
THE INFLUENCE OF ENVIRONMENTAL PERFORMANCE, LEVERAGE, AND BOARD OF COMMISSIONERS SIZE ON FIRM VALUE: EVIDENCE FROM ENERGY COMPANIES LISTED ON THE INDONESIA STOCK EXCHANGE FOR THE 2021–2024 PERIOD



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Abstract

This study examines the effect of environmental performance, leverage, and board of commissioners size on firm value in energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period. Environmental performance is proxied by the PROPER rating, leverage is measured using the Debt-to-Equity Ratio (DER), board of commissioners size is determined by the number of commissioners, and firm value is measured using Tobin's Q. The study population consists of all energy sector companies listed on the IDX. Using a purposive sampling method, 24 companies were selected, resulting in 96 observations over four years. This research employs panel data regression analysis using EViews 12, with the Random Effect Model (REM) identified as the most appropriate specification. The results indicate that environmental performance (PROPER) and leverage (DER) do not have a significant effect on firm value. In contrast, board of commissioners size has a positive and significant effect on firm value. Simultaneously, the three independent variables do not significantly influence firm value. These findings suggest that during the 2021–2024 period, investors in the energy sector were more responsive to corporate governance mechanisms, particularly board oversight, than to signals related to environmental performance or capital structure. The study contributes to the literature on corporate governance and firm value by highlighting the importance of an effective board structure in enhancing market valuation within the energy sector.

Keywords: Firm Value, Environmental Performance, Leverage, Board of Commissioners Size, Energy Sector

INTRODUCTION

Firm value reflects investors' perceptions of a company's performance and future prospects, as represented by its stock price, with Tobin's Q serving as one of the key indicators that compares a firm's market value to the replacement cost of its assets (Tobin, 1969). In the energy sector, firm value is influenced not only by internal factors but also by external factors such as energy price volatility, geopolitical conditions, government regulations, and sustainability demands. In Indonesia, the value of energy sector firms fluctuated during the 2021–2024 period, as reflected in the movement of the Energy Sector Index (IDXENERGY). The index increased significantly in 2022 due to the surge in coal prices following the Russia–Ukraine conflict, declined in 2023 as a result of coal price corrections and weakening global demand, and rebounded in 2024 supported by stable commodity prices and the depreciation of the Indonesian rupiah, which benefited coal exporters (Fernando, 2022; CNBC Indonesia, 2023; Nurmutia, 2023; Mulyana, 2024; Rabbi, 2025). These conditions indicate that investors' valuation of energy companies is shaped by a combination of external influences and firm-specific internal factors.

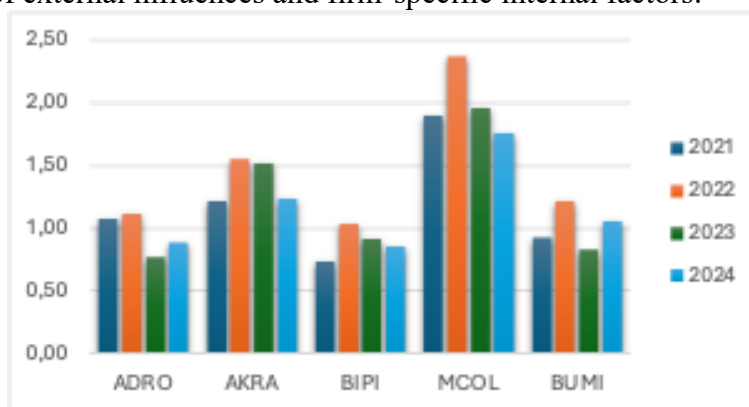


Figure 1.1.

Tobin's Q Trends of Selected Energy Sector Companies Listed on the Indonesia Stock Exchange During 2021–2024

Figure 1.1 shows that the firm value of energy sector companies, measured by Tobin's Q, fluctuated during the 2021–2024 period. Companies such as MCOL, AKRA, BIPI, ADRO, and BUMI experienced varying trends, with most reaching peak values in 2022 before declining or recovering in subsequent years. These fluctuations indicate that investor assessments of energy companies are influenced by both external conditions and internal corporate factors.

