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Measuring Debt-Profit Relation: Evidence in Energy Sector from Indonesia Stock Exchange

Ardhiani Fadila*, M Marlina, Alfida Aziz.

Jurusan Manajemen, Fakultas Ekonomi dan Bisnis, UPN Veteran Jakarta, DKI Jakarta, Indonesia.

Correspondence: fadilaardhiani@upnvj.ac.id

A B S T R A C T

This research aims to assess the impact of debt utilization on the performance of companies listed on the Indonesia Stock Exchange during the period of 2012-2021. Panel data analysis is employed to analyze 35 companies operating in the energy sector, includes the use of a fixed effect model, common effect model, and Hausman test to determine the most suitable model for analysing the data. Short-term and long-term debt measurements are used as independent variables to evaluate their effects on company performance based on accounting metrics, including Return on Assets (ROA), Return on Equity (ROE), and Return on Sales (ROS). The findings reveal that both short-term and long-term debt significantly affect company profitability. Additionally, companies in the energy sector predominantly rely on long-term debt for financing. Tangible assets and company size exhibit varying effects on performance. Furthermore, macroeconomic factors, such as exchange rates, play a significant role. These findings are consistent with the "pecking order" theory, which suggests that debt financing is costlier and entails greater information asymmetry compared to internal resources. The study underscores the importance of considering macroeconomic indicators, such as exchange rates and loan interest rates, in understanding the dynamics of the energy sector in Indonesia. Additionally, the results provide valuable insights for policymakers and practitioners in optimizing debt utilization strategies in the energy sector. This research contributes to the existing literature by integrating macroeconomic variables, particularly exchange rates and loan interest rates, into the analysis of debt utilization and company performance in the Indonesian energy sector, thereby providing a comprehensive understanding of its dynamics.

A R T I C L E   I N F O

1. INTRODUCTION

The exploration of the relationship between capital structure and firm performance, particularly in terms of value creation, has been a prominent area of scholarly investigation for decades. The optimal blend of equity and debt in a firm's capital structure is widely acknowledged as a critical determinant of firm performance (Ahmed & Afza, 2019). The study of capital structure and its implications on firm performance holds paramount importance within the realm of accounting research. It lies at the intersection of various accounting domains, including financial accounting, managerial accounting, and corporate finance. The urgency of investigating this topic stems from its profound implications for financial decision-making processes, corporate governance practices, and ultimately, the economic prosperity of firms. Understanding how capital structure choices influence firm performance is crucial for accounting professionals, policymakers, and stakeholders alike, as it provides valuable insights into the financial health and sustainability of businesses across diverse industries. Therefore, the company will continually reassess and optimize its capital structure to achieve its strategic objectives (Heryana et al., 2023).

The determination of capital structure significantly impacts the company's operations, with effective management and substantial profits leading to favorable investor evaluations (Ifada et al., 2021). Various capital structure theories, including (Modigliani & Miller, 1958) seminal work and subsequent theories such as the trade-off theory (Scott, 1977), agency theory (Jensen, 1986; Myers, 1977), and pecking order theory (Myers & Majluf, 1984), have been employed to analyze the relationship between indebtedness and corporate performance (Weill, 2008). However, the literature on these theories has yielded conflicting findings regarding the association between leverage and firm performance (Weill, 2008). While some studies suggest a negative impact of debt financing on firm profitability (Nazir et al, 2021) others indicate a positive relationship between leverage and firm performance (Ramli et al, 2019). Furthermore, empirical evidence suggests the existence of a curvilinear relationship between leverage and firm performance, with an optimal level of leverage beyond which further increases may lead to a decline in performance (Akhtar et al., 2022). Despite the extensive literature on the topic, ambiguity persists regarding the direction of the relationship between debt usage and firm performance, particularly in the context of Indonesia. Moreover, the behavior of different types of debt (short-term and long-term) in relation to firm performance warrants separate examination due to inconsistent findings from prior studies.

