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Carbon Disclosure, Carbon Performance, and Market Value: Evidence from Indonesia Polluting Industries

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ABSTRACT

The purpose of this study is to investigate the impact of carbon disclosure, carbon performance, carbon reduction target, and environmental performance on the market value. This study used 33 samples of the company in the polluting sector industry in Indonesia during the period 2017-2021. Secondary data were collected from the company's website and content analysis was used to score carbon information disclosed in stand-alone sustainability report. This study used OLS regression to test the hypotheses. The results show carbon performance and environmental performance are valued by investors in making investment decisions that effect market value. On the other side, carbon disclosure and carbon reduction target do not have a significant effect on market value. We argued that the majority of Indonesian investors only focus on the outcome of environmental management without paying attention to detailed information.

1. INTRODUCTION

In 21st century, climate change is a concern and becomes the greatest issue for all countries worldwide [1-3]. The main cause of climate change is the increase in Greenhouse Gas (GHG) emissions which consist of carbon emissions and other GHG emissions [4]. Fossil fuel combustion is claimed to be the highest carbon dioxide and other GHG emissions producer from economic activities [5, 6].

GHG emissions have continued to increase over decades [7] and Indonesia as the fifth carbon emitter in the world was one of the Kyoto Protocol signatories to reduce carbon emissions [8, 9]. Together with 191 countries, Indonesia ratifies the Kyoto Protocol and has strong commitment to reducing carbon emissions by 29% in 2030 [10], which is shown by the establishment of environmental management regulation as stated in Law no. 32 year 2009 on Protection and Management of the Environment [11]. Besides that, the government also initiated the PROPER (Program for Pollution Control, Evaluation and Rating), which is an environmental management assessment program developed by the Ministry of Environment [12]. Therefore, the PROPER indirectly encourages companies to adjust their business activities that effect the environment [13-15].

As climate change becomes global issue, investors start to pay attention to environmental issues [16, 17], which encourages companies to disclose their carbon information that can be informed through stand-alone sustainability reports [18]. In preparing sustainability report, most companies in Indonesia used GRI guidelines which were developed to disclose environmental material information in the report [19, 20]. However, the disclosure of carbon information is voluntary in Indonesia, therefore not all Indonesian companies disclose it.

Companies in voluntary countries disclose their carbon information only to manage stakeholders' expectations and improve the company's image [21, 22] which eventually may also effect investors' assessment and perception that is reflected in the company's market value. Hardiyansah et al. [23], Jiang et al. [24], and Sra et al. [25] found that the more carbon information is disclosed the higher the market value. In the contrary, Alsaifi et al. [26], and Muhammad and Aryani [27] found that carbon disclosure effects the market value negatively. While research conducted by Kurnia et al. [28], found that carbon disclosure that is not accompanied by an increase in financial performance, is not valued by the investors.

Based on GRI guidelines, companies are required to disclose the amount of carbon emissions produced [29]. The company's ability to control carbon emissions produced is called carbon performance [30]. Having good carbon performance will lead to good reputation of the company [31], which eventually may effect to higher market value. Research by Baboukardos [32], Haque and Ntim [33], and Choi and Luo [34] show that good carbon performers may improve company's image. However, good carbon performers may be poorly valued by investors, because it does not increase the company's financial performance [35, 36].

As carbon performance is part of environmental management [37], having good environmental management will lead to higher environmental performance [38]. Sarumpaet et al. [12] found that market values the environmental performance achievement differently. Good environmental performers are assumed by the market to give added value to the company. Meanwhile, Mardiana and Wuryani [39], Nur Utomo et al. [40], and Rusmana and Purnaman [41] found that environmental performance positively effects market value. In the contrary, Deswanto and

Siregar [11] found that environmental aspects are not investor's concern when making investment decisions.

