

The Effect of Capital Structure and Corporate Risk on Firm Value in Energy Sector Companies Listed on the Indonesia Stock Exchange 2020-2024

Renata Endriani Panji^{1*}, Hariyati Hariyati²

^{1,2}Faculty of Economics and Business, Universitas Negeri Surabaya, Indonesia
Email: ¹⁾ renata.22202@mhs.unesa.ac.id, ²⁾ hariyati@unesa.ac.id

Received : 04 July - 2026

Accepted : 06 August - 2026

Published online : 11 August - 2026

Abstract

Notable volatility in firm valuation characterized Indonesia's energy industry from 2020 through 2024, driven by the synergistic effects of the coronavirus crisis, unstable raw material costs, and an accelerating pivot toward sustainable power systems. This research endeavors to examine the role of financial leverage and enterprise-level risk in shaping firm value, using organizational scale as a supplementary control, and concentrates exclusively on IDX-registered energy companies throughout the designated timeframe. The research methodology employs a causal quantitative approach based on secondary data gathered from audited annual financial statements. Utilizing a purposive sampling technique, a final sample of 155 observations was obtained after eliminating extreme data points (outliers). The data analysis techniques applied to test each variable and hypothesis include descriptive analysis, classical assumption tests, and multiple linear regression analysis using SPSS version 25 software. Findings from the simultaneous test reveal that capital structure, corporate risk, and firm size jointly exert a statistically meaningful influence on firm value. Viewed individually, the data show that corporate risk enhances firm value positively, while both capital structure and firm size diminish firm value negatively. This study offers a novelty through empirical documentation of the joint effects attributable to financial leverage and enterprise risk, with organizational scale serving as a control, in the Indonesian energy domain over the 2020–2024 period. Empirical materials drawn from that sector, gathered during a phase of overlapping economic upheaval and foundational energy realignment, permit an extension of agency and signaling frameworks to the interpretation of corporate worth under unpredictable circumstances.

Keywords: Capital Structure, Energy Sector, Firm Risk, Firm Value.

1. Introduction

As a pivotal gauge of market perception regarding organizational achievement, firm value captures not merely the prevailing financial and operational circumstances but also the forward-looking expectations that investors hold about future developmental trajectories (Wandani et al., 2025). An elevated firm value conveys investor trust in managerial capacity to augment shareholder prosperity and emits a favorable signal to potential investors and lenders, consequently drawing fresh capital and external funding (Ridwan & Ekawanti, 2025). Despite the strategic importance of the energy sector, maintaining and enhancing firm value remains a significant challenge for many energy companies the substantial fluctuations in market valuation observed during 2020-2024 suggest that external economic conditions alone cannot fully explain variations in firm value, since companies operating within the same

industry often experience different valuation outcomes despite similar macroeconomic exposure.

Such disparity manifests with particular clarity within Indonesia's energy industry. Over the 2020–2024 interval, IDX-listed energy firms encountered converging disturbances from the coronavirus pandemic, pronounced fluctuations in worldwide commodity valuations, and mounting imperatives for a shift to sustainable energy sources. As a capital-intensive industry heavily exposed to external shocks (Rheynaldi et al., 2023; Tessmann et al., 2024), the sector experienced pronounced firm value fluctuations, making it a critical and timely research setting for examining how internal financial policies shape market valuation (Kartika et al., 2023; Maysari & Endri, 2025; Zandi, 2023).

As one of the largest contributors to national output among capital-intensive industries, the mining, oil, and gas subsectors carry substantial weight in Indonesia's economy, which also makes their valuations particularly exposed to external shocks such as commodity price swings and shifts in global energy demand (Silalahi & Sihotang, 2021); (Pangestuti et al., 2022). Domestically, the energy sector index (IDXENERGY) has shown considerable sensitivity to global oil price volatility and exchange rate fluctuations relative to other sectoral indices, reflecting the sector's exposure to external commodity and currency shocks (Wahyudi & Rahmawati, 2025). These dynamics indicate that firm value in the energy sector during 2020–2024 was shaped jointly by internal financial policy and external market forces, making it an important and timely research setting.

Among the internal factors, capital structure, measured by the Debt-to-Equity Ratio (DER), is particularly important given the sector's large financing requirements for exploration, facility development, and energy transition. The agency framework maintains that funding determinations affect the discord between executives and shareholders, while the signaling perspective asserts that a company's financing activities communicate leadership's assurance about forthcoming operational results (Jensen & Meckling, 1976). While an optimal financing mix diminishes the cost of funds and elevates firm valuation, excessive leverage amplifies fiscal peril and weakens the trust of equity holders (Y. H. H. Chen, 2023; Grosu et al., 2023; Karima et al., 2025; Thewissen et al., 2024).

The research gap is reflected in the inconsistent findings regarding the effects of capital structure, firm risk, and firm size on firm value across different sectors. Moreover, previous studies have largely examined manufacturing, banking, wholesale, and other sectors, while evidence specifically focusing on Indonesia's energy sector remains limited. This limitation is particularly important during the 2020–2024 period, when energy companies faced the combined effects of the COVID-19 pandemic, economic recovery, commodity price fluctuations, and the global energy transition. These conditions may have changed how investors responded to corporate financing decisions and risk exposure (Samour et al., 2024; Zaher & Ahmed, 2026). Therefore, to supply more narrowly applicable empirical evidence and to illuminate the discordant outcomes found in extant research, it becomes necessary to examine how financial leverage and corporate risk affect firm worth, with company size employed as a controlling factor.

Building on this, firm risk, proxied by Beta, captures the sensitivity of stock returns to market movements and investors' uncertainty about future cash flows (Rumondor et al, 2015). Companies with higher systematic risk are often perceived as facing greater uncertainty about future performance, which can dampen investor willingness to invest; yet risk does not always trigger a negative market reaction, as in some cases investors interpret higher risk as a signal of greater growth opportunity and higher expected returns. This dual perspective creates ambiguity regarding the direction of the risk value relationship, particularly in the energy

sector, where business performance depends heavily on commodity price fluctuations, regulatory change, and global economic conditions.

