

Profitability Effect Performance and Eco-Efficiency on Company Value using ESG as A Moderation Variable (Study on Energy Sector Companies on The Indonesia Stock Exchange)

Prastiwi Puspa Ningrum*, Yosefa Sayekti, Ririn Irmadariyani

Universitas Jember, Indonesia

Email: 230820301010@mail.unej.ac.id*, yosefa.sayekti@unej.ac.id, ririn.feb@unej.ac.id

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ABSTRACT

The increasing demand for sustainable business practices has encouraged companies to consider not only financial performance but also environmental responsibility and governance quality in creating long-term corporate value. The energy sector, as one of the industries with significant environmental impacts, faces challenges in maintaining profitability while implementing sustainability strategies. This study aimed to examine the effects of profitability and eco-efficiency on company value and to analyze the role of Environmental, Social, and Governance (ESG) as a moderating variable in these relationships. This research employed a quantitative approach using a causal associative design. Data were obtained from annual reports and sustainability reports of energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2019–2024 period. Using purposive sampling, 215 firm-year observations were selected and analyzed through panel data regression using the Fixed Effects Model (FEM) and Moderated Regression Analysis (MRA). The results showed that profitability had a positive and significant effect on company value, whereas eco-efficiency did not significantly influence company value. Furthermore, ESG strengthened the relationship between profitability and company value, indicating that sustainability disclosures enhanced market recognition of financial performance. However, ESG did not moderate the relationship between eco-efficiency and company value. This study concluded that profitability remained a key determinant of corporate value, while sustainability practices required stronger market recognition to generate valuation benefits. The findings provide implications for companies, investors, and policymakers in developing sustainable strategies that integrate financial performance with ESG principles.

INTRODUCTION

The instability of global economic conditions, increasing awareness of climate change issues, and growing pressure on companies to implement sustainable business practices have changed the way investors evaluate corporate performance. Investors are no longer focused solely on a company's ability to generate profits but also consider how the company manages environmental impacts, fulfills social responsibilities, and maintains effective governance practices. The global shift toward sustainability-oriented business models has encouraged companies to integrate environmental and social considerations into their strategic decisions (Ng et al., 2025). The adoption of sustainability parameters, such as Environmental, Social,

and Governance (ESG), has become increasingly important because these factors have been shown to influence investment decision-making processes (Yu et al., 2024).

The global shift toward sustainability has encouraged companies to incorporate environmental and social responsibility into their business strategies. The implementation of ESG indicators has become increasingly relevant due to their potential to influence company value, both directly and indirectly (Zen & Sofie, 2023). Firm value represents investors' perceptions of a company's performance and future prospects, commonly measured using the Tobin's Q ratio (Vaihekoski & Yahya, 2025).

The importance of company value has made its measurement a major concern in evaluating corporate success from the perspectives of investors and capital markets. One widely used indicator for measuring company value is Tobin's Q, as it reflects market assessments of a company's future prospects and overall performance. Jamaludin (2024) explained that a Tobin's Q value above one indicates that the market assigns a valuation higher than the company's asset value, suggesting positive investor expectations regarding future performance. Furthermore, São Paulo and Afandi (2021) stated that Tobin's Q has been consistently applied in various studies on the Indonesia Stock Exchange (IDX) as a proxy for company value and has demonstrated relationships with financial indicators.

The company value of energy sector companies, as measured by Tobin's Q, during the 2019–2024 period exhibited a fluctuating pattern. From 2019 to 2020, Tobin's Q values remained relatively low. However, in 2021, the ratio increased significantly to approximately 28.5, indicating improved market perceptions of the prospects and performance of energy sector companies. Nevertheless, company value gradually declined during 2022 and 2023, reaching approximately 12.8 in 2023. This decline reflected reduced investor perceptions of corporate value during the period. In 2024, Tobin's Q increased again significantly to approximately 29.3. These fluctuations indicate that market valuations of energy sector companies are influenced by changes in internal corporate conditions as well as broader economic and industry dynamics, making it important to examine the factors affecting company value.

Wusono and Stuttgart (2019) explained that eco-efficiency has a positive influence on company value when measured through market-based indicators. Eco-efficiency reflects a company's ability to create economic value through efficient resource utilization while minimizing environmental impacts. Fairus and Murwaningsari (2023) further demonstrated that the implementation of eco-efficiency contributes significantly to increasing company value, as measured by the Tobin's Q ratio.

The implementation of ESG reflects a company's commitment to conducting sustainable business practices by considering environmental, social, and governance aspects. Tumba et al. (2024) explained that strong ESG performance can significantly enhance company value, particularly through environmental and social dimensions. Suretno et al. (2022) further found that environmental and social performance contributes positively to company value, although the influence of governance dimensions may vary depending on organizational conditions.

Company value reflects how markets and investors assess a business entity's strategic position and long-term prospects. This assessment is commonly measured using market-based ratios such as Tobin's Q. Two important factors influencing company value are

profitability and eco-efficiency, while ESG functions as a moderating variable that may strengthen or weaken these relationships. Profitability, often measured using Return on Assets (ROA), indicates a company's effectiveness in utilizing its assets to generate profits (Rizki & Permana, 2024). Higher profitability generally increases investor confidence in the company's stability and future growth potential (Alduais et al., 2023; Susilowati, 2024).