Based on the previous study, there are conflicting results regarding the environmental factors that effect investors' assessment of the company which can be reflected by the market value. Hence, our study aims to investigate the impact of carbon disclosure, carbon performance, carbon reduction target, and environmental performance on the market value. Therefore, this study contributes to the literature by providing insight into how the Indonesian investor reacts to the environmental aspects related to carbon emissions of polluting companies since disclosure of carbon information in Indonesia was still voluntary. This study includes 33 polluting companies in Indonesia that disclose their carbon emissions in their sustainability report as our samples. We focus on Indonesian high polluters companies because as high polluters, they need to allocate big expenditures to restoring and managing their environment [1, 42] which is expected to impact investors' returns. The content analysis is used to assess and score the sustainability report quality based on the disclosure of items according to GRI 305, which is the measurement of carbon disclosure. Carbon performance is measured by carbon intensity which can be calculated by dividing carbon emissions deflated by sales. Our carbon reduction target is measured by given scores for the disclosure of the company's carbon reduction target in the sustainability report. Then, environmental performance is measured by the company's PROPER ratings.

This paper is organized as follows. Section 2 discusses literature review and hypothesis development. Section 3 presents the research methodology which contains variables definitions and research model. Section 4 presents the empirical results and discussion. The last section discusses the conclusion and implications.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Carbon disclosure

Stakeholders have the right to know company activities that have an impact on the environment [43], therefore it encourages companies to disclose their carbon information [44]. In preparing carbon disclosure, companies need to collect various information, such as information on carbon emissions produced, either directly or indirectly [45]. Companies can disclose their carbon emissions information in stand-alone sustainability reports or annual reports [46].

The disclosure of carbon information is closely related to legitimacy theory. According to legitimacy theory, the company's presence can be accepted by the community if company's activities are within the norms and boundaries that exist in society [47]. Companies that are not responsible for the environment can cause their legitimacy to be threatened [48]. Therefore, companies need to disclose more carbon information to show that companies participate in mitigating climate change, which is closely related to GHG emissions [49-51]. High disclosure of carbon information can support companies to survive [25].

As climate change issue becomes a concern of stakeholders [1], companies are required to inform the stakeholders about how they mitigate their impact on the environment. Carbon emissions disclosure is considered as companies' responsibility in responding stakeholders demand for information regarding company's carbon emissions [23]. By disclosing carbon information, the company may improve its image in society, which will increase stakeholder' supports and effect the sustainability of the company [21, 23]. Therefore, it attracts and increases investor assessment of the company and makes investors dare to invest in the companies which may lead to the higher market value of the companies [23-25]. Given this, we hypothesized that:

H_1: Carbon disclosure has significant effect on market value.

2.2 Carbon performance

Companies need to pay attention to the impact of their business activities on the environment. Environmental issues, especially carbon emissions, have received much attention worldwide. Carbon emissions produced from the use of fossil fuels are divided into three scopes. Scope 1 is the scope of all emissions that are produced directly from sources controlled by the company [52, 53]. Scope 2 is the scope related to emissions that are generated indirectly from energy use [52, 53]. Scope 3 is the scope related to emissions resulting from processes outside the company and factors other than scope 2 [52, 53]. As carbon emissions are the main cause of climate change, it is important for companies to have good carbon performance [4]. Carbon performance can be interpreted as the result of management activities in managing the carbon emissions produced [30], where the lower the carbon emissions produced, the better the company's carbon performance.

Stakeholder theory explains that companies in achieving their goals must not sacrifice the interests of stakeholders [54]. In addition, legitimacy theory provides a view that companies need to act in accordance with the norms and boundaries that exist in society to maintain their legitimacy [47]. Therefore, the company will try to reduce the carbon emissions produced as an effort to convince stakeholders that the company pays attention to the impact of its business activities on stakeholders. The company's success in reducing carbon emissions may retain the company's legitimacy, since it shows the company's concern for its environmental issue and meets stakeholders' expectations [33]. By maintaining good relations with stakeholders and the company's legitimacy, the sustainability of the company can be guaranteed [40, 47] which may increase investor assessment to invest in the company that will effect the market value of a company. Given this, we hypothesize that:

H_2: Carbon performance has significant effect on market value.

2.3 Carbon reduction target

Carbon reduction target shows the company's commitment to reducing the carbon emissions it produces [55]. It also shows that companies participate in reducing global carbon emissions [56]. For companies' side, setting target to reduce carbon emissions is an important step in developing a corporate strategy related to climate change [57]. Companies that do not set target to reduce their carbon emissions are less likely to engage in activities for carbon emission reduction compared to companies with clear target [55].