Inclusion of firm size, conventionally measured by aggregate assets, as a moderating factor rests upon the assumption that more substantial companies possess readier entry to capital markets and stronger reputational capital, though these attributes fail consistently to produce elevated firm worth (Melisa et al., 2024), underscoring the need to control for size when estimating the effects of capital structure and firm risk. However, extant studies has yielded divergent conclusions regarding the size-value nexus, suggesting that organizational scale in itself does not ensure enhanced market appraisal; hence, its inclusion as a control becomes essential to disentangle the distinct influences of capital structure and corporate risk, thereby yielding more resilient empirical outcomes. Understanding how these three factors interact is essential precisely because their combined effect on firm value has produced conflicting evidence across sectors and time periods, which is the gap this study aims to address.

The academic literature offers conflicting evidence on how capital structure, corporate risk, and firm size shape firm value. Studies have documented a constructive and substantial association between financing composition and market valuation (Holly et al., 2025; Wijaya & Setyawan, 2025; Yulisa & Wahyudi, 2023; Doorasamy, 2021), while others find a positive but insignificant effect (Ukhriyawati & Dewi, 2019). Similarly, firm size shows mixed results, indicating that it does not necessarily guarantee higher firm value and should therefore be included as a control variable to isolate the effects of capital structure and firm risk. Firm size has been found to positively affect firm value in some contexts (Diastuti et al., 2021) but negatively or insignificantly in others (Ukhriyawati & Dewi, 2019; Yulisa & Wahyudi, 2023). Concerning firm risk, the findings of Amalutstsani and Anwar, (2021) revealed an insignificant impact in banking, while Handayani et al., (2020) reported a significant relationship in wholesale trade. This contradiction points to a notable research deficit, specifically within the Indonesian energy industry during 2020-2024, an era marked by the coronavirus pandemic, its aftermath, and the global energy transformation.

Proceeding from this empirical shortfall, the research herein undertakes an analysis of the joint ramifications of financing composition and corporate risk for firm value, with firm magnitude serving as a controlling variable, targeting energy companies that maintain IDX listings over the 2020-2024 interval. Grounded in agency and signaling theory, the findings are expected to contribute to the firm valuation literature in capital-intensive industries and to provide practical guidance for investors, creditors, and management in evaluating financing and risk-management strategies.

2. Literature Review

2.1. Agency Theory

Agency theory describes the relationship between shareholders (principals) and managers (agents) who are entrusted with authority to manage the company and make decisions in pursuit of corporate goals (Jensen & Meckling, 1976). Differences in interest between principals and agents give rise to agency problems, which can lower firm value unless properly managed. Messier et al. (2022) identify two consequences of this relationship: information asymmetry and agency conflict, both of which generate monitoring, bonding, and residual-loss costs. In capital-intensive sectors such as energy, agency conflicts often surface in decisions related to financing, asset expansion, and risk management.

2.2. Signaling Theory

According to signaling theory, managers employ financial choices, especially debt utilization, as a mechanism for communicating to investors their outlook on the firm's forthcoming performance. Firms with favorable prospects tend to avoid issuing new equity and instead prefer debt financing, since announcing new share issuance is often interpreted by the market as a negative signal that management perceives the firm's shares to be overvalued. Investors evaluate such signals to make informed investment decisions.

2.3. Firm Value

Investor perception of a corporation finds expression in its firm value, typically represented by equity price. The paramount objective of corporate enterprise is to optimize this valuation, consequently augmenting equity holder prosperity. This investigation operationalizes firm value through Price to Book Value (PBV), defined as the quotient of share price divided by book value per share. A PBV exceeding unity signifies that the market appraises the firm above its accounting worth, thereby indicating favorable sentiment concerning its developmental potential (Putri & Handayani, 2022)

2.4. Capital Structure

Capital structure represents the composition of a firm's permanent financing sources, comprising long-term debt and equity, and is central to corporate financing policy aimed at maximizing firm value. The metric employed for this purpose is the Debt-to-Equity Ratio (DER), which expresses total debt as a percentage of total equity. A DER above one indicates that debt financing dominates the firm's capital structure, which may raise financial risk, interest burden, and the probability of default, potentially reducing investor interest, whereas a DER below one signals a larger equity proportion and lower financial risk.

2.5. Firm Risk

Firm risk refers to the likelihood of conditions that may negatively affect the achievement of corporate objectives, arising from internal or external uncertainty (Fahmi, 2014). Risk management involves measuring, mapping, and managing potential threats to minimize losses while maintaining business continuity; it can therefore represent both a threat and an opportunity when managed strategically. This study measures firm risk using Beta, which captures the sensitivity of a stock's return to market return movements.

2.6. Firm Size

The scope of a firm's activities finds expression in its size, for which the standard surrogate is the logarithmic conversion of total assets, thereby reducing the impact of outlier values. The logarithmic transformation is widely used because it reduces the high skewness and variation commonly found in firm size data (Dang et al., 2018). Larger firms are generally assumed to have greater access to internal and external financing and to be perceived by the market as more stable and better able to withstand economic uncertainty, although this assumption does not always hold across contexts. This measurement approach is consistent with recent Scopus-indexed studies examining capital structure, firm size, and firm value in the Indonesian context (Alghifari et al, 2022)

2.7. Previous Research

A number of prior studies provide the empirical foundation for this research. Diastuti et al. (2021) found that firm size and business risk positively and significantly affect capital structure in manufacturing firms. Yulisa and Wahyudi (2023) found that capital structure and firm size negatively but insignificantly affect firm value in food and beverage companies, while

profitability had a significant positive effect. In the banking industry, Amalutstsani and Anwar (2021) found that governance enhances firm value, yet risk fails to register significance. A positive and robust relationship between intellectual capital and leverage with corporate worth emerged in the work of Holly et al. (2025). Ukhriyawati and Dewi (2019) reported leverage as positively insignificant but firm size as negatively significant for LQ-45 firms. Wijaya and Setyawan (2025) confirmed a significant positive effect for capital structure in energy, alongside non-significant liquidity and dividend variables. Handayani et al. (2020) established that leverage, profitability, and risk collectively affect valuation within wholesale trade. Maysaroh and Ahmad (2025) showed leverage to have a positive significant impact, whereas size as a control proved non-significant in the consumer non-cyclicals sector. Collectively, these findings reveal inconsistencies that justify further investigation in the energy sector context.