Environmental considerations through eco-efficiency practices also play a strategic role in shaping company value. Eco-efficiency reflects a company's ability to generate economic output while reducing natural resource consumption and environmentally harmful emissions (Bergougui & Satrovic, 2025). Eco-efficiency is positively associated with market perception because it demonstrates corporate competitiveness alongside environmental responsibility. The synergy between eco-efficiency and profitability contributes to the development of more stable and long-term-oriented company value, consistent with increasing stakeholder expectations regarding corporate environmental responsibility. However, the effectiveness of eco-efficiency implementation in enhancing company value is not determined solely by environmental efficiency but is also influenced by governance quality and the company's overall commitment to sustainability (Issa et al., 2025).

The presence of Environmental, Social, and Governance (ESG) as a moderating variable adds an important dimension to understanding the relationships among profitability, eco-efficiency, and company value. ESG represents the integration of ethical, sustainability, and governance principles into corporate business practices. Companies with strong commitments to ESG are considered more credible and capable of gaining investor trust because they can balance economic performance with environmental and social responsibilities. Furthermore, ESG aligns operational performance with sustainability objectives, thereby supporting the enhancement of company value. In addition, ESG may strengthen the effect of profitability because profits generated through ethical and transparent practices are more likely to receive positive market recognition while ensuring that environmental efficiency initiatives are implemented in accordance with strong governance and social responsibility principles.

Aydoğmuş et al. (2022) demonstrated that ESG has a positive effect on company profitability. Furthermore, Tyas and Prastiwi (2025) and Thananchai and Somsoda (2025) found that ESG strengthens the relationship between profitability and company value, indicating that companies with strong financial performance and sustainability practices tend to achieve higher market valuations. However, Dinarjito (2024) found that ESG does not moderate the relationship between profitability and company value. These inconsistent findings indicate that the role of ESG as a moderating variable requires further investigation, particularly regarding its interaction with eco-efficiency and company value.

The urgency of sustainability practices is particularly relevant in the energy sector because this industry is one of the largest contributors to global environmental challenges. The International Energy Agency (IEA) reported that global energy-related carbon dioxide emissions reached approximately 37 billion tons in 2023, representing the highest level recorded historically. This condition indicates that energy companies face significant pressure to reduce environmental impacts while maintaining economic performance. In Indonesia, the energy sector plays a crucial role in economic development while simultaneously facing challenges related to carbon emissions, resource utilization, and environmental sustainability.

The Indonesian government has strengthened environmental governance through various sustainability regulations, including mandatory sustainability reporting requirements issued by the Financial Services Authority (Otoritas Jasa Keuangan [OJK]) through Regulation No. 51/POJK.03/2017 and related sustainability reporting guidelines. Therefore, energy companies are increasingly required to demonstrate not only financial capability but also environmental efficiency and responsible governance to maintain stakeholder trust.

Company value has become an important indicator reflecting investor perceptions of corporate performance and future prospects. High company value indicates strong market confidence in a company's ability to generate sustainable returns and manage resources effectively. One widely used measure of company value is Tobin's Q, which compares market valuation with the replacement cost of company assets. In the Indonesian energy sector, company value has experienced considerable fluctuations in recent years. Based on the manuscript data, the Tobin's Q values of energy sector companies listed on the IDX changed significantly during 2019–2024, increasing sharply in 2021 to approximately 28.5, declining to around 12.8 in 2023, and rising again to approximately 29.3 in 2024. These fluctuations indicate that investor perceptions of energy companies are influenced by various internal and external factors, including profitability performance, sustainability practices, and market expectations regarding future business prospects.

One important factor influencing company value is profitability because it reflects a company's ability to utilize resources effectively to generate earnings. Profitability, commonly measured using Return on Assets (ROA), provides investors with signals regarding managerial effectiveness and future growth potential. Previous studies have demonstrated that profitability positively influences company value. For example, Darmawan (2020), Son and Shaykh (2022), Widiastuti et al. (2023), and Alhayra et al. (2024) found that higher profitability increases investor confidence and strengthens market valuation. These findings support signaling theory, which suggests that strong financial performance provides positive information to investors regarding company prospects. However, other studies have reported different results. Alida and Sulastiningsih (2024) and Demara et al. (2021) found that profitability does not always influence company value, suggesting that this relationship may depend on industry characteristics, economic conditions, and other contextual factors.

Besides profitability, eco-efficiency has emerged as another strategic factor influencing corporate value, particularly in environmentally sensitive industries such as the energy sector. Eco-efficiency reflects a company's ability to create economic value while minimizing resource consumption and environmental impacts. Companies implementing eco-efficient practices are expected to improve operational effectiveness, strengthen corporate reputation, and gain stakeholder legitimacy. Several previous studies, including Wusono and Matusin (2019), Atiningsih and Setiyono (2023), and Fairus and Murwaningsari (2023), found that eco-efficiency positively contributes to company value because investors increasingly appreciate companies with strong environmental commitments. However, contradictory findings have also been reported. Damas et al. (2021) and Kurniasari and Cahyono (2025) revealed that eco-efficiency does not always enhance company value because investors may prioritize financial fundamentals over environmental performance. These inconsistent findings indicate that the relationship between eco-efficiency and company value requires further investigation, particularly within the energy sector context.