Stakeholder theory focuses on the fulfillment of the

stakeholder's interest. Setting the target to reduce carbon emissions shows that companies do not only focus on profit, but also pay attention to their stakeholders' interests in carbon reduction [57]. Therefore, it can become added value to the company and build good relationships with its stakeholders. Furthermore, investors are willing to invest their funds in environmentally friendly companies which eventually may increase market value. Given this, we hypothesize:

H_3: Carbon reduction target has significant effect on market value.

2.4 Environmental performance

In Indonesia, the environmental assessment is carried out by the Ministry of the Environment in Indonesia by developing a company performance rating program in environmental management called PROPER [12]. The PROPER assessment is carried out based on the company's efforts to control potential land damage, sea water pollution, hazardous and toxic waste, air pollution, water pollution, and meet the requirements of environmental documents and reporting [38]. The rankings in PROPER are reflected in five colors that allow us to recognize company's environmental performance by color scales, starting with the highest rank, namely gold, then green, blue, red, and black [58].

Companies tend to pollute the environment from their business activites which can be caused by the used of fossil fuels [59]. According to stakeholder theory, companies need to be responsible for their impact to meet stakeholders' expectations. Therefore, companies need to carry out environmental management that shows the companies' concern for their stakeholders [60]. Good environmental management leads to higher environmental performance [58]. Rusmana and Purnaman [41] state that environmental performance can be an indicator of investors in assessing the company. Based on Hassel et al. [61], there are two perspectives on environmental performance. First, company with good environmental performance may gain competitive advantage that increases company's competitive value which attract investor attention, therefore, environmental performance is expected to have positive significant effect on market value. Second, good environmental performance needs high investment in environment which decreases company's earnings. Thus, we hypothesize that:

H_4: Environmental performance has significant effect on market value.

3. RESEARCH METHODOLOGY

3.1 Sample and data

The population in this study is all companies listed on the Indonesia Stock Exchange from 2017-2021. The sample selection uses the purposive sampling method, which is a sample selection technique based on certain criteria as follows: (1) Companies in the industrial sectors that pollute the environment based on Clarkson et al. [1] which consist of pulp and paper, chemicals, oil and gas, metals and mining, and utilities; (2) The companies that do not publish separate annual reports and sustainability reports from 2017-2021; and (3) The sustainability report and/or annual report contains the research variables to be investigated. We use secondary data obtained from the Indonesia Stock Exchange website and company's website. The eliminating samples process can be seen in Table 1.

Table 1. Sample selection process

Criteria	Total
Companies in the polluting sector companies based on Clarkson et al. [1].	177
The companies that do not publish separate annual report and sustainability report from 2017-2021.	(112)
Total sample	65
Research period 2017-2021 (years)	5
Total observations (65 × 5 years)	325
The sustainability report and/or annual report does not contain the variables to be investigated.	(248)
Data observation	77

There were 177 companies in the polluting sector based on Clarkson et al. [1]. After we checked the companies' websites, there were only 65 companies that published their sustainability report for the 2017-2021 period, resulting in 325 observations. However, after collecting data, there were 248 observations that did not reveal the amount of carbon emissions they produced, therefore the number of observations involved in this study was 77 observations.

3.2 Variable measurement

Dependent variable of this study is a Market Value (MV), which is measured by natural logarithm of market capitalization. Some study also used market capitalization as measurement of market value, such as Hassel et al. [61], Jiang et al. [24], Shen et al. [57], Sra et al. [25], and Tang et al. [62]. The market capitalization is measured by number of shares outstanding multiplied by the closing share price at the end of a calendar year.

There are four independent variables in this study, which are Carbon Disclosure (CD), Carbon Performance (CP), Carbon Reduction Target (CRT) and Environmental Performance (EP). CD is measured based on the application level GRI standard, especially GRI 305 that consists of 7 groups by using content analysis in company's sustainability report. We use dummy score to assess the disclosure of carbon. We give score 1 for each item that disclosed by the company that according to items in GRI 305, otherwise we give score 0. Then, we divide the score of each group that has been divided by the number of items in each group by the number of groups in GRI 305. We use GRI 305 as our proxy because most companies in Indonesia use the GRI standard in preparing their sustainability report [20], therefore the use of GRI 305 will be relevant to measured CD in Indonesia.

