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Financial Distress and Corporate Investment Decisions: Empirical Evidence from Indonesian Energy Firms (2020–2024)

Moh. Iqbal Wildan Irhamni[1], Hariyati[2]
[1,2]Surabaya State University, Indonesia
E-mail: mohiqbal.23287@mhs.unesa.ac.id[1], hariyati@unesa.ac.id[2]

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Abstract: *This study examines the effect of financial distress on corporate investment decisions (capital expenditure/CAPEX) and investigates whether this relationship differs between high-risk firms (firms-at-risk) and solvent firms in the Indonesian energy sector. Grounded in Debt Overhang Theory, Pecking Order Theory, and the Risk-Shifting Hypothesis, this research analyzes a balanced panel of 24 energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2020 to 2024 (120 firm-year observations). Financial distress is measured using the inverse Modified Altman Z"-Score (DISTRESS = −Z"), classifying firms with Z" ≤ 2.60 as firms-at-risk (FAR = 1; 29 observations) and Z" > 2.60 as solvent (FAR = 0; 91 observations). Investment is proxied by gross fixed asset additions scaled by total assets (CAPEX_TA). Panel regressions using Pooled OLS and Two-Way Fixed Effects with firm-clustered robust standard errors control for firm size, leverage, operating growth, liquidity, profitability, and commodity volatility. Fixed Effect results show that financial distress significantly and robustly reduces capital expenditure (B = −0.032, p = 0.012; clustered p < 0.001). While high-risk firms exhibit a robust downward regime shift in investment (FAR B = −0.180, clustered p = 0.005), the continuous interaction slope (DISTRESS × FAR B = −0.043, LSDV p = 0.018) is not robust to firm clustering (p = 0.112) as distressed firms' CAPEX is already compressed near the maintenance floor.*

INTRODUCTION

The energy sector constitutes a vital pillar of the Indonesian economy characterized by high capital intensity, pronounced cyclicality, and direct exposure to global commodity price volatility. To sustain production capacity, execute exploration programs, and renew extraction and transport infrastructure, listed firms in this sector rely heavily on continuous capital expenditure (CAPEX) allocations. However, the elasticity of productive asset investment frequently encounters structural impediments when internal liquidity tightens and external financing access becomes restricted, as outside investors demand a premium for information asymmetry regarding firm prospects (Myers & Majluf, 1984). Empirical evidence from emerging markets confirms that financial distress

heightens investment dependence on internal cash flows and constrains capital formation (Gupta & Mahakud, 2023). Credit rationing and operating cash flow compression directly curtail managerial discretion in executing long-term capital investment agendas.

The dynamics of the energy sector on the Indonesia Stock Exchange (IDX) during the 2020–2024 period reflect an unprecedented multi-crisis cycle unfolding across three sequential phases. During the Global Demand Contraction Phase (2020), pandemic-induced mobility restrictions depressed global energy demand, causing Indonesia's Benchmark Coal Price (*Harga Batubara Acuan*/HBA) to plunge from approximately US$65–67 per ton in early 2020 toward its cyclical trough, narrowing operating cash flows across mining and energy producers. Theoretically, such commodity price shocks elevate corporate bankruptcy risk through compressed operating margins and rising debt servicing costs, as documented across a 28-country sample by Halder and Kannadhasan (2025). Subsequently, the Asymmetric Windfall Profit Phase (2021–2022) triggered by global geopolitical disruptions—including a surge in the HBA beyond US$200 per ton in late 2021 and early 2022—temporarily boosted primary commodity revenues. Nevertheless, this liquidity windfall was distributed asymmetrically; issuers burdened by legacy debt overhang remained constrained in their expansion, consistent with Cui's (2022) finding among post-crisis European firms that high pre-shock debt persistently suppresses investment for several years, particularly among borrowers exposed to short-term rollover risk. Finally, in the Monetary Normalization and Tightening Phase (2023–2024), commodity price corrections accompanied by elevated global benchmark interest rates increased refinancing costs—a rollover channel that Cui (2022) identifies as exacerbating debt overhang effects on investment. Concurrently, the implementation of the Indonesia Taxonomy for Sustainable Finance (*Taksonomi untuk Keuangan Berkelanjutan Indonesia*/TKBI) by the Financial Services Authority (OJK) in February 2024 began steering institutional financing away from fossil-fuel activities.