The implementation of ESG has increasingly attracted academic and practical attention because it influences how investors interpret corporate performance. ESG disclosure provides additional information regarding corporate quality, transparency, and sustainability orientation. Companies with strong ESG performance may achieve higher market appreciation because they are perceived as better able to manage long-term risks. Previous studies by Aydoğmuş et al. (2022), Suretno et al. (2022), and Tumba et al. (2024) demonstrated that ESG performance positively affects company value. Furthermore, Tyas and Prastiwi (2025) and Thananchai and Somsoda (2025) found that ESG strengthens the relationship between profitability and company value by increasing investor confidence in sustainable financial performance. Nevertheless, Dinarjito (2024) found that ESG does not always moderate the relationship between financial performance and company value, indicating that the moderating role of ESG remains inconclusive and requires additional empirical evidence.

This research is important because the energy sector represents a strategic industry that must simultaneously achieve financial growth and sustainability transformation. Understanding the interaction among profitability, eco-efficiency, ESG, and company value can provide valuable insights for companies in developing strategies that enhance investor confidence while fulfilling environmental responsibilities. From a managerial perspective, the findings may assist corporate leaders in determining whether sustainability initiatives generate economic benefits and improve market valuation. From an investor perspective, this research provides evidence regarding the relevance of ESG information in investment decision-making. Meanwhile, from a regulatory perspective, the findings may support policymakers in strengthening sustainability disclosure frameworks and promoting responsible corporate practices.

The novelty of this research lies in integrating profitability and eco-efficiency into a comprehensive model with ESG as a moderating variable in explaining company value, particularly among Indonesian energy sector companies listed on the IDX during the 2019–2024 period. Unlike previous studies that primarily examined direct relationships, this research investigates whether ESG strengthens or weakens the relationship between corporate financial performance, environmental efficiency, and market valuation. Furthermore, focusing on the energy sector provides a more specific contribution because this industry faces greater sustainability challenges compared with other sectors. By incorporating ESG moderation into the research model, this study provides broader insights into how financial and non-financial performance indicators jointly influence investor perceptions.

Therefore, this study aimed to examine the effects of profitability and eco-efficiency on company value and analyze the moderating role of ESG in these relationships among energy sector companies listed on the Indonesia Stock Exchange. Specifically, this research examined whether profitability affects company value, whether eco-efficiency contributes to market valuation, whether ESG strengthens the relationship between profitability and company value, and whether ESG strengthens the relationship between eco-efficiency and company value. This study contributes to the sustainability accounting and corporate finance literature by providing empirical evidence from an emerging market context. Practically, the findings provide benefits for companies, investors, and regulators by highlighting the

importance of integrating financial performance, environmental efficiency, and ESG practices as strategic components for achieving sustainable corporate value.

METHOD

Types of Research

This study employed a quantitative method based on the positivist paradigm, using numerical data to test hypotheses objectively and measurably. The research aimed to examine the effects of profitability and eco-efficiency on company value, with Environmental, Social, and Governance (ESG) as a moderating variable. The study used a causal associative research design to examine the relationships among the variables. The data were obtained from secondary sources, including financial statements and sustainability reports of energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2019–2024 period. The dataset consisted of panel data combining time-series and cross-sectional dimensions (Sugiyono, 2019, p. 66).

Research Time and Location

Research data collection is carried out from open sources on the IDX's official website, namely www.idx.co.id and other secondary data such as the company's annual report and sustainability report published by the related company. IDX is the choice of research location considering its status as an exchange institution that provides a comprehensive database, including company information and financial statements that are regularly updated and stored in an organized system. This condition supports the process of collecting data related to financial statements and stock trading activities. The implementation of this research will begin in January 2025 until it is completed.

Population and Sample

Population

A population is a generalized area that includes objects or subjects with specific numbers and characteristics that the researcher has determined to study and draw conclusions from. Each element in the population reflects the entire unit of analysis to be examined. The population includes all entities listed on the IDX in the energy sector. However, not all companies in this population are used as samples. This study specifically targets companies that have published sustainability reports and uncovered ESG items that are measurement indicators. (Sugiyono, 2019, p. 285)

Sample

Samples are a subset that reflects the number and characteristics of the population studied. The selected sample is representative and is able to represent the characteristics of the overall population. Sample determination is carried out through (Sugiyono, 2019, p. 288) *the purposive sampling technique*, which is a sample determination technique based on certain considerations relevant to the purpose of the research, considering certain criteria and in summary in the appendix to table 1, namely:

Table 1. Sample Selection Criteria

No.	Remarks	Quantity
1.	Energy sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2019-2024 (91 companies x 6 years)	546
2.	Observation of companies that do not publish annual financial statements and sustainability reports in 2019-2024	(225)
3.	Observation of companies that do not provide the data required for this study in full during the period 2019-2024	(106)
Number of observations that met the sample criteria (company x years)		215

Source: Researcher-processed data, 2026

Data Collection Techniques

The data collection technique used in this study is a documentation study, namely by collecting secondary data from various documents that have been officially published by related entities. The data used comes from annual financial statements, sustainability reports and stock market data available on [the official website of www.idx.co.id](http://www.idx.co.id). The selection of documentation techniques was carried out because the data needed is quantitative, historical and has been available in the form of official documents. All the data collected were then processed and analyzed to test the relationship between variables according to the formulation of the problem in the research.