CP is measured by carbon emissions intensity, which is calculated by total emissions in scope 1 deflated by company's total sales. We use the scope 1 emissions because scope 1 indicates company's carbon liability [63], therefore it may effect investor in making investment decisions. The use of carbon emission intensity allows comparisons to be made with companies of different sizes and shows how efficient does the company produced carbon [64].

CRT shows the commitment of company to reduce their carbon emissions produced [57]. We adopt the measurement of CRT from Shen et al. [57]. We give score 1 for the company's that disclosed their target to reduce the carbon

emissions produced, otherwise we give score 0.

EP is measured by PROPER ratings which consist of five color scales from lowest to higher ratings: black, red, blue, green, and gold [58]. We give score 1 to 5 for the lowest to higher ratings. For companies that do not have PROPER ratings, then we give score 0.

This study also includes Firm Size (FS) as a control variable that is measured with the natural logarithm of total assets. With higher assets, the company has resources and capabilities to innovate which will effect MV [65]. Some studies also use FS as control variable in the study, such as study conducted by Clarkson et al. [49], Matsumura et al. [66], Baboukardos [32], Nur Utomo et al. [40], and Haque and Ntim [33].

To test the hypotheses of this study, we use the OLS regression and constructed the following equation:

$$MV_{it} = \alpha + \beta_1 CD_{it} + \beta_2 CP_{it} + \beta_3 CRT_{it} + \beta_4 EP_{it} + \beta_5 FS_{it} + e_{it}$$

MV = Market value
CD = Carbon disclosure
CP = Carbon performance (ton CO_2 eq.)
CRT = Carbon reduction target
EP = Environmental performance
FS = Firm size

The use of OLS regression requires that the model is free from the classical assumption in other words, the model is BLUE [67]. Therefore, we test the classical assumptions consisting of normality, heteroskedasticity, multicollinearity and autocorrelation. After we did the classical assumption test, we found that the model has heteroskedasticity and autocorrelation problem. Based on Hoechle [68], heteroskedasticity and autocorrelation problem can be fixed using clustered standard error.

4. RESULT AND DISCUSSION

4.1 Descriptive statistics and correlation

Table 2 provides the summary descriptive consists of mean, standard deviation, minimum, and maximum value for all variables in this study.

Table 2. Descriptive statistics

Variables	N	Mean	SD	Min	Max
MV	77	30.3728	1.2122	28.3336	31.8697
CD	77	0.2013	0.9975	0.0794	0.3833
CP	77	0.0569	0.0548	0.0006	0.1446
CRT	77	0.5974	0.4936	0.0000	1.0000
EP	77	2.4156	2.1846	0.0000	5.0000
FS	77	31.0440	0.9672	29.5812	32.2485

Of 77 observations, the average MV is Rp 15,515 billion that represents the average market capitalization of the companies in our data set. CD is measured by the number of items in GRI 305 that disclosed by the company. We found that the minimum value of CD is 0.0794 which shows the minimum items that disclosed by the company is 7.94% and the maximum value is 0.3833 which means the company discloses at most 38.33% items in GRI 305. While the mean value of CD is 0.2013, shows that 20.13% of items in GRI 305 have been disclosed by the companies. Therefore, CD in our observations is quite low because no company discloses more than 50% of the items in GRI 305.

The average CP that measured by carbon intensity is 0.0569. It shows that the average company produces 0.0569 carbon emissions per one million rupiah of sales. Therefore, CP shows how efficient the company is in producing carbon. While the average CRT is 0.5974. The larger the average value, the more the number of observations that have set their CRT. Then, the average value of CRT shows that more than half of the observation has set their target to reduce the carbon emissions produced.

On the other hand, EP shows corporate responsibility fulfillment of environmental aspect. The mean value of EP that scaled by PROPER ratings from 1 to 5 is 2.4156 indicates that some of the observations do not have PROPER ratings or have bad EP.

In Table 2, the minimum value of FS is Rp 7,029 billion, while the mean value of FS is Rp 30,354 billion. FS represents the value of assets owned by the companies. Based on Law no. 20 year 2008, company that has net wealth more than ten billion, is categorized as a large company. Therefore, all observations are categorized as large companies.

Table 3 shows Perason's correlations for all variables including dependent, independent, and control variables. It shows that there is high value in correlation matrix between FS and MV (0.7356), therefore we do further check using VIF and resulting VIF value of 2.43. Thus, multicollinearity is not at problematic level.