The energy sector in Indonesia is one of the key commodities in the modern economy, particularly in the sub-sectors of oil, gas, and coal, characterized by capital-intensive and technologically intensive businesses with high risks, non-renewable resources, and negative environmental impacts (Fadila et al., 2022). Mining companies play a crucial role within this sector due to their responsibility in supplying the energy resources essential for the nation. Listed on the Indonesia Stock Exchange (IDX), these mining companies are categorized into four sub-sectors: coal mining, crude petroleum and natural gas production, metal and mineral mining, and land/stone quarrying (Nurdin et al., 2023). As global energy demand continues to rise (International Energy Institute, 2019), companies operating in this sector face multifaceted challenges influenced by factors such as greenhouse gas emissions, climate change, and geopolitics (Georgakopoulos et al., 2022). Companies operating in this field need to consider these factors continuously and make appropriate choices both internally and externally.

The current problems regarding this phenomenon involve the need to understand the specific impact of short-term and long-term debt utilization on the performance of companies in the

energy sector, the influence of various firm-level variables on company performance, and the decision-making process regarding capital structure within energy companies in Indonesia.

The contribution of this study focuses on several innovations, including: Firstly, this research concentrates on the energy sector in Indonesia by analyzing the measurement of debt, specifically short-term and long-term debt. Secondly, this study introduces specific firm-level variables, namely tangibility, firm size, and sales growth, which have been overlooked in prior research and are consistent with the studies (Dalci, 2018; Forte & Tavares, 2019; Pattitoni et al., 2014). Furthermore, this research incorporates macroeconomic variables that have received limited attention in previous studies, namely exchange rate and loan interest rates. The aim of these variables is to investigate the impact of debt utilization on firm performance, as measured by three profitability indicators derived from accounting performance. Consequently, this study presents a unique and distinctive contribution compared to previous research endeavors.

2. METHODS

The research employs a dataset comprising energy sector companies that are publicly listed on the Indonesia Stock Exchange (IDX) during the timeframe spanning from 2012 to 2021. The sample selection criteria require the companies to have been listed on the IDX since 2012 until 2021 and to have complete and available financial data throughout the research period. The company data was obtained from the EMIS (Emerging Markets Research, Data, and News) website, IDX, and the companies' annual financial reports.

The data collection process involved several steps to ensure the integrity and reliability of the dataset. Firstly, companies meeting the criteria of being listed on the IDX from 2012 to 2021 were identified. Subsequently, their financial data, including balance sheets, income statements, and cash flow statements, were extracted from reputable sources such as EMIS, IDX, and the companies' annual reports.

Additionally, data validation checks were performed to ensure the accuracy and completeness of the collected information. Any discrepancies or missing data were addressed through cross-referencing with multiple sources and direct communication with the companies, if necessary. This meticulous approach to data collection aimed to mitigate potential biases and ensure the robustness of the dataset for rigorous analysis.

In this study, data collection primarily relied on digital tools such as Microsoft Excel for spreadsheet management and data analysis. While no physical devices were utilized for data collection, the software tools served as essential instruments for organizing, processing, and analyzing the financial data obtained from various sources. The utilization of digital tools facilitated efficient data management and allowed for systematic analysis, ensuring the accuracy and reliability of the research outcomes.

This study in **Table 1** aims to examine the effects of employing both short-term and long-term debt on corporate performance. It references and incorporates various variables from previous research studies by (Ahmed & Afza, 2019; Akhtar et al., 2022; Aziz & Abbas, 2019; Dalci, 2018; Forte & Tavares, 2019; Nazir et al., 2021; Ramadhan, 2019; Ramli & Nartea, 2016).

The research methodology employed in this study involves the application of panel data regression analysis using statistical software. The study utilizes the variables outlined in the aforementioned table. The research model was designed to enhance the results by incorporating three crucial determinants of accounting-based profitability, namely Return on Assets (ROA), Return on Equity (ROE), and Return on Sales (ROS). The independent variables comprised short-term debt (STD), long-term debt (LTD), tangibility (TANG), firm size (FSZE), sales growth (SGROW),

as well as macroeconomic variables such as exchange rate (EXC) and loan interest rate (LEND). The research model is formulated as follows:

$$ROA_{it} = \alpha - \beta_1 STD_{i,t} - \beta_2 LTD_{i,t} - \beta_3 TANG_{i,t} + \beta_3 FSIZE_{i,t} + \beta_5 SGROW - \beta_6 EXC_{i,t} - \beta_7 LEND_{i,t} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \alpha - \beta_1 STD_{i,t} - \beta_2 LTD_{i,t} - \beta_3 TANG_{i,t} + \beta_3 FSIZE_{i,t} + \beta_5 SGROW - \beta_6 EXC_{i,t} - \beta_7 LEND_{i,t} + \varepsilon_{it} \quad (2)$$

$$ROS_{it} = \alpha - \beta_1 STD_{i,t} - \beta_2 LTD_{i,t,} - \beta_3 TANG_{i,t} + \beta_3 FSIZE_{i,t} + \beta_5 SGROW - \beta_6 EXC_{i,t} - \beta_7 LEND_{i,t} + \varepsilon_{it} \quad (3)$$