2.8. Hypothesis Development

2.8.1. The Effect of Capital Structure on Firm Value

Capital-intensive operations in the energy sector necessitate considerable investment, compelling numerous enterprises to resort to debt financing. Prudent utilization of leverage can augment corporate worth via the tax shield advantage (Modigliani & Miller, 1963). From a signaling perspective, an increase in debt may be interpreted by the market as management's confidence in the firm's ability to generate future cash flows (Abedifar et al., 2021; Eldomiaty, 2024; Farooq & Ahmed, 2024), particularly for large firms that can bear fixed interest obligations without excessive default risk. Empirical evidence from Holly et al. (2025), Yulisa and Wahyudi (2023), as well as Wijaya and Setyawan (2025) confirms that financial leverage exhibits a positive and statistically meaningful relationship with corporate valuation. Proceeding from this rationale, the subsequent hypothesis is advanced:

H1: Capital structure has a positive and significant effect on firm value.

2.8.2. The Effect of Firm Risk on Firm Value

High firm risk can affect financing decisions and reduce investor interest by increasing uncertainty about business continuity. From an agency theory perspective, conflicts of interest between managers and shareholders influence risk management and decision-making (Jensen & Meckling, 1976), which may translate into agency costs that affect firm value. However, under conditions of asymmetric information, a firm's ability to manage risk effectively can itself serve as a positive signal of growth potential to external investors Putri et al., (2019). Comprehensive risk management is therefore a strategic factor in sustaining business continuity and preventing significant losses. Based on this reasoning, the following hypothesis is proposed:

H2: Firm risk has a positive and significant effect on firm value.

2.8.3. The Effect of Firm Size on Firm Value

Larger firms generally find it easier to access internal and external financing. Within the agency theory framework, larger firms tend to have more complex agency relationships between management and shareholders, but also more structured monitoring mechanisms that help control agency costs and strengthen investor confidence (Jensen & Meckling, 1976). From a signaling perspective, firm size conveys credibility to investors, as larger and longer-established firms are generally perceived as more stable and better able to withstand market dynamics (Putra & Gantino, 2021). Diastuti et al., (2021) confirm that firm size positively and significantly affects firm value. Based on this reasoning, the following hypothesis is proposed:

H3: Firm size has a positive effect on firm value.

2.8.4. Research Framework

Figure 1 presents the research framework derived from the foregoing hypotheses. Capital structure (X1) and firm risk (X2) are posited to influence firm value (Y), while firm size (K) functions as a moderating parameter.

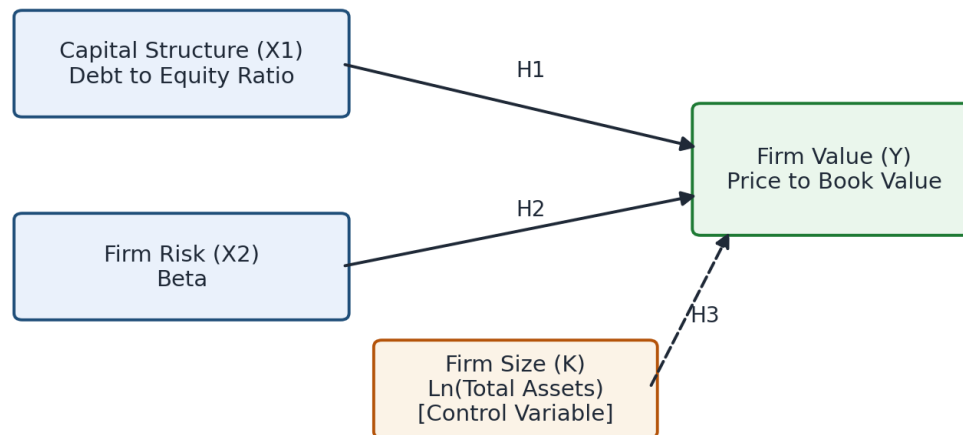


Figure 1. Research Framework
Source: Authors' compilation, 2026

3. Methods

This investigation adopts a causal-associative quantitative framework to analyze how capital structure and firm risk influence firm value, with firm size serving as a controlling factor (Sugiyono, 2013). The secondary data originated from audited yearly financial reports of energy firms, accessible through the Indonesia Stock Exchange's official website for the 2020–2024 window. Analytical methods applied to assess all variables and hypotheses encompassed descriptive statistics, classical assumption evaluations, and multiple linear regression, with SPSS version 25 serving as the computational tool.

3.1. Population and Sample

The target population consists of 91 energy-sector entities listed on the IDX throughout the 2020-2024 period. Application of purposive sampling, guided by the criteria enumerated in Table 1, yielded a final sample of 50 companies, equivalent to 250 firm-year observations.

Table 1. Sample Selection Criteria

Variable	Type	Proxy	Measurement
Firm Value (Y)	Dependent	Price to Book Value (PBV)	Share Price / Book Value per Share
Capital Structure (X1)	Independent	Debt to Equity Ratio (DER)	Total Debt / Total Equity
Firm Risk (X2)	Independent	Beta	Covariance of stock and market return / Variance of market return
Firm Size (K)	Control	Total Assets	Ln (Total Assets)

Source: Processed secondary data, 2026

The operational definitions for all study variables appear in Table 1. Firm value is operationalized through Price to Book Value (PBV), indicating market worth in relation to book equity. Capital structure finds its proxy in the Debt-to-Equity Ratio (DER), which captures the extent of debt financing against shareholder equity, whereas firm risk employs

beta to gauge stock return sensitivity to overall market fluctuations. Firm size, serving as a control, utilizes the natural logarithm of total assets to adjust for variations in organizational scale. These measurements are based on secondary data and are intended to provide consistent and objective indicators for the empirical analysis.