Table 3. Correlation matrix

	MV	CD	CP	CRT	EP	FS
MV	1.0000					
CD	0.1356	1.0000				
CP	-0.3409	0.2575	1.0000			
CRT	0.1511	0.0579	0.0327	1.0000		
EP	0.3590	0.4403	0.2240	0.0474	1.0000	
FS	0.7356	0.2685	-0.1019	0.0840	0.4160	1.0000

4.2 Regression results

This section provides OLS regression results and discussions of our hypotheses. The results show t-statistic by using clustered standard error in the model. While the discussions are based on two-tail test since the hypotheses do not predict the direction.

From Table 4, the value of R^2 is 64.44%. It shows that all variables in this study can define MV as 64.44%. The remaining 35.56% is explained by other variables outside this study. It also shows that there are 2 independent variables and 1 control variable that effect the market value.

The results show that CD does not effect MV. This result is inconsistent with Alsaifi et al. [26], Muhammad and Aryani [27], Hardiyansah et al. [23], Jiang et al. [24], and Sra et al. [25]. However, this result aligns with Kurnia et al. [28] that also found CD does not effect MV. Therefore, the first hypothesis is rejected.

Second independent variable, CP is measured by carbon intensity. In the regression results, the coefficient has negative value that shows carbon intensity has negative relationship with the market value. The higher carbon intensity will effect to the lower market value. The higher carbon intensity shows the company's carbon performance is low. Therefore, we can conclude that good CP will lead to higher market value which is consistent with Baboukardos [32], Haque and Ntim [33],

and Choi and Luo [34]. Therefore, this result is aligned with the second hypothesis.

Table 4. OLS regression results

Dependent Variable: MV	Coefficient	t-statistic
CD	-0.4663	-0.40
CP	-6.8455	-2.74***
CRT	-0.2505	1.45
EP	0.0986	2.11**
FS	0.7920	6.51***
F-stat	0.0000	
VIF (FS)	2.43	
R^2	64.44%	

*** Significant at the 0.01 level
** Significant at the 0.05 level
* Significant at the 0.1 level

The company's commitment to reduce its carbon emissions produced is not valued by the investors which is shown by no significant relationship with MV. This result is inconsistent with Shen et al. [57] that found significant relationship between CRT and MV. Therefore, this result does not support the third hypothesis.

The last independent variable which is EP is found to have significant relationship with MV, consistent with the study conducted by Mardiana and Wuryani [39], Nur Utomo et al. [40], and Rusmana and Purnaman [41]. The result has positive coefficient, which means that investors value the company's environmental initiatives as a good activity, therefore good environmental performers may gain higher MV. Hence, the fourth hypothesis is accepted.

For the only control variable, FS, we found significant relationship with MV, consistent with Matsumura et al. [66], and Haque and Ntim [33]. FS which is measured by total assets is important for investors in making investment decisions. The result shows that the coefficient of FS is positive, therefore the bigger FS will effect the higher MV.

4.3 Discussions

Legitimacy theory explains that legitimacy is important for the sustainability of the company in society [69]. Disclosure of carbon information can be an important tool to meet stakeholders' interests, therefore the company can maintain its legitimacy [70]. Research conducted by Lee et al. [13] shows that investors tend to dislike environmental management, because it can increase the costs incurred by the company. On the other hand, society and consumers see environmental management as something that distinguishes a company from other companies, thus increasing the value of the company [71].

Carbon disclosure is carried out to show the responsibility of companies in mitigating the impact of their carbon emissions produced to the environment [2]. However, the carbon disclosure that does not effect the market value leads us to argue that investors might focus only on the results of environmental management, therefore investors do not pay attention to detailed carbon information. Furthermore, disclosure of carbon information is still voluntary in Indonesia [28], therefore investors in Indonesia may be less informed about carbon information that may not effect investor in making investment decision.