This empirical phenomenon is vividly illustrated by one of Indonesia's largest energy producers, PT Bumi Resources Tbk (BUMI). In the initial period (2020–2021), the company operated within the formal distress zone, recording a deeply depressed Modified Altman Z″-Score. Although quasi-reorganization and surging coal prices during 2022–2023 improved its Z″-Score, BUMI's capital structure remained encumbered by a massive accumulated deficit in retained earnings. Over the same horizon, corporate capital allocation exhibited extreme volatility: realized CAPEX fluctuated sharply with commodity cycles and net income—from near-total paralysis in 2020, to a pronounced expansion in 2022 at the peak of coal prices, followed by a renewed contraction in 2023 when BUMI's net profit dropped from US$525.27 million in 2022 to US$10.92 million in 2023. Such financial distress fundamentally disrupts corporate capital allocation efficiency, forcing management to trade off short-term liquidity preservation against long-term productive capacity.

Both theoretically and empirically, the direction of the relationship between financial distress and corporate investment decisions remains an unresolved conceptual debate (research gap). According to Debt Overhang Theory (Myers, 1977), firms with impaired solvency are prone to underinvestment. Management tends to forego positive Net Present Value (NPV) projects because the resulting future cash flows primarily accrue to senior creditors rather than generating residual value for shareholders. Supporting this prediction, Cui (2022) demonstrates that deteriorating debt burdens significantly depress realized investment over multi-year horizons, while Gupta and Mahakud (2023) document a similar defensive contraction in capital expenditure aimed at preserving residual liquidity among financially distressed Indian firms. Conversely, the Risk-Shifting Hypothesis (Jensen & Meckling, 1976) posits the opposite prediction. When a firm

approaches the bankruptcy boundary and equity value nears zero, moral hazard incentives emerge for shareholders and managers to pursue high-risk projects (*gambling for resurrection*). If speculative investments succeed, shareholders capture the upside recovery; if they fail, the downside losses are borne by creditors. Bai et al. (2024) confirm this behavior among Chinese firms hit by the COVID-19 shock using entropy-balancing matching and difference-in-differences, showing significant increases in leverage and risk-taking concentrated among moderately constrained firms. Within the energy sector specifically, Chen and Duchin (2021) find that oil and gas firms distressed by the 2014 oil price collapse increased risk by shifting cash into risky financial assets, particularly when exposed to high rollover risk and low collateral.

Crucially, however, both Bai et al. (2024) and Chen and Duchin (2021) demonstrate that risk-shifting behavior is concentrated within specific subgroups rather than operating uniformly across all distressed firms. Likewise, Borensztein and Ye (2021) show that the investment drag of corporate debt overhang in emerging economies is highly nonlinear—becoming substantially more severe once leverage crosses a critical threshold. Consequently, treating energy sector issuers as a homogeneous population risks masking regime differences between solvent companies and firms operating near bankruptcy. This study distinguishes itself from prior literature through two primary contributions. First, it isolates heterogeneity across solvency regimes (*firms-at-risk isolation*) by segmenting Indonesian energy issuers into high-risk firms (Modified Altman $Z'' \leq 2.60$, cross-checked against IDX Special Notation status) and solvent firms ($Z'' > 2.60$) to test whether financial distress operates as a continuous slope accelerator or a discrete threshold regime shift. Second, it examines a comprehensive multi-crisis panel window (2020–2024) that integrates pandemic liquidity contraction, commodity windfall booms, monetary tightening, and early energy transition pressures within a unified econometric framework.

LITERATURE REVIEW

Financial distress refers to a condition in which a firm experiences difficulty fulfilling its financial obligations to creditors, ranging from short-term liquidity pressure to formal default risk. Andrade and Kaplan (1998) emphasize the necessity of separating financial distress from economic distress: a corporation may possess economically viable productive assets, yet excessive debt service obligations push it into financial turmoil. The costs arising from financial distress extend well beyond direct legal and restructuring expenses; more pervasive indirect costs emerge when management is forced to abandon or postpone profitable investment projects. Myers (1977) conceptualizes growth opportunities as discretionary call options whose exercise depends on future capital outlays. When a firm carries risky debt, a disproportionate share of the payoff from new positive-NPV projects is captured by existing bondholders to recover prior claims, reducing shareholder incentives to inject new capital and inducing chronic underinvestment.