Data Analysis Techniques

Descriptive Statistics

Descriptive statistics are statistics that are used to analyze data by describing or describing data numerically to make conclusions that apply to generalizations or generalizations. The data presented include the minimum, maximum, (Sugiyono, 2019, p. 206) *mean*, and standard deviation values of each research variable, namely profitability, *eco-efficiency*, company value (Tobin's Q), and ESG. This analysis provides an *overview* of the trends of the data used before entering the advanced analysis phase (Brigham & Ehrhardt, 2017).

Data Normality Test

The normality test aims to find out whether the residual data in the regression model is normally distributed or not. In this study, normality testing was carried out using the Jarque-Bera (JB) test available on the EViews application. The Jarque-Bera test measures the level of normality based on residual skewness and kurtosis values. The decision-making criteria are carried out by looking at the probability value (Prob.) Jarque-Bera, where if the probability value is greater than 0.05, the residual is declared to be normally distributed, while if the probability value is less than 0.05, the residual is not normally distributed. Normality testing is carried out to ensure that the assumption of normality is fulfilled so that the results of the estimation and statistical testing carried out can provide valid results.

Multicollinearity Test

The multicollinearity test aims to find out whether there is a high relationship or correlation between independent variables in the regression model. Multicollinearity can cause instability in the estimation of regression coefficients so that the interpretation of the influence of each independent variable becomes less accurate. In this study, the

multicollinearity test was carried out by looking at the correlation matrix between independent variables. The decision-making criterion is that if the value of the correlation coefficient between independent variables is less than 0.90, then it can be concluded that the model does not experience multicollinearity problems. On the other hand, if the value of the correlation coefficient is more than 0.90, then there is an indication of multicollinearity in the regression model.

Heteroscedasticity Test

The heteroscedasticity test aims to find out whether there is a residual variance inequality in the regression model. The test was carried out by regressing the value of ABS_RES (Absolute Residual) to an independent variable. The model is declared free of heteroscedasticity if the probability value of each independent variable is greater than 0.05, while a probability value of less than 0.05 indicates an indication of heteroscedasticity.

Autocorrelation Test

The autocorrelation test aims to find out whether there is a correlation between the residual in one period and the residual in the other period in the regression model. The test was performed using Durbin-Watson (DW) statistics. The model is stated to have no autocorrelation if the Durbin-Watson value is around 2, while a value close to 0 indicates a positive autocorrelation and a value close to 4 indicates a negative autocorrelation.

Regression Data Panel

Panel data regression is a quantitative analysis method used to test the influence of profitability and *eco-efficiency* on company value with ESG as a moderation variable. The data panel is a combination of *time series* and *cross section data* so that it is able to capture the dynamics of changes between times as well as differences in characteristics between companies. In this study, unbalanced panel data was used, namely panel data that had a different number of observations for each cross section unit or there was data that was not available in several observation periods. The use of *unbalanced panels* can still be processed in EViews and does not reduce the validity of the analysis as long as the available data meets the needs of the research. The selection of panel models, both Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) was carried out through the Chow test to distinguish CEM and FEM, as well as the Hausman test to determine the selection between FEM and REM. When required, the Lagrange Multiplier (LM) test is used as an additional test to determine the selection between CEM and REM. The role of ESG moderation was analyzed using Moderated Regression Analysis (MRA) by incorporating the interaction variables between ESG and the independent variables of profitability and *eco-efficiency* into the panel data regression model. The model is formulated as follows:

$$Y_{it} = \beta_0 + \beta_1 X1_{it} + \beta_2 X2_{it} + \varepsilon$$

Description:

- Y_{it} = Company value (Tobin's Q) company i in year t
- β_0 = Tobins' Q's basic values without the influence of profitability and *eco-efficiency*
- β_1 = The magnitude of the change in the value of the company due to a change in 1 unit of profitability assuming that other variables are constant
- $X1_{it}$ = Profitability (ROA) of the company i in year t
- β_2 = The magnitude of the change in Tobin's Q when *eco-efficiency* increases by 1 unit,

assuming other variables remain
 X_{2it} = *Eco-efficiency* (PROPER) company i in t
 ε = *Company term error* i in year t

The results of this basic regression model show how much and how each variable affects the company's value. Where Y is the company's value, X_1 is ROA and X_2 is *eco-efficiency*.

Moderated Regression Analysis (MRA)

The Moderated *Regression Analysis* (MRA) model is used to analyze the role of ESG as a moderating variable, applying the moderation regression model. This model inserts the interaction between independent variables and moderation variables in the regression equation to identify whether the relationship between company performance and *eco-efficiency* to company value will change or be influenced by the company's ESG level. The regression model is:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 Z_{it} + \beta_4 (X_{1it} \times Z_{it}) + \beta_5 (X_{2it} \times Z_{it}) + \varepsilon_{it}$$

Description:

Y_{it} = Company value (Tobin's Q) company i in year t
 X_{1it} = Profitability (ROA) of the company i in year t
 X_{2it} = *Eco-efficiency* (PROPER) company i in t
 S_{it} = Corporate ESG in the year t
 β_0 = Enterprise value when all variables = 0
 β_1 = Direct influence of X_1 on Y (without considering moderation)
 β_2 = Direct influence of X_2 on Y
 β_3 = Direct influence of Z (ESG) on Y
 β_4 = The effect of profitability and ESG ($X_1 \times Z$) interaction on company value, measures the extent to which ESG strengthens/weakens the influence of profitability on Y.
 β_5 = The effect of eco-efficiency and ESG ($X_2 \times Z$) interaction on company value, measures the extent to which ESG strengthens/weakens the influence of eco-efficiency on Y.
 ε = *Company term error* i in year t