This study focuses on three internal determinants of firm value: environmental performance, leverage, and board of commissioners size, drawing on stakeholder theory (Freeman & McVea, 2001) and signaling theory (Spence, 1973). Environmental performance reflects a company's commitment to managing environmental impacts and is measured using the PROPER rating system issued by the Ministry of Environment and Forestry. Strong environmental performance serves as a positive signal to stakeholders, enhancing corporate reputation and investor confidence.

Leverage represents financing decisions that influence investor perceptions of risk and return. In the capital-intensive energy sector, debt financing is often used to support

expansion and infrastructure development. Appropriate leverage may increase firm value through tax advantages and by signaling management's confidence in future growth prospects. In addition, the size of the board of commissioners reflects the effectiveness of corporate governance and oversight mechanisms, providing investors with signals regarding accountability and management quality. Therefore, these three factors are considered important determinants of firm value in Indonesia's energy sector.

Corporate governance, particularly the size of the board of commissioners, plays an important role in monitoring management and aligning corporate decisions with stakeholder interests. An effective board provides expertise, oversight, and governance signals that can enhance investor confidence and firm value, although excessively large boards may create coordination challenges (OJK, 2014; Ackermann & Eden, 2011).

Previous studies on the effects of environmental performance, leverage, and board size on firm value have produced mixed findings. Several studies report that environmental performance positively influences firm value by improving corporate reputation and investor trust (Fauziah et al., 2025; Sagala & Kusumadewi, 2023; Saputri et al., 2023; Adyaksana et al., 2024), while others find negative or insignificant effects (Fitriana et al., 2024; Ryanto et al., 2025; Luthfiyah & Mardiana, 2024; Putri & Susanti, 2023; Ramdani & Nugraha, 2024). Similar inconsistencies are found in studies examining leverage and board size, with some reporting positive effects on firm value, whereas others identify negative or insignificant relationships (Dianova & Widyalasmono, 2024; Priyananda & Nuswandari, 2025; Umairroh et al., 2025; Fadli et al., 2025).

These inconsistent findings suggest that the relationships between environmental performance, leverage, board size, and firm value remain inconclusive. Differences in industry characteristics, observation periods, regulatory environments, and stakeholder pressures may explain these variations. Given the capital-intensive nature, environmental risks, and sustainability challenges of the energy sector, further investigation is needed. Therefore, this study examines the effects of environmental performance, leverage, and board of commissioners size on firm value in Indonesian energy companies during the 2021–2024 period, a time marked by economic recovery, commodity price volatility, and accelerating energy transition initiatives.

REVIEW OF LITERATURE

Stakeholder Theory

Stakeholder theory defines stakeholders as parties who can affect or are affected by the achievement of organizational objectives (Freeman & Reed, 1983). According to Freeman and McVea (2001), a company's long-term success depends on its ability to manage relationships with various stakeholders, not merely shareholders. In the energy sector, maintaining positive relationships with communities, governments, investors, and environmental stakeholders is essential for sustainable business operations (Ackermann & Eden, 2011). Therefore, firm value is created through effective stakeholder management and the integration of stakeholder interests into strategic decision-making.

Signaling Theory

Signaling theory explains how parties with superior information communicate signals to reduce information asymmetry in the market (Spence, 1973). In the capital market context, companies provide observable signals through their policies and actions to convey

information about their quality and future prospects. These signals help investors make more informed investment decisions under conditions of uncertainty (Spence, 1973).

Firm Value

Firm value reflects investors' perceptions of a company's performance and future prospects, as represented by its market valuation and stock price (Adyaksana et al., 2024). High firm value indicates positive market expectations regarding future profitability and growth (Fitriana et al., 2024). From a stakeholder perspective, firm value also reflects management's success in maintaining stakeholder trust and support (Ackermann & Eden, 2011). This study measures firm value using Tobin's Q, which compares a company's market value with the replacement cost of its assets (Tobin, 1969). A Tobin's Q value greater than one indicates that the market values the company above its asset replacement cost, reflecting positive expectations regarding future performance (Tobin, 1969; Imansyah et al., 2025).