3.2. Operational Definition of Variables

The measurement of firm value (Y) relied upon Price-to-Book Value (PBV), whereas capital structure (X1) was captured through the Debt-to-Equity Ratio (DER). Beta provided the measure for firm risk (X2), and firm size (K), incorporated as a control, was proxied by the natural logarithm of total assets. Detailed operationalization and measurement procedures for every variable appear in Table 2.

Table 2. Operational Definition of Variables

No.	Sample Criteria	Number of Companies
1.	Energy sector companies listed on the Indonesia Stock Exchange	91
2.	Companies that did not publish complete annual reports for 2020-2024	(38)
3.	Companies with incomplete data related to the research variables for 2020-2024	(3)
	Companies used as the sample	50
	Observation period (years)	5
	Total observations (50 × 5 years)	250

Source: Processed secondary data, 2026

3.3. Data Analysis Technique

The data underwent examination through descriptive statistical measures, classical assumption evaluations (namely normality, multicollinearity, heteroscedasticity, and autocorrelation), and multiple linear regression analysis utilizing SPSS version 25 (Sugiyono, 2013). Prior to hypothesis testing, extreme values were detected and removed using an outlier-detection procedure in Google Colaboratory, reducing the number of valid observations from 250 to 155, in order to improve model stability and the validity of statistical inference (S. Chen & Bien, 2019). The multiple linear regression model used in this study is presented in Equation (1).

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta K + \varepsilon \dots\dots\dots (1)$$

where Y is firm value, α is the constant, β_1 , β_2 , and β are the regression coefficients, X1 is capital structure, X2 is firm risk, K is firm size, and ε is the error term. Model fit was evaluated using the adjusted coefficient of determination (R^2), while the hypotheses were tested using the F-test (simultaneous) and t-test (partial) at a significance level of 0.05.

4. Results and Discussion

Presented in this section are the descriptive statistical summaries, findings from the classical assumption tests, the multiple regression analysis, and the hypothesis testing based upon 155 valid firm-year cases remaining after outlier exclusion. An interpretive discussion that situates these results within the context of prior studies and established theory concludes the section.

4.1. Research Results

4.1.1. Descriptive Statistics

The descriptive statistics for firm value (Y), capital structure (X1), firm risk (X2), and firm size (K) are presented in Table 3.

Table 3. Descriptive Statistics Results

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Y (PBV)	155	0.02	1.47	0.6807	0.34803
X1 (DER)	155	0.00	18.75	1.4093	2.03601
X2 (Beta)	155	-63.58	124.83	3.1272	24.00362
K (Ln Total Assets)	155	17.40	32.48	27.2554	3.91390

Source: Processed data using SPSS, 2026

The mean PBV of 0.68 indicates that, on average, energy sector share prices traded below book value during the observation period, reflecting valuation pressure from the pandemic and the energy transition uncertainty. DER shows a high standard deviation (2.04), indicating substantial heterogeneity in financing policy across firms. Beta exhibits the widest dispersion (SD = 24.00), reflecting markedly different risk exposures across sampled companies. Firm size, by contrast, shows low variation, suggesting a relatively homogeneous sample in terms of asset scale.

4.1.2. Classical Assumption Test

As summarized in Table 4, the classical assumption diagnostics verify that the model fulfills all prerequisites for valid regression inference. The Kolmogorov-Smirnov test, employed to assess normality, produced an Asymp. Sig. of 0.011; nevertheless, the Monte Carlo significance value of 0.212 (99% CI: 0.201–0.222) surpasses the 0.05 threshold and was accordingly adopted to confirm the normality of residual distribution. Multicollinearity is absent, as all variables show Tolerance above 0.1 and VIF below 10. Although the Glejser test detected heteroscedasticity for capital structure and firm size, this pattern is commonly observed in panel data with heterogeneous firm characteristics and does not invalidate the overall model. The Durbin-Watson autocorrelation test, based on a Cochrane-Orcutt lag transformation, produced a value of 2.072, within the ideal range of 1.5-2.5, indicating no autocorrelation problem. A summary of the classical assumption test results is presented in Table 4.

Table 4. Classical Assumption Test Results

Test	Statistic / Value	Criteria	Conclusion
Normality (Monte Carlo K-S)	Sig. = 0.212	Sig. > 0.05	Residuals normally distributed
Multicollinearity	Tolerance > 0.1; VIF < 10 (all variables)	Tolerance > 0.1; VIF < 10	No multicollinearity
Heteroscedasticity (Glejser)	Sig. X1 = 0.009; X2 = 0.574; K = 0.005	Sig. > 0.05	Heteroscedasticity indicated for X1 and K
Autocorrelation (Durbin-Watson)	DW = 2.072	1.5 < DW < 2.5	No autocorrelation

Source: Processed data using SPSS, 2026

4.1.3. Multiple Regression Analysis

Presented in Table 5 are the multiple linear regression findings, which generate the following equation.

$$Y = 1.040 - 0.023X_1 + 0.003X_2 - 0.012K \dots\dots\dots (2)$$

Table 5. Multiple Regression Analysis Results

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	1.040	0.193	-	5.378	0.000
X1 (Capital Structure)	-0.023	0.013	-0.133	-1.699	0.091
X2 (Firm Risk)	0.003	0.001	0.227	2.913	0.004
K (Firm Size)	-0.012	0.007	-0.139	-1.783	0.077

Dependent Variable: Y (Firm Value).

Source: Processed data using SPSS, 2026

A constant of 1.040 signifies the anticipated firm value in the absence of any independent variable effects. Capital structure exhibits a coefficient of -0.023, reflecting a negative influence on firm value; specifically, an increase of one point in DER lowers PBV by 0.023. Firm risk shows a positive coefficient of 0.003, meaning that a one-point elevation in Beta raises PBV by 0.003. Firm size carries a coefficient of -0.012, indicating that a one-unit rise in Ln(Total Assets) diminishes PBV by 0.012.