In this model, the interaction between ROA and ESG as well as ($X_1 \times Z$) *eco-efficiency* and ESG was included to see the moderation effect. If the interaction coefficient (and) is significant, then ESG is considered to have an influence in strengthening or weakening the relationship between independent variables and the company's value. ($X_2 \times Z$) $\beta_4 \beta_5$

Hypothesis Test

Hypothesis testing aims to identify whether independent variables have a significant impact on the company's value, as well as evaluate the ability of moderation variables on the relationship between independent and dependent variables. This procedure was carried out using multiple linear regression analysis and moderation regression/MRA with the support of *statistical software*. Hypothesis testing refers to the significance value (p-value) of the regression analysis output. The determination criteria in hypothesis testing are:

1. If the significant value (Sig.) < 0.05, then the hypothesis is accepted
2. If the significant value (Sig.) ≥ 0.05, then the hypothesis is rejected

The results of the test will identify whether each hypothesis is supported by empirical evidence or not, as well as how strong the influence of moderation provided by ESG on the relationship between variables in the research model.

RESULTS AND DISCUSSION

Data Analysis Results

Descriptive Statistical Analysis

Descriptive statistical analysis aims to provide an overview of the characteristics of the research data. This analysis is carried out by looking at the minimum (*minimum*), maximum (*maximum*), mean (*mean*), and standard deviation (*standard deviation*). Minimum and maximum values indicate the range of data, *mean* describes the average tendency of the data, while *standard deviation* indicates the extent to which the data is spread or variation to the average value.

Table 2. Descriptive Statistical Analysis

	Profitability	Eco-Efficiency	Company Values	ESG
Red	0,105983	3,376744	23,28486	0,877731
Median	0,068352	3,000000	1,020984	0,909091
Maximum	0,616346	5,000000	1446,577	1,000000
Minimum	-0,311773	2,000000	0,262843	0,454545
Std. Dev.	0,140850	0,750339	161,0763	0,116914
Observations	215	215	215	215

Source: Researcher-processed data, 2026

Based on Table 1, the number of data analyzed in this study is 215 observations. The profitability variable proxied by *Return on Assets* (ROA) has a minimum value of -0.311773 owned by PT Apexindo Pratama Duta Tbk in 2022 and a maximum value of 0.616346 owned by PT Golden Energy Mines Tbk in 2022, with a mean value of 0.105983 with a standard deviation of 0.140850. This shows that the average energy sector company is able to generate a profit of 10.60% of the total assets owned, even though there are companies that suffer losses during the research period.

The *eco-efficiency* variable proxied using the PROPER rating has a minimum value of 2 which is owned by PT Baramulti Suksessarana Tbk, PT Delta Dunia Makmur Tbk, and PT Dian Swastatika Sentosa Tbk. in several years of observation. The maximum value of 5 is owned by a number of companies such as PT Adaro Energy Indonesia Tbk., PT Bukit Asam Tbk., and PT Bumi Resources Tbk. in several years of observation. This value shows that in general energy sector companies are rated PROPER Blue to Green, which indicates a fairly good level of environmental management, although not many companies have achieved a Gold rating.

The company's value variable proxied with Tobin's Q has a minimum value of 0.262843 owned by PT Sumber Energi Andalan Tbk. in 2023, and a maximum value of 1446,577 owned by PT Dwi Guna Laksana Tbk. in 2024. The average value was 23.28486 with a standard deviation of 161.0763. The high standard deviation compared to the average

value indicates that there is a considerable variation (data distribution) between energy sector companies in terms of market valuation of the company's value.

The ESG variable measured based on the number of disclosure items (*ESG items*) has a minimum value of 0.454545 owned by PT Sumber Energi Andalan Tbk in 2021 and a maximum value of 1.000000 which is owned by PT ABM Investama Tbk., PT AKR Corporindo Tbk., and PT Adaro Energy Indonesia Tbk. in several observation years, the average value is 0.877731 with a standard deviation of 0.116914. The average value shows that energy sector companies in general have disclosed around 87.77% of ESG items that are indicators in the study, while the relatively small standard deviation values indicate that the level of ESG disclosure between companies tends to be homogeneous.

Test Estimation of Panel Data Model

The selection of the panel data regression model was carried out to determine the estimation model that best suits the characteristics of the research data.

Chow Test

The Chow test aims to determine the most appropriate panel data regression model between *the Common Effect Model* (CEM) and *the Fixed Effect Model* (FEM). The basis for decision-making is based on probability values (*Prob.*) *Cross-section F*. If the probability value is < 0.05 , then the model chosen is *the Fixed Effect Model* (FEM), while if the probability value is > 0.05 , the model chosen is *the Common Effect Model* (CEM).

Table 3. Chow Test Results

Effects Test	Statistic	D.F.	Prob.
Cross-section F	1,982659	(47, 162)	0,0009
Cross-section Chi-square	97,694366	47	0,0000

Source: Researcher-processed data, 2026

Based on Table 2, the results of Chow's test show a probability value (*Cross-section F*) of $0.0009 < 0.05$. Thus, the selected model is the *Fixed Effect Model* (FEM).

Hausman Test

The Hausman test aims to determine the most precise panel data regression model between *the Fixed Effect Model* (FEM) and *the Random Effect Model* (REM). The basis for decision-making is based on probability values (*Prob.*). If the probability value is < 0.05 , then the model chosen is *the Fixed Effect Model* (FEM), while if the probability value is > 0.05 , the model chosen is *the Random Effect Model* (REM).