Environmental Performance

Environmental performance reflects a company's responsibility in managing the environmental impacts of its operations, including pollution control, waste management, land protection, and environmental sustainability initiatives (Rahmawati & Purwasih, 2025; Permen KLHK No. 1, 2021). In Indonesia, environmental performance is assessed through the PROPER program established by the Ministry of Environment and Forestry. PROPER uses a color-based rating system ranging from Black (lowest) to Gold (highest), where Green and Gold ratings indicate performance beyond regulatory compliance (Permen KLHK No. 1, 2021; Saputri et al., 2023). The rating serves as a signal of a company's environmental commitment and transparency to stakeholders.

Leverage

Leverage refers to the extent to which a company uses debt financing to support its operations and assets (Wijayanti et al., 2023). While debt can create value through tax advantages, excessive leverage may increase financial risk and reduce investor confidence (Priyananda & Nuswandari, 2025). High reliance on external financing may also expose firms to financial distress if cash flows are insufficient to meet obligations (Sumilir et al., 2023). This study measures leverage using the Debt-to-Equity Ratio (DER), which compares total liabilities to total equity.

Board of Commissioners Size

The board of commissioners is responsible for supervising management and providing strategic advice to ensure effective corporate governance (POJK No. 33/POJK.04/2014). Board size refers to the number of commissioners serving on the board (Umbing et al., 2022). A larger board may provide greater expertise, experience, and oversight capacity, but excessive size can reduce decision-making efficiency due to coordination and communication challenges (Usry et al., 2022; Umbing et al., 2022).

Previous Studies

Previous research on environmental performance, leverage, and board size has produced inconsistent findings regarding their effects on firm value. Some studies report positive effects of environmental performance on firm value through improved reputation and investor confidence (Fauziah et al., 2025; Sagala & Kusumadewi, 2023; Saputri et al., 2023; Adyaksana et al., 2024), while others find negative or insignificant relationships (Fitriana et al., 2024; Ryanto et al., 2025; Putri & Susanti, 2023). Similar inconsistencies are found in leverage studies, with evidence showing positive, negative, or no significant effects

on firm value depending on the context and industry characteristics (Dianova & Widyalasmono, 2024; Priyananda & Nuswandari, 2025; Maulani & Rahmawati, 2025; Salsabilla & Diana, 2023). These mixed results highlight the need for further investigation, particularly in the energy sector, which faces high capital intensity, environmental pressures, and sustainability transition challenges.

Research on the effect of board of commissioners size on firm value has produced mixed results. Several studies report a positive effect, arguing that a larger board enhances expertise diversity and monitoring effectiveness (Umairoh et al., 2025; Fadli et al., 2025; Usry et al., 2022). In contrast, other studies find a negative effect, suggesting that excessively large boards create coordination problems and slow strategic decision-making (Fitriani & Purnamasari, 2023; Umbing et al., 2022). Meanwhile, some researchers conclude that board size has no significant effect on firm value because governance effectiveness depends more on the quality of board members than on their number (Hidayat et al., 2025; Fadhilla & Khairani, 2025).

These inconsistent findings indicate the need for further investigation in the context of Indonesian energy companies during the 2021–2024 period, which was characterized by high volatility and sustainability transition pressures. Accordingly, this study examines the effects of environmental performance, leverage, and board of commissioners size on firm value. The conceptual framework proposes that Environmental Performance (X1), Leverage (X2), and Board of Commissioners Size (X3) influence Firm Value (Y) among energy sector companies listed on the Indonesia Stock Exchange (IDX) during 2021–2024.