Table 1. Measurement of variables

Variables	Symbol	Measurement	References
Depended Variables			
Return on Asset	ROA	*Net Profit/Total Assets*	(Ahmed & Afza, 2019; Akhtar et al., 2022; Aziz & Abbas, 2019; Dalci, 2018; Forte & Tavares, 2019; Nazir et al., 2021; Ramadhan, 2019; Ramli & Nartea, 2016)
Return on Equity	ROE	*Net Profit/Total Equity*	
Return on Sales	ROS	*Operating Profit/Net Sales*	
Independent Variables			
Short-term Debt	STD	*Short-term debt/Total Asset*	(Ahmed & Afza, 2019; Akhtar et al., 2022; Aziz & Abbas, 2019; Dalci, 2018; Forte & Tavares, 2019)
Long-term Debt	LTD	*Long-term debt/Total Asset*	(Ahmed & Afza, 2019; Akhtar et al., 2022; Aziz & Abbas, 2019; Dalci, 2018; Forte & Tavares, 2019)
Company Specific Variables			
Tangibility	TANG	*Net fixed assets divided by total assets*	(Margaritis & Psillaki, 2010; Nazir et al., 2021; Ramli et al., 2019; Vijayakumaran & Vijayakumaran, 2019)
Firm Size	FSIZE	*Ln (Total Assets)*	(Akhtar et al., 2022; Georgakopoulos et al., 2022; Nazir et al., 2021; Ramli et al., 2019; Vijayakumaran & Vijayakumaran, 2019)
Sales Growth	SGROW	*Sales amount difference from the previous year divided by the sales of the previous year*	(Aziz & Abbas, 2019; Dalci, 2018; Forte & Tavares, 2019; Nazir et al., 2021; Vijayakumaran & Vijayakumaran, 2019)
Macro Variables			
Exchange Rate	EXC	*Currency rate IDR/USD*	(Isnurhadi et al., 2018; Lee, 2017; Setiawanta et al., 2020)
Lending Rate	LEND	*Lending Rate*	(Fosu, 2013; Ramli et al., 2019; Ramli & Nartea, 2016; Tantra et al., 2022)

3. RESULTS AND DISCUSSION
3.1. Analysis Descriptive Statistics

In **Table 2** presents a summary of statistics, including the mean, standard deviation, maximum, minimum, skewness, and kurtosis, for the variables employed in this study. The panel data consists of 35 energy companies that meet the research criteria, with a total of 350 observations during the period from 2012 to 2021.

The table demonstrates that the mean values of ROA (Return on Assets), ROE (Return on Equity), and ROS (Return on Sales), which serve as indicators to assess the accounting-based performance of energy sector companies, are 0.015116, 0.013616, and 0.087867, correspondingly. This indicates that the average profitability of energy sector companies is 1.51% (ROA), 1.36% (ROE), and 8.78% (ROS).

Table 2. Descriptive statistics

	Min	Max	Mean	St. Deviation	Skewness	Kurtosis
ROA	-1.113700	0.520200	0.015116	0.146335	-2.066593	17.04220
ROE	-9.644000	6.163100	0.013616	0.792196	-4.862431	79.64595
ROS	-3.112300	4.960400	0.087867	0.556190	2.560595	35.59276
STD	0.000000	0.603961	0.100164	0.116242	2.049158	7.170459
LTD	0.000000	0.799544	0.196492	0.177704	0.956249	3.564703
TANG	0.000200	0.941800	0.461837	0.207414	0.349173	2.174443
FSIZE	11.07593	18.50003	15.41358	1.377710	-0.091414	3.102004
SGROW	-0.998500	1136.032	3.368756	60.72267	18.62267	347.8702
EXC	9384.240	14582.36	12907.03	1681.032	-1.003532	2.624555
LEND	8.920000	12.66000	11.10600	1.192269	-0.398530	2.035570
N	350	350	350	350	350	350