This underinvestment channel is reinforced by asymmetric information in external capital markets. Myers and Majluf (1984), under the Pecking Order Theory framework, show that when corporate insiders possess superior information relative to outside investors, external equity and debt financing command a steep lemon premium. For financially distressed firms, heightened default risk amplifies external financing costs and tightens credit rationing, rendering capital expenditure highly sensitive to internal cash flow availability (Gupta & Mahakud, 2023). By contrast, Agency Theory and the Risk-Shifting Hypothesis (Jensen & Meckling, 1976) view the firm as a nexus of contracts characterized by divergent incentives between shareholders and creditors. Because limited liability truncates shareholder downside losses at zero, near-insolvent equity holders face a convex payoff structure resembling a call option on firm value, creating moral

hazard incentives to substitute low-risk maintenance outlays with high-variance projects (*asset substitution*).

1. Constructs and Prior Research

This study operationalizes two core constructs alongside a regime-switching moderator. The first construct, financial distress, is measured using the Modified Altman Z″-Score model developed for non-manufacturing enterprises and emerging markets (Altman, 1995/2000). By excluding the industry-sensitive asset turnover ratio and introducing an emerging-market constant, the Z″-Score captures multidimensional balance sheet and operating vulnerability across four financial ratios: working capital to total assets (X_1), retained earnings to total assets (X_2), earnings before interest and taxes to total assets (X_3), and book value of equity to total liabilities (X_4). Firms with $Z'' > 2.60$ are classified in the safe (solvent) zone, those with $1.10 \leq Z'' \leq 2.60$ in the grey zone, and those with $Z'' < 1.10$ in the distress zone. Consistent with the study's problem boundary, issuers in the grey and distress zones ($Z'' \leq 2.60$) are grouped into the high-risk category (*firms-at-risk*, FAR = 1). The second construct, corporate investment decision, is defined as capital expenditure (CAPEX) allocated to acquire, upgrade, or maintain productive fixed assets—such as mining concessions, drilling rigs, heavy equipment, and marine transport vessels—scaled by total assets.

Prior empirical literature reveals three distinct patterns regarding the distress–investment nexus. Under the first pattern, empirical studies predominantly document a negative relationship consistent with debt overhang and financing constraints. Cui (2022), analyzing matched firm–bank data in Europe following the 2008–2013 crisis, finds that firms entering a crisis with higher debt cut capital expenditure more deeply for several subsequent years, with rollover risk magnifying the contraction. Borensztein and Ye (2021), examining corporate balance sheets across emerging economies, confirm that debt overhang exerts a substantial and nonlinear drag on investment that intensifies once leverage is already elevated. Similarly, Gupta and Mahakud (2023), applying System GMM to Indian firms over 2001–2019, establish that financial distress increases investment–cash flow sensitivity while directly depressing corporate investment. In the energy context, Halder and Kannadhasan (2025) show across 28 countries that energy uncertainty raises corporate bankruptcy risk via margin compression and higher debt costs, while Li et al. (2023) demonstrate using Chinese SVAR data that oil price uncertainty generates financial distress costs that subsequently depress real investment. Conversely, Anh et al. (2024) report that among global manufacturing firms during 2004–2022, energy uncertainty can stimulate investment scale, underscoring that investment responses to energy shocks depend critically on firm-level financial health.

Under the second pattern, empirical support for risk-shifting emerges conditionally within specific distressed subsamples. Bai et al. (2024) document that Chinese firms severely affected by the COVID-19 shock increased leverage and risk-taking when facing moderate financing constraints, whereas Chen and Duchin (2021) show that distressed oil and gas producers shifted cash into risky financial securities when exposed to high debt rollover risk and weak collateral coverage. Zhang (2022) further finds that distressed U.S. corporations become more aggressive in acquisitions when bankruptcy risk is high. Under the third pattern, Geng et al. (2025) identify reverse causality on Chinese A-share firms (2008–2020), showing that overinvestment linearly worsens distress risk while underinvestment exhibits a U-shaped relationship. A critical methodological boundary follows from this literature: CAPEX scaled by total assets captures the volume of physical capital expenditure rather than the risk composition of selected projects (Jensen & Meckling, 1976; Chen & Duchin, 2021). Accordingly, empirical tests on CAPEX volume

identify whether distressed energy firms contract or expand capital outlays, rather than directly measuring portfolio risk substitution (compare Ye et al., 2025).