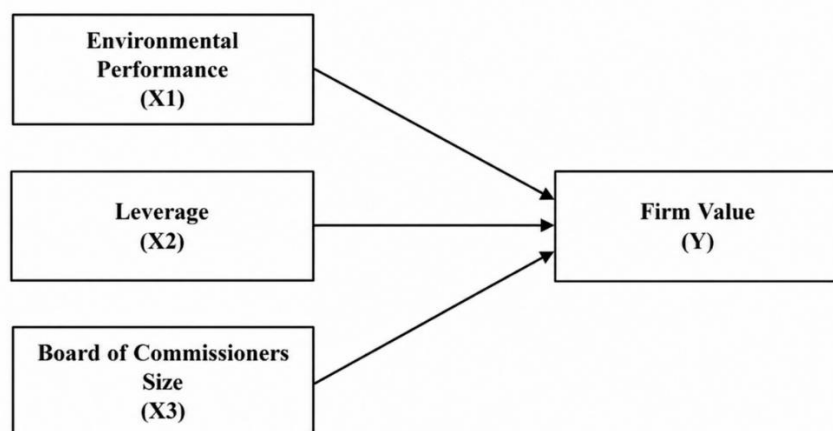


Figure 2.1
Conceptual Framework

Hypothesis Development

The Effect of Environmental Performance on Firm Value

High environmental performance can enhance firm value by improving stakeholder relationships and reducing information asymmetry in the capital market. According to stakeholder theory, companies that demonstrate a strong commitment to environmental management are better able to build positive relationships with communities, governments, and investors because such actions reflect concern for the interests of parties affected by corporate operations (Freeman & McVea, 2001). Effective environmental management

strengthens corporate reputation, reduces conflicts with external stakeholders, and supports long-term business sustainability (Ackermann & Eden, 2011). From the perspective of signaling theory, a high PROPER rating serves as a credible signal of management's ability to manage environmental risks and commitment to sustainability, thereby reducing investor uncertainty regarding future company performance (Spence, 1973). Empirical evidence also indicates that environmental performance positively affects firm value, as companies with higher PROPER ratings tend to gain greater investor confidence, which is reflected in higher market valuations (Adyaksana et al., 2024; Fauziah et al., 2025; Sagala & Kusumadewi, 2023; Saputri et al., 2023). Based on these arguments, the following hypothesis is proposed:

H1: Environmental performance has a positive effect on firm value.

The Effect of Leverage on Firm Value

An appropriate level of debt can increase firm value through tax benefits and by signaling management's confidence in the company's future growth prospects. Stakeholder theory suggests that an optimal leverage policy reflects a company's ability to balance the interests of shareholders and creditors while utilizing external financing to support expansion and growth (Freeman & McVea, 2001). According to signaling theory, reasonable debt usage conveys positive information regarding management's confidence in the company's future cash flows and its ability to meet debt obligations (Spence, 1973). Furthermore, the tax shield generated by interest expenses can enhance firm value by reducing tax burdens and increasing net profitability. Empirical studies support this view, showing that leverage positively influences firm value because investors perceive debt financing as a strategy that promotes expansion, productive investment, and tax efficiency (Dianova & Widyalasmono, 2024; Priyananda & Nuswandari, 2025; Sumilir et al., 2023; Wijayanti et al., 2023). Therefore, the following hypothesis is proposed:

H2: Leverage has a positive effect on firm value.

The Effect of Board of Commissioners Size on Firm Value

A larger board of commissioners can enhance firm value through more effective oversight and better management of stakeholder interests. Stakeholder theory argues that the board serves as a bridge between stakeholders and corporate strategic decisions, enabling a larger board to accommodate diverse perspectives and interests (Ackermann & Eden, 2011). The diversity of expertise and experience among board members can improve monitoring quality and ensure that strategic decisions consider not only shareholders' interests but also those of employees, creditors, and society (Freeman & McVea, 2001). From the signaling theory perspective, an adequately sized board sends a positive signal regarding the quality of corporate governance and the company's commitment to protecting shareholder interests through effective supervision (Spence, 1973). Empirical evidence indicates that board size positively affects firm value because larger boards strengthen managerial oversight, reduce agency conflicts, and increase investor confidence in corporate governance, ultimately improving market valuation (Fadli et al., 2025; Umairoh et al., 2025; Usry et al., 2022). Based on these arguments, the following hypothesis is proposed:

H3: Board of commissioners size has a positive effect on firm value.