Notes: ROA (Return on Asset), ROE (Return on Equity), ROS (Return on Sales), STD (Short-term Debt), LTD (Long-term Debt), TANG (Tangibility), FSIZE (Firm Size), SGROW (Sales Growth), EXC (Exchange Rate), LEND (Lending Rate)

In addition, the energy sector companies exhibit an average ratio of short-term debt and long-term debt to total assets, amounting to 10.01% (STD) and 19.64% (LTD), respectively. This suggests that energy sector companies have a larger proportion of long-term debt compared to short-term debt. In the energy sector, the predominant source of financing for companies is long-term debt (LTD).

3.2. Correlation Analysis

The following Pearson correlation matrix in **Table 3** presents the correlation coefficients between the research variables. The short-term debt (STD) variable shows a significant negative relationship with the performance variables, namely ROA and ROS. The long-term debt (LTD) variable exhibits a negative relationship with the performance variables, namely ROA and ROE. These results support the research hypothesis stating a negative relationship between debt usage and firm performance.

The Return on Assets (ROA) variable demonstrates a significant negative correlation with both short-term and long-term debt, with correlation coefficients of 25.4% and 16.4% respectively. Furthermore, the ROS variable exhibits a significant negative correlation solely with short-term debt usage, with a correlation coefficient of 11.2%. Similarly, the ROE variable shows a significant negative correlation exclusively with long-term debt usage, with a correlation coefficient of 13%.

Table 3. Pearson correlation matrix

	ROA	ROE	ROS	STD	LTD	TANG	FSIZE	SGROW	EXC	LEND
ROA	1	.220**	.473**	-.254**	-.164**	-.241**	.260**	0.029	-0.042	-0.063
ROE	.220**	1								
ROS	.473**	.108*	1							
STD	-.254**	-0.013	-.112*	1						
LTD	-.164**	-.130*	0.068	-0.071	1					
TANG	-.241**	-0.092	-.275**	0.072	.254**	1				
FSIZE	.260**	.137*	.302**	-.201**	.157**	-.347**	1			
SGROW	0.029	0.013	0.025	-0.021	0.021	0.069	-0.015	1		
EXC	-0.042	-0.036	0.004	-0.014	-0.021	-0.002	0.063	-.112*	1	
LEND	-0.063	-0.057	-0.044	0.097	0.068	0.056	-0.033	0.029	-.584**	1

Notes: ROA (Return on Asset), ROE (Return on Equity), ROS (Return on Sales), STD (Short-term Debt), LTD (Long-term Debt), TANG (Tangibility), FSIZE (Firm Size), SGROW (Sales Growth), EXC (Exchange Rate), LEND (Lending Rate). Variables are significant at $*p < 0.05$.

The tangibility variable, representing firm-specific characteristics, displays a significant negative correlation with ROA and ROS, while demonstrating a positive relationship with long-term debt. The firm size variable shows a positive correlation with all three performance measurements. The sales growth variable does not exhibit any significant correlation with the three performance measurements. These results indicate low and insignificant correlation levels among the examined variables, confirming a low level of multicollinearity.

3.3. Hypothesis Result and Analysis

The **Table 4** bellow summarizes the panel data regression results for the three equations tested in this study, indicating the relationships between debt financing, firm-specific variables, and macroeconomic variables with accounting-based firm performance using proxies of ROA, ROE, and ROS.

Table 4. Panel data results

Variables	Model 1	Model 2	Model 3
Dependent Variables	**ROA** *Fixed Effect*	**ROE** *Common Effect*	**ROS** *Fixed Effect*
C	-0.692164 (0.0009)	0.085624 (0.9272)	-2.122944 (0.0000)
STD	**-0.229983 (0.0000) ***	0.131530 (0.7217)	**-0.614484 (0.0001) ***
LTD	**-0.136679 (0.0007) ***	**-0.682690 (0.0073) ***	-0.141024 (0.1505)
TANG	**-0.108442 (0.0091) ***	0.040835 (0.8582)	**-0.214394 (0.0078) ***
FSIZE	**0.066801 (0.0000) ***	**0.099061 (0.0039) ***	**0.169150 (0.0000) ***
SGROW	8.93E-05 (0.0612)	0.000112 (0.8713)	0.000352 (0.0761)
EXC	**-1.25E-05 (0.0000) ***	-5.32E-05 (0.0864)	**-1.57E-05 (0.0012) ***
LEND	-0.005545 (0.0638)	-0.072972 (0.0950)	-0.000612 (0.9274)
Lagrange Multiplier	-	0.0517	-
Hausman Test	0.000000	-	0.000000
F-Stat (Prob F-stat)	14.87985 (0.000000) *	2.717514 (0.009369) *	7.490322 (0.000000) *
R^2	0.664515	0.052691	0.499271
Adjusted R^2	0.619856	0.033302	0.432616
N	350	350	350