Table 4. Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. D.F.	Prob.
Cross-section random	6,298346	5	0,0278

Source: Researcher-processed data, 2026

Based on Table 3, the results of the Hausman test show a probability value of $0.0278 < 0.05$. Thus, the selected model is the *Fixed Effect Model* (FEM).

LM Test

The Lagrange Multiplier (LM) test aims to determine the most appropriate panel data regression model between *the Common Effect Model* (CEM) and *the Random Effect Model* (REM). The basis for decision-making is based on probability values (*Prob.*). If the

probability value is < 0.05 , then the model chosen is *the Random Effect Model* (REM), while if the probability value is > 0.05 , the model chosen is *the Common Effect Model* (CEM). In this study, the Lagrange Multiplier (LM) test was not carried out because the results of the Chow test and the Hausman test both showed that the most appropriate model was the *Fixed Effect Model* (FEM). Therefore, *the Fixed Effect Model* (FEM) was established as the panel data regression model used in this study.

Classic Assumption Test

The classical assumption test is carried out to ensure that the regression model meets the basic assumptions so that the estimated results obtained are valid and unbiased. The results of the classical assumption test in this study are:

Normality Test

The normality test aims to find out whether the residual data in the regression model is normally distributed. The basis for decision-making is based on probability values (*Prob.*) *Jarque-Bera*. If the probability value is > 0.05 , then the residual data is normally distributed, while if the probability value is < 0.05 , then the residual data is not normally distributed.

The results of the normality test showed a probability value (*Jarque-Bera*) of 0.287281 > 0.05 . Thus, it can be concluded that the residual data is normally distributed so that it meets the assumption of normality and is suitable for further analysis.

Multicollinearity Test

The multicollinearity test aims to find out whether or not there is a high correlation between independent variables in the regression model. The basis for decision-making is based on the value of the correlation coefficient, where the correlation value < 0.90 indicates that it does not occur

All independent variable correlation coefficient values are below 0.90, with the highest correlation value of 0.637923. Thus, it can be concluded that the regression model does not experience multicollinearity problems so that all independent variables are suitable for use in further analysis.

Heteroscedasticity Test

The heteroscedasticity test with the Glejser method aims to find out whether there is residual variance inequality in the regression model. The basis for decision-making is based on probability values (*Prob.*). If the probability value is > 0.05 , heteroscedasticity does not occur, while if the probability value is < 0.05 , heteroscedasticity occurs.

All independent variables have a probability value (*Prob.*) greater than 0.05. It can be concluded that the regression model does not experience heteroscedasticity problems so that it meets the assumption of homogeneity and is suitable for further analysis.

Autocorrelation Test

The autocorrelation test aims to find out whether or not there is a correlation between the residual in one period and another in the regression model. The test was performed using *the Durbin-Watson* (DW) value. The regression model was declared to have no autocorrelation if *the Durbin-Watson* value was between 1.5 and 2.5.

The results of the autocorrelation test showed a *Durbin-Watson value* of 1.987907. The value is in the range of 1.5 to 2.5, so it is concluded that the regression model does not experience autocorrelation and meets the assumption of autocorrelation.

Panel Data Regression Analysis

The panel data regression analysis aims to test the influence of independent variables on dependent variables using combined *cross section* and *time series* data. In this study, the regression model used is the *Fixed Effect Model* (FEM) based on the results of the panel data model selection test.

Table 5. Panel Data Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1,493871	0,974784	0,378802	0,7053
PROFITABILITY	0,681218	0,265078	2,569877	0,0153
ECO-EFFICIENCY	0,329475	0,202553	1,626611	0,8080
ESG	0,500056	0,163270	3,065841	0,0265
ROA*ESG	0,828233	0,282836	2,928315	0,0418
ECO-EFFICIENCY*ESG	1,640653	0,632569	0,214351	0,8305

Source: Researcher-processed data, 2026

Based on Table 5, the regression equation of panel data is obtained as follows:

$$\text{Tobin's Q} = 1,493871 + 0,681218 \text{ PROFITABILITAS} + 0,329478 \text{ ECO} - \text{EFFICIENCY} + 0,500056 \text{ ESG} \\ + 0,828233 (\text{PROFITABILITAS} * \text{ESG}) + 1,640653 (\text{ECO} - \text{EFFICIENCY} * \text{ESG}) + e$$

Based on these equations, all independent variables (Profitability, eco-efficiency, ESG) and interaction variables (Reliability*ESG and Eco-efficiency*ESG) show a positive coefficient direction for the company's value (Tobin's Q). This means that an increase in each of these variables tends to be followed by an increase in the company's value, assuming the other variables are considered fixed (*ceteris paribus*). The interpretation of the significance of each variable is further explained in the results of the following hypothesis test.

Hypothesis Test

Hypothesis tests were carried out to determine the influence of each independent variable on the dependent variables and to test the role of the moderation variable in the research model.

Partial Test (t-test)

The t-test aims to determine the influence of each independent variable on the dependent variable partially. The basis for decision-making is based on probability values (*Prob.*). When the value of *Prob.* < 0.05 then the hypothesis is accepted and if the value of *Prob.* > 0.05, the hypothesis is rejected.