RESEARCH METHOD

Research Design

This study employs a quantitative approach with a causal research design to examine the effects of environmental performance, leverage, and board of commissioners size on firm value in the energy sector. A causal design is used to identify cause-and-effect relationships among variables through hypothesis testing and statistical analysis (Sekaran & Bougie, 2019). The quantitative method is appropriate because all variables are measured using standardized numerical data, enabling objective and systematic analysis. This study is classified as applied research since its findings are expected to provide practical insights for stakeholders regarding the determinants of firm value in the energy sector. In addition, the study adopts an ex post facto approach because it relies on historical data without manipulating the observed variables (Sekaran & Bougie, 2019).

Population and Sample

The population consists of all energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period. According to Sekaran and Bougie (2019), a population refers to the entire group of elements relevant to the research objectives. The sample was selected using a non-probability sampling technique, specifically purposive sampling, in which companies were chosen based on predefined criteria aligned with the study's objectives (Sekaran & Bougie, 2019). The selection process was conducted systematically to identify firms that met all research requirements. The sampling criteria and selection results are presented in the following table.

Table 3.1
Sample Selection Criteria

Description	Number of Companies
Energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period	91
Energy sector companies that did not publish complete and consistent financial statements or annual reports during the 2021–2024 period	(19)
Energy sector companies that did not obtain PROPER ratings from the Ministry of Environment and Forestry (KLHK) during the 2021–2024 period	(48)
Total Sample	24
Total Observations for 4 Years (2021–2024)	96

Source: Processed by the author (2026).

Data Type and Data Sources

This study uses quantitative data, which consist of numerical information that can be analyzed using statistical techniques. Quantitative data enable objective measurement of research variables (Sekaran & Bougie, 2019). The study relies on secondary data obtained from financial statements, annual reports, and sustainability reports of sample companies for the 2021–2024 period. These data were collected from the official website of the Indonesia Stock Exchange (IDX) and the official websites of the respective companies. The use of

secondary data provides access to reliable historical information that has been publicly disclosed (Sekaran & Bougie, 2019).

Data Collection Technique

Data were collected using the documentation method, which involves gathering information from official records, reports, and documents relevant to the research objectives (Sekaran & Bougie, 2019). Financial statements were used to obtain data on leverage and firm value, annual reports provided information on board of commissioners size, and sustainability reports along with PROPER publications were used to measure environmental performance. The collected data were then organized and prepared for statistical analysis.

Data Analysis Method

Descriptive Statistics

Descriptive statistics are used to provide an overview of the research data without drawing general conclusions. Using EViews 12, this study reports the minimum, maximum, mean, and standard deviation of all variables, including firm value (Tobin's Q), environmental performance (PROPER rating), leverage (DER), and board of commissioners size. This analysis helps identify the distribution and characteristics of the data before further statistical testing.

Panel Data Regression Analysis

This study employs panel data regression, which combines cross-sectional and time-series data to examine the effects of environmental performance, leverage, and board size on firm value (Basuki, 2021). Three estimation models are considered: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). Each model accounts for differences among companies in different ways and is evaluated to determine the most appropriate specification.

Panel Data Model Selection

The most suitable panel regression model is selected through a series of statistical tests (Basuki, 2021). The Chow Test is used to choose between CEM and FEM, the Hausman Test determines whether FEM or REM is more appropriate, and the Lagrange Multiplier (LM) Test is applied to select between CEM and REM when necessary. These procedures ensure that the chosen model best fits the characteristics of the data.

Classical Assumption Tests

To ensure the validity of the regression model, this study conducts multicollinearity and heteroscedasticity tests (Basuki, 2021). Multicollinearity is assessed using the correlation matrix among independent variables, while heteroscedasticity is examined using the Glejser test. These tests help ensure accurate parameter estimation and reliable statistical inference.

Hypothesis Testing

Hypothesis testing is performed using the t-test, F-test, and coefficient of determination (Adjusted R^2). The t-test evaluates the individual effect of each independent variable on firm value, while the F-test examines their joint effect. Adjusted R^2 measures the proportion of variation in firm value explained by the independent variables, providing an indication of the model's explanatory power (Basuki, 2021).