2. Hypotheses

Synthesizing the theoretical and empirical arguments above, the primary hypothesis of this study is anchored in Debt Overhang Theory (Myers, 1977) and Pecking Order Theory (Myers & Majluf, 1984), which enjoy the most consistent empirical support in emerging markets (Borensztein & Ye, 2021; Gupta & Mahakud, 2023). As an energy firm's Modified Altman Z″-Score deteriorates (indicating rising financial distress), debt servicing burdens and working capital deficits absorb internal operating cash flows while external credit access tightens, compelling management to curtail capital expenditure. Furthermore, because Borensztein and Ye (2021) establish that debt overhang operates nonlinearly and Cui (2022) highlights the amplifying role of refinancing vulnerability, the investment contraction is expected to be more pronounced among firms that have crossed into the grey or distress zone (firms-at-risk, $Z'' \leq 2.60$) than among solvent firms ($Z'' > 2.60$). At the same time, testing the interaction within the firms-at-risk regime evaluates whether competing risk-shifting incentives (Bai et al., 2024; Chen & Duchin, 2021) attenuate or reverse the negative investment slope. Formally, two hypotheses are proposed and tested:

H1: Financial distress has a negative effect on corporate investment decisions (CAPEX) among energy sector firms listed on the Indonesia Stock Exchange during 2020–2024.

H2: The negative effect of financial distress on corporate investment decisions (CAPEX) is stronger among high-risk firms (firms-at-risk, $Z'' \leq 2.60$) than among solvent firms ($Z'' > 2.60$).

RESEARCH METHOD

This study employs a quantitative causal-explanatory design using balanced panel data to test the effect of financial distress on corporate investment decisions and the moderating role of firms-at-risk status. Panel data combine cross-sectional variation across issuers with time-series variation over the 2020–2024 period, enabling the econometric specification to control for unobserved time-invariant firm heterogeneity—such as mining concession scale, reserve maturity, and baseline capital intensity—alongside common macroeconomic shocks (Cui, 2022; Chen & Duchin, 2021). Secondary quantitative data were collected through documentation study from audited annual financial statements and annual reports published on the official Indonesia Stock Exchange website (www.idx.co.id) and corporate websites, cross-checked against capital market databases, Ministry of Energy and Mineral Resources (ESDM) monthly HBA coal price records, U.S. Energy Information Administration (EIA) crude oil prices, and IDX Special Notation (*Notasi Khusus*) disclosures.

The research population comprises all energy sector issuers listed on the Indonesia Stock Exchange under the IDX Industrial Classification (IDX-IC) from 2020 to 2024. Using purposive sampling, firms were selected based on five inclusion criteria: (1) consistent listing in the IDX-IC energy sector across 2020–2024 without mid-period delisting; (2) publication of complete audited annual financial statements for each observation year; (3) consistent reporting currency (Indonesian Rupiah or U.S. Dollar) allowing standardized ratio computation; (4) complete accounting records for all Altman Z″ components, gross fixed asset schedules, and control variables across 2020–2024; and (5) exclusion of mid-period initial public offerings (IPOs) lacking complete five-year historical series. Table 1 summarizes the sample selection and risk-group classification.

Table 1. Sample selection process and risk classification

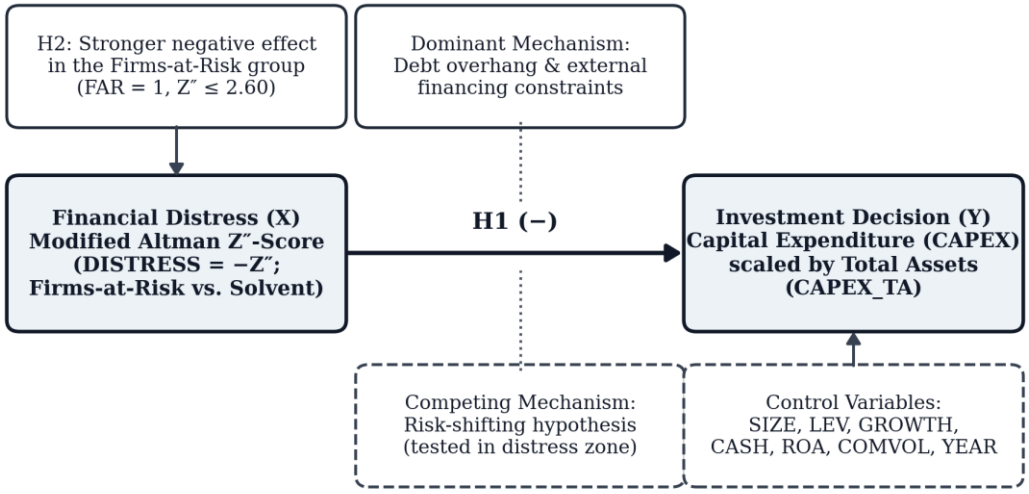
Sample Selection and Classification Stage	Total
Energy sector firms (IDX-IC) meeting full 5-year purposive sampling criteria (2020–2024)	24
Candidate balanced panel observations (24 firms × 5 years)	120
Observations with complete audited data and valid Modified Altman Z″-Score	120
Observations classified as Solvent (Z″ > 2.60; FAR = 0)	91
Observations classified as Firms-at-Risk (Z″ ≤ 2.60; FAR = 1)	29
Unique firms consistently Solvent throughout 2020–2024	15
Unique firms with at least one Firms-at-Risk observation (Z″ ≤ 2.60) during 2020–2024	9