The profitability variable (ROA) has a probability value of 0.0153 < 0.05 with a positive coefficient of 0.681218, so H1 is accepted. This shows that profitability has a positive effect on the company's value. The *eco-efficiency* variable (PROPER) has a probability value of 0.8080 > 0.05 with a positive coefficient of 0.329475, so H2 is rejected. This shows that *eco-efficiency* has no effect on the company's value. Meanwhile, the ESG variable has a probability value of 0.0265 < 0.05 with a positive coefficient of 0.500056, which shows that ESG has a positive effect on the company's value.

The variable of profitability interaction (ROA)*ESG has a probability value of 0.0418 < 0.05 with a positive coefficient of 0.828233, so H3 is accepted. This shows that ESG is able to moderate (strengthen) the influence of profitability on company value. The *eco-efficiency**ESG interaction variable has a probability value of 0.8305 > 0.05 with a positive coefficient of 1.640653, so H4 is rejected. This shows that ESG is not able to moderate the influence of *eco-efficiency* on company value.

Simultaneous Test (F Test)

The F test aims to determine the feasibility of the regression model used in this study. The basis for decision-making is based on probability values (Prob. (F-statistic)). When the value of Prob. (F-statistic) < 0.05 , then the regression model is declared feasible to use. The F test value was obtained from the output of the same panel data regression as the model in Table 5.

Table 6. F Test

R-squared	0,415318	Mean dependent var	3,284858
Adjusted R-squared	0,388813	S.D. dependent var	1,076245
S.E. of regression	5,873604	Akaike info criterion	1,021139
Sum squared resid	470183,2	Schwarz criterion	1,852041
Log likelihood	1,772542	Hannan-Quinn crister.	1,356862
F-statistic	3,673905	Durbin-Watson stat	1,987907
Prob(F-statistic)	0,000000		

Source: Researcher-processed data, 2026

Based on Table 6, the results of the F test show the value of Prob. (F-statistic) of $0.000000 < 0.05$. Thus, it can be concluded that the regression model used in this study is declared feasible (fit), so that independent variables and moderation variables together (simultaneously) make a significant contribution in explaining the value of the company.

Coefficient of Determination Test (R²)

The determination coefficient (R²) test aims to find out how much the ability of independent variables to explain the variation of dependent variables. The R² value that is getting closer to 1 indicates that the model's ability to explain the dependent variable is getting better. The value of the determination coefficient is taken from the model summary section of the regression output in the same regression output as Table 4.7,

The *Adjusted R-squared* value was obtained of 0.388813. This shows that 38.88% of the variation in company value can be explained by profitability, *eco-efficiency*, ESG, and interaction variables in the research model, while the remaining 61.12% can be explained by other variables outside the research model.

The Effect of Profitability on Company Value

Based on the results of hypothesis testing, a profitability regression coefficient (ROA) value of 0.681218 with a probability value of $0.0153 < 0.05$ was obtained. These results show that H1 is accepted, so profitability has a positive effect on the company's value. This means that the higher the level of profitability of the company, the higher the value of the company proxied with Tobin's Q.

The results of this study are in line with the *signaling theory* put forward by the one who explains that a high level of profitability gives a positive signal to investors about the company's ability to generate profits and manage assets effectively. These signals increase investor confidence in the company's prospects, thus having an impact on increasing the company's value. In addition, the results of this study also support the theory of legitimacy and stakeholder theory which explains that companies that are able to show good financial performance will gain the trust of stakeholders, so that it can increase market appreciation of the company. (Spence, 1973)

In energy sector companies, the ability to generate profits reflects the effectiveness of the company in managing the assets it owns to create profits. This condition is one of the considerations of investors in assessing the company's prospects, so that companies with a higher level of profitability tend to have a higher company value.

The results of this study are in line with the research AnnaSquirt et al., (2024) , , , Son & Shaykh , (2022) Widiastuti et al., (2023) Darmawan, (2020) , and Issa et al. (2025) which stated that profitability has a positive effect on company value. The findings show that the higher the company's ability to generate profits, the higher the investor confidence which is reflected in the increase in the company's value.

The Effect of *Eco-Efficiency* on Company Value

Based on the results of the hypothesis test, the *eco-efficiency* regression coefficient (PROPER) value was 0.329475 with a probability value of 0.8080 (>0.05). These results show that H2 is rejected, so *eco-efficiency* has no effect on the company's value. This means that the high and low PROPER rating of the company has not been able to affect the value of the company proxied with Tobin's Q.

The results of this study are not in line with the *signaling theory* which states that the implementation of *eco-efficiency* is a positive signal for investors regarding the company's commitment to sustainability. In energy sector companies, information about environmental performance reflected in the PROPER rating has not been the main consideration of investors in assessing the company. Investors tend to focus more on aspects of financial performance and profit prospects than on the company's environmental performance.

The insignificance of the influence of *eco-efficiency* also indicates that the application of environmental efficiency has not been able to be translated by the market as a factor that can increase the company's value. Although the company obtains a good PROPER rating, the information is not necessarily directly responded to by investors in investment decision-making, so it does not have an impact on the increase in the company's value.

The results of this study are in line with Damas et al., (2021) the Stuart Stuart - Stuart O'Neill (2025) finding that *eco-efficiency* is not able to increase company value, because investors still consider the fundamental factors of the company rather than the aspect of environmental management in assessing the company. However, the results of this study are not in line with the research Wusono & Stuttgart, (2019) , as Fairus & Murwaningsari, (2023) well as Issa et al. (2025) who stated that *eco-efficiency* has a positive effect on company value.