RESULTS AND DISCUSSION

Research Object and Descriptive Statistics

This study examines energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period. Using purposive sampling, 24 companies were selected from a population of 91 energy firms based on the availability of complete financial reports and consistent PROPER ratings throughout the observation period. The final dataset consists of 96 panel observations derived from 24 companies over four years. The 2021–2024 period was chosen because it represents the post-pandemic recovery phase and a period of significant volatility driven by geopolitical developments and the global energy transition, which affected the performance of Indonesia’s energy sector.

Descriptive statistical analysis was conducted to provide an overview of the characteristics of the research variables, namely firm value, environmental performance, leverage, and board of commissioners size. The analysis presents key statistics, including minimum, maximum, mean, and standard deviation values, as a preliminary assessment of the data before further regression testing.

Table 4.1
Descriptive Statistics of Research Variables

Statistics	PROPER	DER	Board of Commissioners Size (BOC)	Tobin’s Q
Mean	3.802083	1.193750	4.864583	1.677917
Median	4.000000	0.845000	5.000000	1.040000
Maximum	5.000000	7.220000	10.000000	12.920000
Minimum	2.000000	0.060000	2.000000	0.570000
Std. Dev.	0.776223	1.306629	1.726693	2.062702
Skewness	0.220148	2.551513	0.518597	4.363835
Kurtosis	1.966167	9.977414	2.750439	22.618840
Jarque-Bera	5.050686	298.900700	4.552202	1844.284000
Probability	0.080031	0.000000	0.102684	0.000000
Sum	365.000000	114.600000	467.000000	161.080000
Sum Sq. Dev.	57.239580	162.191500	283.239600	404.200400
Observations	96	96	96	96

Source: EViews 12 Output, processed by the author (2026).

Based on Table 4.1, environmental performance (PROPER) has a mean value of 3.80 with low variability, ranging from 2 (Red rating) to 5 (Gold rating), and is normally distributed. Leverage (DER) has a mean of 1.19 and exhibits high variability, with values ranging from 0.06 to 7.22, indicating substantial differences in capital structures among firms; however, the variable is not normally distributed. The board of commissioners size (BOC) has an average of 4.86 members, ranging from 2 to 10 members, and follows a normal distribution. Firm value (Tobin’s Q) records an average of 1.68 with relatively high variation,

ranging from 0.57 to 12.92, suggesting that some companies have market values significantly higher than their book values; this variable is also not normally distributed.

Although leverage and Tobin's Q do not meet the normality assumption, this condition is acceptable in panel data regression analysis. According to the Central Limit Theorem, a sufficiently large sample size allows the sampling distribution to approximate normality even when the underlying data are not normally distributed (Basuki, 2021). Therefore, with 96 panel observations, the regression analysis can still produce consistent and unbiased estimators.

Panel Data Regression Model Selection

a. Chow Test

The Chow Test was conducted to determine the most appropriate panel data regression model between the Common Effect Model (CEM) and the Fixed Effect Model (FEM). The results of the Chow Test are presented in Table 4.2 below.

Table 4.2
Chow Test Results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	12.901209	(23, 69)	0.0000
Cross-section Chi-square	160.107153	23	0.0000

Redundant Fixed Effects Tests

Equation: Untitled

Test Cross-Section Fixed Effects

Source: EViews 12 Output, processed by the author (2026).

The probability values of the Cross-section F and Chi-square statistics are both 0.0000, which are lower than 0.05. Therefore, H_0 is rejected, indicating that the Fixed Effect Model (FEM) is more appropriate than the Common Effect Model (CEM). This result suggests that there are significant differences in characteristics among the sample companies that need to be accommodated through fixed effects in the regression model.

b. Hausman Test

The Hausman Test was conducted to determine the most appropriate panel data regression model between the Fixed Effect Model (FEM) and the Random Effect Model (REM). The results of the Hausman Test are presented in Table 4.3 below.

Table 4.3
Hausman Test Results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section Random	5.374968	3	0.1463

Correlated Random Effects – Hausman Test

Equation: Untitled

Test Cross-Section Random Effects

Source: EViews 12 Output, processed by the author (2026).