As one of the main causes of climate change, carbon emissions become a concern of the Indonesian government. Therefore, the government ratifies the Kyoto Protocol as indicated by the issuance of Law no. 17 year 2004. Participation in the Kyoto Protocol will lead to changes in business processes related to GHG emissions produced [13, 14], therefore it is important for companies to control their carbon emissions produced. In stakeholder theory, company is required to pay attention to the interests of their stakeholders in running a business [54]. Besides that, legitimacy theory requires companies to act in accordance with norms and boundaries that exists in society to maintain their legitimacy [47]. As Indonesia ratifies Kyoto Protocol and sets to reduce 29% of emissions in 2030 [10], then by having good carbon performance, the company will support the government's target to reduce the carbon emissions produced, therefore it will build good relations with the government which is part of stakeholders and improves the company's image that will maintain the company's legitimacy, therefore the company is attractive in the eyes of investors.

One form of the company's commitment to reducing carbon emissions is by setting a target to reduce the carbon emissions produced which can lead to the development of environmentally friendly business strategies [55, 57]. Based on legitimacy theory, the company's legitimacy can be maintained if the company acts in accordance with the norms and boundaries that exist in society [47]. If the company does not act as expected in society, then the company's legitimacy will be threatened and experience rejection in the community which has a negative impact on the company's sustainability [72]. The high carbon emissions produced by the company will have a negative impact on society and the company's environment which crosses the boundaries that can be accepted by society. Therefore, by setting target to reduce the carbon emissions produced shows the company's commitment to act in accordance with the norms and boundaries that exist in society. However, setting the target to reduce carbon emissions is not considered as added value to the company that can effect market value since investors focus only on the result of environment management.

Environmental performance is defined as the result of company management's measurement of environmental aspects [73]. PROPER ratings as the proxy of environmental performance are developed and assessed by Ministry of Environment and Forestry in Indonesia [12]. According to stakeholder theory, companies need to consider the impact of their business activities on stakeholders. Environment and society need to be considered in running a business since they are part of the stakeholder [74]. Therefore, good environmental performance can be a way for companies to reduce the negative impact of their business activities on the environment and society. Thus, as in legitimacy theory, when a company operates within the limits and norms accepted by society, the company can maintain its legitimacy, so that the company's sustainability can be guaranteed. In addition, good environmental performance can improve the company's image in the eyes of investors. Then, these things can increase the market value of the company.

Based on the results, firm size as the only control variable that is measured by total assets has significant effect on market value. The higher the total assets effects to the higher the market value. Higher assets will show that the company has capabilities to innovate [65], so that the company has a competitive advantage against its competitors. In addition, higher total asset shows that the company is not likely to bankrupt. Therefore, it attracts investors to invest in the

company.

5. CONCLUSION

This study aims to investigate whether the company's non-financial information related to the environment, such as carbon disclosure, carbon performance, carbon reduction target, and environmental performance effect the market value of the companies in the polluting sector industry in Indonesia. Our study finds that carbon performance and environmental performance effect on market value. Companies that concern with the environment will have a good image and reputation that will lead to higher market value.

This study also finds that carbon disclosure and carbon reduction target do not effect the market value. As Indonesian investors only focus on the results of environmental mangement, detailed information regarding carbon and environmental issues is not investors concerned in making investment. Besides that, disclosure of carbon information is still voluntary in Indonesia, therefore companies do not feel important in measuring and reporting their carbon emissions, therefore investors are less informed about carbon disclosure. The interesting thing that can be seen is that carbon intensity as a proxy of carbon performance and as part of carbon disclosure effects market value, while carbon disclosure does not effect market value. This could be because items related to carbon performance only consist of 2 of the 49 items in the GRI 305 standard, therefore making investors only focus on these 2 items and not pay attention to the disclosure of other carbon items as a whole.

The results of this study have important implication for companies regarding their environmental responsibility to mitigate climate change. As one of the main causes of climate change, carbon emissions need to be controlled and reduced by the company which can be done in various way, such as implementing green production and reducing energy consumption, therefore it will help in preventing climate change from getting worse. On the other hand, reducing carbon emissions produced will result in good environmental and carbon performance which will effect the market value of the company. Therefore, the company needs to pay attention to its business activities that impact the environment.

There are some limitations in this study. First, not all companies published a sustainability report, therefore lack of sustainability reports in collecting the data may not describe the actual situation. Second, the use of content analysis in collecting the data was carried out based on the researcher's understanding of each indicator in GRI 305, so that there could be differences in interpretation and subjectivity in collecting research data. Future research can develop this study by conducting comparative studies across countries. In addition, future research can also add some variables, such as independent, intervening, moderating, control, etc., therefore it can explain market value better.

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