4.1.4. Coefficient of Determination and Hypothesis Testing

The model yields an adjusted R² of 0.068, signifying that capital structure, firm risk, and firm size collectively account for roughly 6.8% (with an unadjusted R Square of 0.086, or 8.6%) of the total variance in firm value, whereas other unmodeled factors explain the remaining portion. Table 6 contains the outcomes of both the F-test and the t-tests.

Table 6. Hypothesis Testing Summary

Hypothesis	Test	Statistic	Sig.	Result
Simultaneous (F-test)	X1, X2, K → Y	F = 4.745	0.003	Significant simultaneous effect
H1: X1 → Y	t-test	t = -1.699	0.091	Negative, not significant, H1 rejected
H2: X2 → Y	t-test	t = 2.913	0.004	Positive, significant, H2 accepted
H3: K → Y	t-test	t = -1.783	0.077	Negative, not significant, H3 rejected

Source: Processed data using SPSS, 2026

An F-statistic of 4.745 ($p = 0.003 < 0.05$) confirms that capital structure, firm risk, and firm size jointly exert a significant influence on firm value. Individually, capital structure shows a negative but insignificant coefficient (failing to support H1), firm risk displays a positive and significant coefficient (supporting H2), and firm size reveals a negative but insignificant coefficient (failing to support H3).

4.2. Discussion

4.2.1. The Effect of Capital Structure on Firm Value

The negative and statistically non-significant effect of Capital structure on firm value leads to the dismissal of H1. Consistent with Ukhriyawati and Dewi (2019), who reported an equivalent insignificant result, this evidence suggests that capital structure's influence on firm value is shaped by industry dynamics and economic circumstances, not a uniformly beneficial

one. During 2020-2024, Indonesia's energy sector experienced the COVID-19 pandemic, declining energy investment, and the transition toward renewable energy, creating heightened uncertainty for highly leveraged firms. This finding is consistent with signaling theory, the use of debt is expected to signal management's confidence in future cash flows which suggests that under adverse economic conditions, debt may lose its positive signaling function and instead amplify concerns regarding financial distress and default risk. From an agency theory standpoint, higher debt levels can increase agency costs and default risk, potentially prompting managers to pursue riskier investment decisions that do not align with creditors' interests (Jensen & Meckling, 1976).

In the context of Indonesia's energy sector, these findings indicate that the benefits of using debt as a source of funding can become limited due to the uncertainty and structural changes that occurred during the 2020-2024 period. The COVID-19 pandemic, fluctuations in energy commodity prices, and increasing demands for the transition toward renewable energy caused energy companies to face uncertainty regarding their cash flow and business prospects. Under these conditions, investors tend to exhibit greater caution toward companies carrying substantial debt, since rising financial liabilities do not invariably accompany improved earnings. The insignificant influence of capital structure thus suggests that investor assessment focuses more on cash flow adequacy, debt servicing capability, and industry responsiveness than on debt composition alone. These findings also imply that capital structure cannot be used as a universal strategy to increase firm value. For the management of energy companies, decisions on the use of debt need to be adjusted to cash flow capacity, risk level, and long-term investment prospects so that an increase in leverage does not instead increase financial pressure and reduce market confidence (Apriatni & Youlianto, 2021; Diantimala et al., 2021; Ngatno et al., 2021).

4.2.2. The Effect of Firm Risk on Firm Value

Firm risk demonstrates a positive and significant influence on firm value, thereby confirming H2. This aligns with Handayani et al. (2020), whose work also identified a meaningful contribution of firm risk to firm value in the wholesale industry. The positive relationship indicates that higher systematic risk was associated with higher market valuations during 2020-2024. Following the pandemic, the recovery in global energy demand and commodity prices benefited firms with higher Beta, as these firms were more responsive to favorable market movements and generated greater expected returns. Although agency theory suggests that risk-taking by managers can create conflicts with shareholders' risk preferences (Jensen & Meckling, 1976), the results suggest that investors in the energy sector exhibit a relatively high risk appetite and interpret elevated Beta values as a signal of aggressive growth strategy, active exploration, and expansion rather than merely as a threat. A higher sensitivity of stock returns to market movements may therefore be read by the market as evidence of a firm's capacity to pursue higher returns. From a signaling theory standpoint, higher systematic risk observed during this era conveyed to investors a message of promising expansion opportunities, not financial instability.

These findings carry important implications because they differ from the general view that an increase in risk will decrease firm value. In the context of Indonesia's energy sector during 2020-2024, a higher systematic risk can reflect a company's greater level of exposure to changes in the energy market, including opportunities arising from the recovery of energy demand and movements in commodity prices. Therefore, investors may view companies with a higher Beta as companies that have a greater opportunity to obtain higher returns when market conditions move positively (Bui et al., 2023; Ferriswara et al., 2022). This result indicates that risk is not always perceived as a negative factor, but can provide added value

when the risk is related to clear growth opportunities that can be managed by the company (Behl et al., 2022; Dai & Xue, 2022). For investors, these findings imply that firm risk should not be assessed only based on potential losses, but also based on return opportunities and the company's ability to take advantage of market conditions. Meanwhile, for management, risk-taking can contribute to firm value if it is carried out in a measured manner, supported by adequate resources, and accompanied by effective risk management mechanisms. However, a high level of risk still needs to be controlled so that it does not turn into financial and operational risk that could harm the company.

4.2.3. The Effect of Firm Size on Firm Value

The negative and non-significant coefficient for firm size on firm value leads to dismissal of H3. Contrary to Diastuti et al. (2021), who identified a positive significant association, this result indicates that expanded corporate magnitude does not guarantee enhanced valuation in the Indonesian energy sector. During 2020-2024, large energy companies faced greater exposure to structural risks arising from the transition toward renewable energy, particularly because substantial portions of their assets remained concentrated in fossil fuel-based operations. In addition, agency theory by Jensen and Meckling (1976) suggests that larger firms tend to experience greater agency costs, organizational complexity, and slower strategic adaptation, which may reduce the advantages typically associated with firm size. These conditions explain why firm size did not significantly enhance firm value and imply that future studies should consider asset composition, particularly the proportion of renewable and fossil fuel assets, as a more relevant determinant of firm value than total assets alone.