The probability value of 0.1463 is greater than 0.05, therefore H_0 is not rejected. This indicates that the Random Effect Model (REM) is more appropriate than the Fixed Effect

Model (FEM). The result suggests that there is no significant correlation between the individual company effects and the independent variables, making the Random Effect Model a more efficient estimator.

c. Lagrange Multiplier Test

The Lagrange Multiplier (LM) Test was conducted to determine the most appropriate panel data regression model between the Common Effect Model (CEM) and the Random Effect Model (REM). The results of the Lagrange Multiplier Test are presented in Table 4.4 below.

Table 4.4
Lagrange Multiplier Test Results

Test Hypothesis	Cross-section	Time	Both
Breusch–Pagan	71.61454 (0.0000)	1.557141 (0.2121)	73.17168 (0.0000)

Lagrange Multiplier Tests for Random Effects

Null Hypothesis: No Effects

Alternative Hypotheses: Two-sided (Breusch–Pagan) and one-sided (all others) alternatives

Source: *EViews 12 Output, processed by the author (2026).*

The Breusch–Pagan probability values for both the cross-section and both effects are 0.0000, which are lower than 0.05. Therefore, H_0 is rejected, indicating that the Random Effect Model (REM) is more appropriate than the Common Effect Model (CEM). This result suggests the presence of significant individual effects across companies that cannot be ignored and are better modeled through a random error component rather than a pooled regression approach. Based on the results of the three model selection tests, the Random Effect Model (REM) was selected as the most appropriate model because it can accommodate firm-specific heterogeneity more efficiently.

Classical Assumption Tests

a. Multicollinearity Test

The multicollinearity test was conducted to examine whether there is a high correlation among the independent variables in the research model. The results of the multicollinearity test are presented in Table 4.5 below.

Table 4.5
Multicollinearity Test Results

Variables	PROPER	DER	BOC Size
PROPER	1.000000	0.151021	0.254673
DER	0.151021	1.000000	-0.056786
BOC Size	0.254673	-0.056786	1.000000

Source: *EViews 12 Output, processed by the author (2026).*

All correlation coefficients are below 0.85, indicating that the model does not suffer from multicollinearity. The highest correlation is observed between PROPER and BOC Size at 0.254673, suggesting that the relationships among the independent variables remain within

acceptable limits. Therefore, there is no multicollinearity problem that could affect the estimation of the regression coefficients.

b. Heteroscedasticity Test

The heteroscedasticity test was conducted to determine whether the panel data regression model exhibits unequal residual variances across observations. In this study, heteroscedasticity was tested using the Glejser method, which involves regressing the absolute residual values on the independent variables. The results of the heteroscedasticity test are presented in Table 4.6 below.

Table 4.6
Heteroscedasticity Test Results (Glejser Test)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.264916	0.934165	-1.354060	0.1790
PROPER	0.321880	0.184549	1.744150	0.0845
DER	0.026946	0.130170	0.207004	0.8365
BOC Size	0.191542	0.124560	1.537752	0.1275

Source: EViews 12 Output, processed by the author (2026).

All probability values are greater than 0.05, indicating that the model does not suffer from heteroscedasticity. The highest probability value is observed for DER at 0.8365, suggesting that the error variance remains constant across all observations. These results indicate that the model satisfies the homoscedasticity assumption, meaning that the estimated coefficients are efficient and unbiased.

Multiple Linear Regression Analysis

Multiple linear regression analysis was conducted to examine the effects of environmental performance, leverage, and board of commissioners size on firm value using the Random Effect Model (REM), which was selected through a series of panel data model selection tests. The results of the multiple linear regression analysis are presented in Table 4.7 below.

Table 4.7
Multiple Linear Regression Analysis Results (Random Effect Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.038261	1.220736	-0.850521	0.3972
PROPER	0.258721	0.237217	1.090651	0.2783
DER	0.076206	0.168465	0.452357	0.6521
BOC Size	0.337445	0.163212	2.067520	0.0415
Effects Specification				
Component	S.D.		Rho	
Cross-section Random	1.885847		0.7667	
Idiosyncratic Random	1.040177		0.2333	

Source: EViews 12 Output, processed by the author (2026).