Notes: ROA (Return on Asset), ROE (Return on Equity), ROS (Return on Sales), STD (Short-term Debt), LTD (Long-term Debt), TANG (Tangibility), FSIZE (Firm Size), SGROW (Sales Growth), EXC (Exchange Rate), LEND (Lending Rate). Variables are significant at $*p < 0.05$

The study utilizes the variables outlined in the aforementioned table. The research model was designed to enhance the results by incorporating three crucial determinants of accounting-based profitability, namely Return on Assets (ROA), Return on Equity (ROE), and Return on Sales (ROS). The independent variables comprised short-term debt (STD), long-term debt (LTD),

tangibility (TANG), firm size (FSZE), sales growth (SGROW), as well as macroeconomic variables such as exchange rate (EXC) and loan interest rate (LEND).

3.4 Return on Assets (ROA) Model

The Hausman test, with a probability value below 0.05, confirmed the suitability of the Fixed Effect (FE) model for analyzing the relationship between ROA and the independent variables. This suggests that both short-term and long-term debt financing have significant impacts on firm profitability, specifically in terms of Return on Assets (ROA).

The notable inverse association observed with short-term debt suggests a detrimental influence on firm performance. This aligns with Akhtar et al (2022), who highlight the potential instability introduced by short-term debt due to fluctuating interest rates. The negative impact on ROA is exacerbated by firms' reliance on short-term debt, which may delay profitable projects due to the need for quick repayments, as noted by Dalci (2018). This finding is consistent with previous studies (Ahmed & Afza, 2019; Akhtar et al., 2022; Aziz & Abbas, 2019; Nazir et al., 2021; Vijayakumaran & Vijayakumaran, 2019).

Long-term debt also negatively impacts ROA. The descriptive statistics indicate that energy sector companies in Indonesia rely more heavily on long-term debt, which can lead to reduced profitability, particularly in emerging markets as suggested by Nazir et al. (2021). The high level of asymmetric information associated with long-term debt further diminishes firm performance, corroborating findings from (Akhtar et al., 2022). These results are in line with previous research (Ahmed & Afza, 2019; Akhtar et al., 2022; Aziz & Abbas, 2019; Nazir et al., 2021).

3.5 Return on Equity (ROE) Model

The Lagrange Multiplier test, supported by a Breusch-Pagan test probability value of 0.0517, indicates that the common effect model is appropriate for ROE.

Unlike its impact on ROA, short-term debt shows a positive but insignificant effect on ROE. This positive relationship is consistent with Aziz & Abbas (2019) and Forte & Tavares (2019), suggesting that tax shields provided by short-term debt may enhance ROE.

Long-term debt has a significant negative effect on ROE, supporting findings from Ahmed & Afza (2019) and Akhtar et al. (2022). This negative impact is attributed to agency problems and asymmetric information, which are more pronounced in long-term financing. The detrimental effect of LTD on equity performance underscores the need for cautious debt management in energy sector companies.

3.6 Return on Sales (ROS) Model

The Hausman test confirmed the appropriateness of the fixed effect model for ROS, with the probability value falling below 0.05.

The significant negative effect of short-term debt on ROS highlights the adverse impact of short-term financing on operating income. This finding, consistent with Akhtar et al. (2022) and Vijayakumaran & Vijayakumaran (2019), signals the need for energy sector companies in Indonesia to carefully manage their short-term debt levels.

Long-term debt shows a negative but statistically insignificant effect on ROS. This result contrasts with Akhtar et al. (2022), indicating that the impact of LTD on sales performance may vary across different contexts.