This divergence from Diastuti et al. (2021) implies that firm size may not consistently serve as a value-enhancing attribute, particularly when the enterprise operates amid sectoral structural upheaval. Although large companies generally have greater resources, assets, and access to funding, this advantage does not necessarily improve market perception if the assets held face the risk of value decline or are less aligned with the direction of energy industry development. During the 2020-2024 period, increasing attention to the energy transition may cause investors to consider not only the amount of assets owned by the company, but also the quality, productivity, and prospects for the use of those assets. Thus, the magnitude of total assets does not necessarily reflect a firm's capacity to generate future economic value. These results suggest that management should not concentrate solely on expanding firm size through asset accumulation; rather, asset growth must accompany improvements in efficiency, profitability, and adaptability to industrial shifts (Guo et al., 2020; Jaworski & Czerwinka, 2021; Liu et al., 2024). For investors, firm size should be used as one piece of supporting information and not as the sole basis for assessing firm value. Investors need to consider asset composition, dependence on fossil energy, readiness to face the energy transition, and the company's ability to generate economic benefits from the assets it owns.

5. Conclusion

Focusing on IDX-listed energy companies during 2020-2024, this study explores how capital structure and firm risk affect firm value, with firm size serving as a control. Firm risk shows a positive significant relationship, whereas capital structure and firm size show negative insignificant relationships; however, their simultaneous effect on firm value proves significant. By extending Agency Theory and Signaling Theory to the Indonesian energy industry during the post-COVID period and energy shift, these findings demonstrate that firm risk constitutes a stronger determinant of valuation than capital structure and firm size. Practically, the results suggest that managers should prioritize effective risk management

rather than relying solely on debt-financing policies to enhance firm value, while investors should evaluate firm risk alongside other financial indicators when making investment decisions. Nevertheless, this study is limited by its relatively low explanatory power, the reduced sample following outlier treatment, and the use of only secondary financial data. Therefore, future scholarly work is advised to include additional factors such as profitability, liquidity, dividend policy, governance mechanisms, ESG metrics, or asset structure in their analytical frameworks. In addition, future studies could investigate whether the positive effect of firm risk differs across energy sub-sectors or under different macroeconomic conditions to provide a deeper understanding of firm value determinants.

6. References

- Abedifar, P., Bouslah, K., & Zheng, Y. (2021). Stock price synchronicity and price informativeness: Evidence from a regulatory change in the US banking industry. *Finance Research Letters*, 40, 101678. <https://doi.org/10.1016/j.frl.2020.101678>
- Alghifari, E. S., Solikin, I., Nugraha, N., Waspada, I., Sari, M., & Puspitawati, L. (2022). *Capital Structure, Profitability, Hedging Polic , Firm Size, and Firm Value : Mediation and Moderation Analysis*. 9(5), 789–801. <https://doi.org/10.15549/jecar.v9i5.1063>
- Amaluttsani, W. Y., & Anwar, M. (2021). Corporate Governance, Risiko, dan Nilai Perusahaan Pada Perusahaan Sektor Perbankan Di Indonesia. *Jurnal Ilmu Manajemen*, 11(1), 1–9. <https://doi.org/10.32502/jimn.v11i1.3514>
- Apriatni, E. P., & Youlianto, A. (2021). Moderating effects of corporate governance mechanism on the relation between capital structure and firm performance. *Cogent Business & Management*, 8(1), 1–22. <https://doi.org/10.1080/23311975.2020.1866822>
- Behl, A., Kumari, P. S. R., Makhija, H., & Sharma, D. (2022). Exploring the relationship of ESG score and firm value using cross-lagged panel analyses: case of the Indian energy sector. *Annals of Operations Research*, 313(1), 231–256. <https://doi.org/10.1007/s10479-021-04189-8>
- Bui, T. N., Nguyen, X. H., & Pham, K. T. (2023). The Effect of Capital Structure on Firm Value: A Study of Companies Listed on the Vietnamese Stock Market. *International Journal of Financial Studies*, 11(3), 100. <https://doi.org/10.3390/ijfs11030100>
- Chen, S., & Bien, J. (2019). Valid Inference Corrected for Outlier Removal. *Journal of Computational and Graphical Statistics*, 29(2), 323–334. <https://doi.org/10.1080/10618600.2019.1660180>
- Chen, Y. H. H. (2023). An economy-wide framework for assessing the stranded assets of energy production sector under climate policies. *Climate Change Economics*, 14(1), 2350003. <https://doi.org/10.1142/S2010007823500033>
- Dai, D., & Xue, Y. (2022). The impact of green innovation on a firm's value from the perspective of enterprise life cycles. *Sustainability*, 14(3), 1226. <https://doi.org/10.3390/su14031226>
- Dang, C., (Frank) Li, Z., & Yang, C. (2018). Measuring firm size in empirical corporate finance. *Journal of Banking & Finance*, 86, 159–176. <https://doi.org/10.1016/j.jbankfin.2017.09.006>
- Diantimala, Y., Syahnur, S., Mulyany, R., & Faisal, F. (2021). Firm size sensitivity on the correlation between financing choice and firm value. *Cogent Business & Management*, 8(1), 1926404. <https://doi.org/10.1080/23311975.2020.1866822>
- Diastuti, S. A., Cholifah, C., & Istanti, E. (2021). Pengaruh Ukuran Perusahaan, Profitabilitas dan Risiko Bisnis terhadap Struktur Modal pada Perusahaan Manufaktur (LQ45) Tahun 2015-2018. *Benchmark*, 1(2), 114–121. <https://doi.org/10.46821/benchmark.v1i2.149>
- Doorasamy, M. (2021). Capital structure, firm value and managerial ownership: Evidence from East African countries. *Investment Management and Financial Innovations*, 18(1),