Multiple Linear Regression Analysis

The Random Effect Model (REM) produced the following regression equation:

$$\text{Tobin's } Q_{it} = -1.038261 + 0.258721\text{PROPER}_{it} + 0.076206\text{DER}_{it} + 0.337445\text{UDK}_{it} + \varepsilon_{it}$$

The regression results indicate that environmental performance (PROPER) and leverage (DER) have positive coefficients, suggesting that improvements in environmental performance and increases in leverage tend to raise firm value. However, both variables are statistically insignificant (p-values of 0.2783 and 0.6521, respectively), indicating that they do not have a meaningful effect on firm value during the study period. In contrast, the board of commissioners size has a positive and significant coefficient of 0.337445 (p-value = 0.0415), implying that the addition of one board member increases Tobin's Q by approximately 0.337 points. This finding suggests that a larger board of commissioners enhances corporate governance effectiveness and contributes positively to firm value.

The model's Rho value of 0.7667 indicates that approximately 76.67% of the total error variance is attributable to differences across firms (cross-sectional random effects), while the remaining 23.33% is explained by idiosyncratic variations within firms over time. This result highlights that firm-specific heterogeneity is the dominant component of the error structure, supporting the selection of the Random Effect Model, which was confirmed through the Chow, Hausman, and Lagrange Multiplier tests.

Discussion

The findings indicate that environmental performance has a positive but insignificant effect on firm value ($\beta = 0.258721$; $p = 0.2783$), suggesting that environmental performance, as measured by the PROPER rating, has not become a decisive factor in investors' valuation of energy companies. During the 2021–2024 period, investors appeared to prioritize short-term financial performance and operational stability amid commodity price volatility and energy transition pressures. This result is consistent with previous studies that found no significant relationship between environmental performance and firm value.

Similarly, leverage shows a positive but insignificant effect on firm value ($\beta = 0.076206$; $p = 0.6521$). Although debt financing may signal management confidence in future growth, investors in the energy sector seem to focus more on a company's ability to manage debt and generate stable cash flows than on leverage levels themselves. Given the capital-intensive nature of the energy industry, high leverage is generally viewed as a normal financing practice rather than a distinguishing signal of firm quality.

In contrast, board of commissioners size has a positive and significant effect on firm value ($\beta = 0.337445$; $p = 0.0415$). A larger board enhances governance quality by providing greater expertise, broader networks, and more effective oversight, which strengthens investor confidence. This finding supports stakeholder and signaling theories, suggesting that strong governance mechanisms are positively valued by investors, particularly in a complex and highly regulated sector such as energy.

Furthermore, the simultaneous test reveals that environmental performance, leverage, and board size jointly do not significantly affect firm value (Prob. F-statistic = 0.120054). The low Adjusted R^2 of 3.05% indicates that most variations in firm value are explained by other factors, such as profitability, liquidity, revenue growth, commodity price fluctuations, government policies, and market sentiment. These findings suggest that during the highly

volatile 2021–2024 period, investors were more responsive to fundamental financial and macroeconomic factors than to environmental, capital structure, or governance considerations.

CONCLUSION

Based on the panel data regression analysis using the Random Effect Model on 24 energy sector companies listed on the Indonesia Stock Exchange during 2021–2024, several important findings were obtained. First, environmental performance, measured by the PROPER rating, does not significantly affect firm value, indicating that investors do not consider environmental ratings as a primary signal when evaluating energy companies. Second, leverage, measured by the Debt-to-Equity Ratio (DER), also has no significant effect on firm value, suggesting that debt usage is not perceived as a distinguishing factor given the capital-intensive nature of the energy industry. Third, board of commissioners size has a positive and significant effect on firm value, implying that a larger board enhances monitoring effectiveness and corporate governance quality, thereby increasing investor confidence. However, the simultaneous test shows that these three variables collectively do not adequately explain variations in firm value, as reflected by the low Adjusted R-squared and insignificant F-statistic. This finding suggests that other factors beyond environmental performance, leverage, and board size play a more substantial role in determining the firm value of energy companies during the 2021–2024 period.

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