3.7 The Impact of Firm-specific Variables

Tangibility exhibits a statistically significant negative effect on both ROA and ROS, suggesting that tangible assets may not be optimally utilized in the energy sector, as proposed by Vijayakumaran & Vijayakumaran (2019). This negative impact highlights the potential inefficiency in the use of tangible assets, aligning with findings from Nazir et al. (2021) and Srivastava (2017).

Firm size demonstrates a statistically significant positive impact on all three performance measures (ROA, ROE, and ROS). Larger firms benefit from economies of scale, better management, and diversified investment opportunities, as suggested by Aziz & Abbas (2019) and Vijayakumaran & Vijayakumaran (2019). The positive correlation underscores the advantages of scale and resource access in enhancing firm performance.

Sales growth does not yield a statistically significant impact on performance measures, though the positive coefficient suggests a potential positive relationship. This finding contrasts with Vijayakumaran & Vijayakumaran (2019), indicating that the impact of sales growth may be context-specific.

3.8 The Impact of Macroeconomic Variables

Exchange rate fluctuations have a statistically significant negative impact on ROA and ROS, affecting companies involved in international trade. This finding contradicts Lee (2017), suggesting that exchange rate volatility can hinder profitability in the energy sector.

Loan interest rates show a non-significant negative impact on all three performance measures. The negative direction indicates that companies prefer debt when interest costs are low, benefiting from tax deductions on interest expenses. This result contrasts with (Ramli et al., 2019), highlighting the complex relationship between interest rates and firm performance.

3.9 Summary of Findings

The main findings of this research highlight its novelty in several aspects. Firstly, the study provides new insights into the relationship between debt utilization and firm performance in the Indonesian energy sector, offering a nuanced understanding of how different types of debt impact various profitability measures. Secondly, by incorporating firm-level variables such as tangibility and firm size, alongside macroeconomic factors like exchange rate fluctuations, the research contributes to a more comprehensive analysis of capital structure dynamics within the Indonesian context. Lastly, the validation of the 'pecking order' theory in the Indonesian energy sector adds a novel empirical dimension to existing theoretical frameworks in finance. Overall, the novelty of this research lies in its ability to deepen our understanding of capital structure decisions and their implications for firm performance in the specific context of the Indonesian energy industry.

Energy sector companies in Indonesia exhibit a higher reliance on long-term debt compared to short-term debt. However, the overall utilization of debt remains relatively low, indicating a preference for internal financing. This finding aligns with the "pecking order" theory by Myers & Majluf (1984), suggesting that firms prioritize internal resources due to the higher costs and information asymmetry associated with debt financing. This preference underscores the importance of strategic debt management to maintain firm value and performance.

4. CONCLUSION

The findings of this study align closely with the research objectives outlined in the introduction, providing valuable insights into the relationship between debt utilization and the performance of energy sector companies in Indonesia. The observed negative impact of debt

utilization, particularly short-term and long-term debt, on the profitability measures reaffirms the importance of prudent capital structure management in enhancing firm performance. The prevalence of long-term debt reliance among energy sector companies highlights the need for strategic debt management practices to mitigate risks associated with financing activities. Moreover, the identified significant effects of tangibility, firm size, and exchange rate fluctuations on performance underscore the multifaceted nature of factors influencing firm profitability in the energy sector. The validation of the "*pecking order*" theory within the Indonesian energy sector offers empirical support for existing theoretical frameworks, shedding light on the rationale behind firms' financing decisions. Notably, the positive impact of firm size on performance underscores the importance of resource accessibility and investment capacity in driving firm profitability.

While the findings contribute substantially to the body of knowledge in finance, it is essential to acknowledge the study's limitations. The focus solely on energy sector companies in Indonesia may limit the generalizability of the findings to other industries or geographical contexts. Additionally, the retrospective nature of the data analysis and reliance on secondary data sources may introduce biases and limitations inherent to the data quality and availability. Nevertheless, the robustness of the findings, supported by a rigorous methodology and comprehensive data analysis, enhances the credibility and validity of the study outcomes. Future research endeavours could address these limitations by adopting longitudinal or experimental research designs and incorporating primary data collection methods to enrich the depth and breadth of analysis. In conclusion, this study provides valuable insights into the intricate relationship between capital structure decisions and firm performance in the Indonesian energy sector. By elucidating the impacts of debt utilization and other pertinent variables on performance measures, this research contributes to a deeper understanding of the financial dynamics shaping the energy industry landscape.

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