- 346–356. [https://doi.org/10.21511/imfi.18\(1\).2021.28](https://doi.org/10.21511/imfi.18(1).2021.28)
- Eldomiaty, T. (2024). An Alignment of Financial Signaling and Stock Return Synchronicity. *Journal of Risk and Financial Management*, 17(4), 162. <https://doi.org/10.3390/jrfm17040162>
- Fahmi, I. (2014). *Manajemen Risiko Teori, Kasus, dan Solusi*. Alfabeta.
- Farooq, O., & Ahmed, N. (2024). Shariah compliance and stock price synchronicity: evidence from India. *International Journal of Emerging Markets*, 19(3), 752–774. <https://doi.org/10.1108/IJOEM-07-2021-1149>
- Ferriswara, D., Sayidah, N., & Agus Buniarto, E. (2022). Do corporate governance, capital structure predict financial performance and firm value?(empirical study of Jakarta Islamic index). *Cogent Business & Management*, 9(1), 2147123. <https://doi.org/10.1080/23311975.2022.2147123>
- Grosu, V., Tiron-Tudor, A., Socoliuc, M., Ciubotariu, M.-S., Hlaciuc, E., Macovei, A.-G., Tulvinschi, M., Mihalcu, C.-C., & Melega, A. (2023). Financial sustainability of oil and gas companies—basis for building resilience strategies. *Frontiers in Environmental Science*, 11. <https://doi.org/10.3389/fenvs.2023.1205522>
- Guo, Z., Hou, S., & Li, Q. (2020). Corporate Social Responsibility and Firm Value: The Moderating Effects of Financial Flexibility and R&D Investment. *Sustainability*, 12(20), 8452. <https://doi.org/10.3390/su12208452>
- Handayani, S. R., Jamaluddin, J., Palit, T. C., & Sipahutar, I. A. (2020). Pengaruh Struktur Modal, Profitabilitas, dan Risiko Perusahaan Terhadap Nilai Perusahaan Pada Sub Sektor Wholesale Yang Terdaftar Di Bursa Efek Indonesia Periode 2014-2018. *Business Innovation and Entrepreneurship Journal*, 2(3), 188–196. <https://doi.org/10.35899/biej.v2i3.144>
- Holly, A., Jao, R., Mardiana, A., & Kusuma, W. (2025). Pengaruh Intellectual Capital dan Struktur Modal terhadap Nilai Perusahaan. *Jurnal Ekualisasi*, 6(2), 1–11. <https://doi.org/10.60023/bebny67>
- Jaworski, J., & Czerwionka, L. (2021). Determinants of Enterprises' Capital Structure in Energy Industry: Evidence from European Union. *Energies*, 14(7), 1871. <https://doi.org/10.3390/en14071871>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4). [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Karima, T., Hidayat, K., Nuzula, N. F., & Damayanti, C. R. (2025). The Effect of Risk on Capital Structure, Profitability, and Firm Value with Sustainability Report as a Moderating Variable. *OIDA International Journal of Sustainable Development*, 18(12), 475–488. <https://ssrn.com/abstract=5780042>
- Kartika, A., Irsad, M., Setiawan, M., & Sudiyatno, B. (2023). The Relationship between Capital Structure, Firm Performance, and A Firm's Market Competitiveness: Evidence From Indonesia. *Investment Management and Financial Innovations*, 20(1), 88–98. [https://doi.org/10.21511/imfi.20\(1\).2023.09](https://doi.org/10.21511/imfi.20(1).2023.09)
- Liu, J., Zhu, B., & Hu, X. (2024). Systemic risk spillovers among global energy firms: Does geopolitical risk matter? *Energy Economics*, 140, 108036. <https://doi.org/10.1016/j.eneco.2024.108036>
- Maysari, M., & Endri, E. (2025). ESG Disclosure, Intellectual Capital, and Firm Value in the Energy Sector in Indonesia: The Moderating Role of Firm Size. *International Journal of Energy Economics and Policy*, 15(6), 512–522. <https://doi.org/10.32479/ijeep.21243>
- Maysaroh, S., Ahmad, G. N., & Andy, A. (2025). Pengaruh Struktur Modal, Profitabilitas, dan Pertumbuhan Penjualan terhadap Nilai Perusahaan dengan Ukuran Perusahaan Sebagai Variabel Kontrol pada Sektor Consumer Non-Cyclicals yang Terdaftar di Bursa Efek Indonesia Periode 2018-2023. *Jurnal Rimba : Riset Ilmu Manajemen Bisnis Dan Akuntansi*, 3(3), 269–280. <https://doi.org/10.61132/rimba.v3i3.2053>

