Unstandardized residuals	0.0 79	0.346	Normal

Source: Results of Data Analysis. 2023

Based on the results of the normality test using the *Kolmogorov-Smirnov method* through the Monte Carlo approach, it shows a significant value of 0.346, it can be concluded that the residual data is normally distributed because the significance value is > 0.05.

UMulticollinearity

Table 4
Multicollinearity Test Results

Variable	tolerance	VIF	Information
Firm Size	0.775	1, 290	There is not multicollinearity
Leverage	0.483	2,070	There is not multicollinearity
Liquidity	0.409	2,442	There is not multicollinearity
Profitability	0.925	1,081	There is not multicollinearity

Source: Data Analysis Results, 2023

Based on the test results above, it shows that all independent variables have a calculated *tolerance value* of > 0.10 and a calculation of the VIF *variance inflation factor value < 10, so it can be concluded that there is no multicollinearity.*

Heteroscedasticity Test

Table 5
Heteroscedasticity Test Results

Variable	sig.(2- tailed)	Information
Firm Size	0.767	There is noHeteroscedasticity
Leverage	0.397	There is noHeteroscedasticity
Liquidity	0.848	There is noHeteroscedasticity
Profitability	0.137	There is noHeteroscedasticity

Source: Data Analysis Results, 2023

In this test, the researcher used the *glejsermethod* , the basis for determining whether there is heteroscedasticity. If significance > 0.05 then there is no heteroscedasticity. In this study, the significance value of all independent variables exceeded the confidence level of 0.05 (5%) so that it can be said that the regression model did not have heteroscedasticity.

Autocorrelation Test

Table 6

Autocorrelation Test Results

Du	Durbin-Watson	4-du	Conclusion
1.76450	2.008	2.2355	No Autocorrelation Occurs

Source: Data Analysis Results, 2023

From the test results above, the DW value (durbinwaston) is 2.008. In this study, there were 4 independent variables and a total sample of 135, DU table < DW statistics < (4-DU table); 1.76450 < 2.008 < 2.2355, it can be concluded that the data does not have autocorrelation.

Multiple Linear Regression Test

Table 7

Multiple Linear Regression Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	std. Error	Betas		
1	(Constant)	34,163	70,604		0.484	0.629
	Firm Size	0.940	2.158	0.041	0.436	0.664
	leverage	-32,106	14,739	-0.260	-2.178	0.031
	Liquidity	-3,374	1,690	-0.259	-1,997	0.048
	Profitability	73,273	23,891	0.265	3,067	0.003

Source: Data Analysis Results, 2023

Based on table 7 above, a regression equation can be made which will complement the results found in the study:

CE_Disc = 34.163 + 0.940 SIZE - 32.106 LEV - 3.374 LIK+ 73,273 PROF+ e

Based on the test results of the coefficient of determination (*Adjusted R Square)* shows the valueof 0.076 or 7.6%. This shows that the independent variables, namely firm size, *leverage* , liquidity, and profitability can explain the variation of the dependent variable, namely the disclosure of carbon emissions of 0.076 or 7.6% while the remaining 92.4% (100% - 7.6%) is explained by other independent variables not included in this study.

Based on table IV.9 the results of the simultaneous F test show a significant value of 0.006. The significance value produced by the F test is less than 0.05, so it can be concluded that the multiple

regression model meets the requirements and can be said to be a *fit regression model* or feasible to use.

Based on the test results, it can be explained as follows:
1. Firm Size

   Based on the t test of the first hypothesis (H $_1$), namely firm size. And looking at the results of the t test in table IV.10 it can be concluded that firm size has a significant value of 0.664 greater than 0.05. This shows that H1 $_{is}$ rejected. It can be interpreted that firm size has no effect on disclosure of carbon emissions.

2. *leverage*

   Based on the t test of the second hypothesis (H2 $_)$, namely *leverage* . And looking at the results of the t test in table IV.10 it can be concluded that *leverage* has a significant value of 0.031 which is less than 0.05. This shows that H2 $_{is}$ accepted. It can be interpreted that *leverage* affects the disclosure of carbon emissions.

3. Liquidity

   Based on the t test of the third hypothesis (H $_3$), namely liquidity. And looking at the results of the t test in table IV.10 it can be concluded that liquidityhas a significance value of 0.048 less than 0.05. This shows that H3 $_{is}$ accepted. Can be interpreted that liquidityeffect on the disclosure of carbon emissions.

4. Profitability

   Based on the t test of the fourth hypothesis (H $_4$), namely profitability. And looking at the results of the t test in table IV.10 it can be concluded that profitabilityhas a significance value of 0.003 less than 0.05. This shows that H4 $_{is}$ accepted. It can be interpreted that profitabilityeffect on the disclosure of carbon emissions.

8. Conclusion

This study aims to empirically examine the effect of firm size, *leverage* , liquidity, and profitability on disclosure of carbon emissions in companies on the non-banking Indonesia Stock Exchange that are listed on LQ-45 Index shares for 2017-2021. Based on the results of the tests and discussions that have been carried out in this study, the following conclusions can be drawn:
1. Firm size has no effect on disclosure of carbon emissions with a significance value of 0.664 greater than 0.05. The size of the company has no effect on the disclosure of carbon emissions.
2. *Leverage* affects the disclosure of carbon emissions with a significance value of 0.031 which is less than 0.05. The level of *leverage* has an effect on the disclosure of carbon emissions.
3. Liquidity affects the disclosure of carbon emissions with a significance value of 0.048 which is less than 0.05. High or low liquidity affects the disclosure of carbon emissions.
4. Profitability affects the disclosure of carbon emissions with a significance value of 0.003 which is less than 0.05. The level of profitability affects the disclosure of carbon emissions.

9. Suggestion

Based on the results of the analysis and conclusions in this study, there are suggestions that can be considered for future research. These suggestions are expected to provide an overview and more knowledge for future researchers for better results:

1. This study uses independent variables, namely firm size, *leverage* , liquidity, and profitability to determine the effect on disclosure of carbon emissions. It is the hope of the researcher for further research to use and add other independent variables such as organizational visibility and regulatory pressure.

2. This study only uses samples of non-banking companies listed on the LQ-45 stock index for 2017-2021. For future researchers, it is expected to use a broader research scope.

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