The Role of ESG Moderation on the Influence of Profitability and Company Value

Based on the results of the hypothesis test, the value of the ROA*ESG interaction coefficient was 0.828233 with a probability value of 0.0418 (<0.05). These results show that H3 is accepted, so that ESG is able to moderate the influence of profitability on company value. The positive interaction coefficient shows that the higher the ESG disclosure, the stronger the influence of profitability in increasing the company's value.

The results of this study are in line with the legitimacy theory that companies that disclose ESG information well will gain higher legitimacy and trust from stakeholders. In addition, *signaling theory* explains that the combination of high profitability and good ESG disclosure gives a positive signal to investors that the company is not only able to generate profits, but also conduct business activities in a sustainable, transparent, and responsible

manner. This condition increases investor confidence so that it has an impact on increasing the company's value.

In energy sector companies, ESG disclosure is additional information that strengthens investors' assessment of the company's performance. Companies that are able to generate high profits while having a commitment to environmental, social, and governance aspects are considered to have better prospects and more guaranteed business sustainability than companies that only show good financial performance.

The results of this study are in line with the research Tyas & São Paulo, (2025) , Thananchai & Somsoda ,(2025) and Issa et al. (2025) who stated that ESG is able to strengthen the influence of profitability on company value. This shows that ESG disclosure is a factor that increases investor confidence in the quality of the company's profits, thus having an impact on increasing the company's value.

However, the results of this study are not in line with the findings that ESG is not able to moderate the relationship between profitability and company value. The difference in results is suspected to be due to differences in the characteristics of the research object, conducted on cross-sector companies on the Indonesia Stock Exchange for the 2016-2021 period, while this study focuses on energy sector companies for the 2019-2024 period. In the energy sector, ESG disclosure has a higher relevance because this sector faces public spotlight and stricter regulations related to environmental impacts, so ESG information is better able to strengthen the profitability signals conveyed to investors than in other sectors that are less exposed to sustainability issues. (Dinarjito, 2024)

The Role of ESG Moderation on the Influence of *Eco-Efficiency* and Corporate Value

Based on the results of the hypothesis test, the PROPER*ESG interaction coefficient value was 1.640653 with a probability value of 0.8305 (>0.05). These results show that H4 is rejected, so ESG is not able to moderate the influence of *eco-efficiency* on company value. This shows that the high and low ESG disclosure has not been able to strengthen or weaken the relationship between *eco-efficiency* and company values.

The results of this study are not in line with the legitimacy theory and signal theory which explains that companies that implement *eco-efficiency* and are supported by good ESG disclosure will gain legitimacy and give positive signals to investors. For energy sector companies, information about environmental performance reflected in PROPER ratings and ESG disclosures has not been the main consideration for investors in assessing the company's value. Investors tend to pay more attention to the fundamental aspects of the company, especially the company's ability to generate profits and future business prospects. Although companies have disclosed ESG information well, it has not been enough to improve the market's response to the company's environmental performance. Thus, the existence of ESG has not been able to increase the effectiveness of implementing *eco-efficiency* in creating company value.

So far, there has been no research specifically examining the role of ESG as a moderation variable in the relationship between *eco-efficiency* and company value. The results of this study are not in line with the research Marlina & Herawaty, (2024) and Issa et al. (2025) who stated that ESG is able to strengthen the influence of *eco-efficiency* on company value. The findings of this study indicate that in energy sector companies on the

Indonesia Stock Exchange for the 2019-2024 period, ESG disclosure has not been a factor that is able to strengthen the relationship between *eco-efficiency* and company value.

CONCLUSION

This study concluded that profitability had a positive and significant effect on company value among energy sector companies listed on the Indonesia Stock Exchange during the 2019–2024 period. The findings indicated that companies with stronger profitability performance received higher appreciation from investors because the ability to generate profits reflects effective asset management and positive future prospects. Meanwhile, eco-efficiency did not have a significant effect on company value, suggesting that environmental efficiency practices had not yet become a primary consideration for investors in evaluating energy sector companies. Furthermore, Environmental, Social, and Governance (ESG) was found to strengthen the relationship between profitability and company value, indicating that sustainability disclosure enhanced investor confidence in the quality and long-term sustainability of corporate financial performance. However, ESG did not moderate the relationship between eco-efficiency and company value, implying that environmental efficiency initiatives supported by ESG disclosure had not been sufficiently reflected in market valuation. These findings contributed to the understanding that financial performance remained a dominant factor influencing company value, while sustainability practices required stronger market recognition and communication strategies to generate economic benefits.

Future research should expand the research model by incorporating other variables that may influence company value, such as carbon emission disclosure, green innovation, corporate governance mechanisms, financial risk, and investor sentiment. Further studies may also extend the observation period, include companies from different industrial sectors, and compare sustainability performance between developing and developed markets to obtain broader insights. In addition, future researchers are encouraged to apply alternative measurements of ESG, eco-efficiency, and sustainability performance to provide a more comprehensive assessment of corporate responsibility practices. Qualitative approaches, mixed-method designs, or comparative studies may also provide deeper explanations regarding why environmental performance indicators are not always reflected in market valuation. These developments are expected to strengthen the literature on sustainable corporate value creation and provide practical recommendations for companies, investors, and policymakers in promoting responsible business practices.

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