- Melisa, N., Oktavianti, S., Haqiqi, T. M., Zainal, R. I., & Firmansyah, F. (2024). Pengaruh Struktur Modal Dan Ukuran Perusahaan Terhadap Nilai Perusahaan Pada Perusahaan Sektor Energi Di Indonesia. *Journal of Management, Entrepreneur and Cooperative*, 3(1), 51–65. <https://doi.org/10.56869/jmec.v3i1.533>
- Messier, W. F., Glover, S. M., & Prawitt, D. F. (2022). *Auditing & Assurance Services: A Systematic Approach*. McGraw Hill Education.
- Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: a correction. *The American Economic Review*, 53(3), 433–443. <https://www.jstor.org/stable/1809167>
- Ngatno, N., Apriatni, E. P., & Youlianto, A. (2021). Moderating effects of corporate governance mechanism on the relation between capital structure and firm performance. *Cogent Business & Management*, 8(1), 1866822. <https://doi.org/10.1080/23311975.2020.1866822>
- Pangestuti, D., Muktiyanto, A., Geraldina, I., & Darmawan, D. (2022). Role of Profitability, Business Risk, and Intellectual Capital in Increasing Firm Value. *Journal of Indonesian Economy and Business*, 37(3), 311–338. <https://doi.org/10.22146/jieb.v37i3.3564>
- Putra, R. D., & Gantino, R. (2021). Pengaruh Profitabilitas, Leverage, dan Ukuran Perusahaan Terhadap Nilai Perusahaan. *Jurnal Bisnis Dan Manajemen*, 11(1), 81–96. <https://doi.org/10.15408/ess.v11i1.20338>
- Putri, A., Djazuli, A., & Riyah, C. (2019). Pengaruh Ukuran, Pertumbuhan, dan Risiko Perusahaan terhadap Nilai Perusahaan yang Tergabung dalam Indeks LQ45 di Bursa Efek Indonesia. *Balance: Jurnal Akuntansi Dan Bisnis*, 4(2), 607–621. <https://doi.org/10.32502/jab.v4i2.1987>
- Putri, O. F. T. A., & Handayani, N. (2022). Pengaruh Struktur Modal dan Ukuran Perusahaan terhadap Nilai Perusahaan. *JIRA: Jurnal Ilmu Dan Riset Akuntansi*, 11(7), 1–16. <https://jurnalmahasiswa.stiesia.ac.id/index.php/jira/article/view/4688>
- Rheynaldi, P. K., Endri, E., Minanari, M., Ferranti, P. A., & Karyatun, S. (2023). Energy price and stock return: Evidence of energy sector companies in Indonesia. *International Journal of Energy Economics and Policy*, 13(5), 31–36. <https://doi.org/10.32479/ijeep.14544>
- Ridwan, A., & Ekawanti, W. (2025). Pengaruh Profitabilitas, Pertumbuhan Perusahaan, Struktur Modal dan Ukuran Perusahaan terhadap Nilai Perusahaan. *Jurnal Akuntan Publik*, 3(3), 1–20. <https://doi.org/10.59581/jap-widyakarya.v3i3.5501>
- Rumondor, R., Mangantar, M., & Sumarauw, J. S. B. (2015). Pengaruh Struktur Modal, Ukuran Perusahaan, dan Risiko Perusahaan terhadap Nilai Perusahaan pada Sub Sektor Plastik dan Pengemasan di BEI. *Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, 3(3), 159–169. <https://doi.org/10.35794/emba.3.3.2015.9338>
- Samour, A., AlGhazali, A., Gadoiu, M., & Banuta, M. (2024). Capital structure and financial performance of China's energy industry: What can we infer from COVID-19? *Plos One*, 19(6), e0300936. <https://doi.org/10.1371/journal.pone.0300936>
- Silalahi, E., & Sihotang, V. (2021). Pengaruh Struktur Modal, Pertumbuhan Perusahaan, dan Ukuran Perusahaan terhadap Nilai Perusahaan pada Perusahaan Barang Konsumsi yang Terdaftar di Bursa Efek Indonesia. *Jurnal Riset Akuntansi & Keuangan*, 7(2), 153–166. <https://doi.org/10.54367/jrak.v7i2.1381>
- Sugiyono. (2013). *Metode Kuantitatif, Kualitatif dan R&D*. Alfabeta.
- Tessmann, M., Gutiérrez, C. E. C., Khodr, O., Magalhães, L. A., & Passos, M. de O. (2024). Volatility transmission and market connectivity of metals and energy commodities: Insights from the spillover index. *International Journal of Energy Economics and Policy*, 14(3), 609–618. <https://doi.org/10.32479/ijeep.15152>
- Thewissen, J., Ayaydin, Ö. A., Westerman, W., & Dorsman, A. (2024). The ESG Framework and the Energy Industry: Demand and Supply, Market Policies and Value Creation. In *Esg Framework and the Energy Industry Demand and Supply Market Policies and*

- Value Creation*. Springer Cham. <https://doi.org/10.1007/978-3-031-48457-5>
- Ukhriyawati, C. F., & Dewi, R. D. (2019). Pengaruh Struktur Modal, Pertumbuhan Perusahaan, dan Ukuran Perusahaan terhadap Nilai Perusahaan pada Perusahaan LQ45 yang Terdaftar di Bursa Efek Indonesia. *EQUILIBIRIA: Jurnal Fakultas Ekonomi*, 6(1), 1–14. <https://doi.org/10.33373/jeq.v6i1.1899>
- Wahyudi, S. T., & Rahmawati, A. (2025). Examining the link between world oil price volatility and sectoral stock performance in Indonesia. *Cogent Economics & Finance*, 13(1), 2535484. <https://doi.org/10.1080/23322039.2025.2535484>
- Wandani, R. T., Widiawati, H. S., & Faisol, F. (2025). Pengaruh Profitabilitas, Leverage, Growth Opportunity, dan Kebijakan Dividen Terhadap Nilai Perusahaan pada Perusahaan yang Terdaftar di LQ45 Periode 2021-2024. *Jurnal Riset Manajemen Dan Akuntansi*, 5(2), 785–799. <https://doi.org/10.55606/jurima.v5i2.5614>
- Wijaya, S., & Setyawan, I. R. (2025). Pengaruh struktur modal, likuiditas, profitabilitas, dan kebijakan dividen terhadap nilai perusahaan pada perusahaan sektor energi di Indonesia. *Jurnal Manajemen Bisnis Dan Kewirausahaan*, 9(5), 922–933. <https://doi.org/10.24912/jmbk.v9i5.35333>
- Yulisa, C. F., & Wahyudi, I. (2023). Pengaruh Struktur Modal, Profitabilitas dan Ukuran Perusahaan Terhadap Nilai Perusahaan Pada Perusahaan Manufaktur Sektor Makanan dan Minuman Yang terdaftar di Bursa Efek Indonesia Tahun 2018-2021. *Jurnal Publikasi Ekonomi Dan Akuntansi*, 3(1), 52–61. <https://doi.org/10.51903/jupea.v3i1.580>
- Zaher, A., & Ahmed, M. (2026). Capital Structure Resilience During the COVID-19 Pandemic: An Analysis of the Impact of Financial Characteristics on Egyptian Listed Companies. *Journal of Risk and Financial Management*, 19(4), 252. <https://doi.org/10.3390/jrfm19040252>
- Zandi, G. (2023). Exploring Capital Structure Determinants for OECD Energy Firms. *International Journal of Energy Economics and Policy*, 13(4), 338–347. <https://doi.org/10.32479/ijeeep.14559>