Source: Processed by the authors from IDX financial reports (2026).

As shown in Table 1, 24 energy sector issuers fulfilled all criteria, yielding 120 balanced firm-year observations over 2020–2024:

1. PT Bumi Resources Tbk (BUMI)
2. PT Exploitasi Energi Indonesia Tbk (CNKO)
3. PT Energi Mega Persada Tbk (ENRG)
4. PT Apexindo Pratama Duta Tbk (APEX)
5. PT Logindo Samudramakmur Tbk (LEAD)
6. PT Pelayaran Nasional Bina Buana Raya Tbk (BBRM)
7. PT Buana Lintas Lautan Tbk (BULL)
8. PT Borneo Olah Sarana Sukses Tbk (BOSS)
9. PT Atlas Resources Tbk (ARII)
10. PT Darma Henwa Tbk (DEWA)
11. PT BUMA Internasional Grup Tbk (DOID)
12. PT Medco Energi Internasional Tbk (MEDC)
13. PT Indika Energy Tbk (INDY)
14. PT Astrindo Nusantara Infrastruktur Tbk (BIPI)
15. PT Wintermar Offshore Marine Tbk (WINS)
16. PT TBS Energi Utama Tbk (TOBA)
17. PT Perusahaan Gas Negara Tbk (PGAS)
18. PT Elnusa Tbk (ELSA)
19. PT Rukun Raharja Tbk (RAJA)
20. PT Bukit Asam Tbk (PTBA)
21. PT AlamTri Resources Indonesia Tbk (ADRO)
22. PT Indo Tambangraya Megah Tbk (ITMG)
23. PT Harum Energy Tbk (HRUM)
24. PT Resource Alam Indonesia Tbk (KKGI)

The conceptual framework is illustrated in Figure 1.



Source: Developed by the authors, 2026

Figure 1. Conceptual Research Framework

The independent variable, financial distress, is derived from the Modified Altman Z″-Score (Altman, 1995/2000): $Z'' = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$, where X_1 is working capital to total assets, X_2 is retained earnings to total assets, X_3 is EBIT to total assets, and X_4 is book value of equity to total liabilities. Because a lower Z″-Score denotes greater financial distress whereas H1 and H2 are formulated in terms of increasing distress severity, the regression variable is defined as the inverse score $DISTRESS_{it} = -Z''_{it}$. Consequently, higher values of $DISTRESS_{it}$ directly represent higher financial distress, and a negative coefficient ($\beta_1 < 0$) directly indicates debt overhang underinvestment. The regime moderator FAR_{it} equals 1 if $Z''_{it} \leq 2.60$ and 0 if $Z''_{it} > 2.60$. For the dependent variable (CAPEX), negative gross fixed asset additions arising from genuine vessel or equipment disposals are retained in the baseline data to reflect real capital contraction, and subsequently tested via winsorizing at the 1st/99th and 2.5th/97.5th percentiles as well as Net CAPEX. Table 2 summarizes the operationalization of all variables.

Table 2. Operationalization of Variables

Variable	Measurement / Operational Definition	Literature Reference
CAPEX (Y)	(Gross Fixed Assets (t) − Gross Fixed Assets (t−1)) ÷ Total Assets (t); also tested on winsorized (1/99 & 2.5/97.5) and net basis	Cui (2022); Anh et al. (2024)
DISTRESS (X)	Inverse Modified Altman Z″-Score: DISTRESS = −Z″, where $Z'' = 3.25 + 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$	Altman (1995/2000); Gupta & Mahakud (2023)
FAR (Z)	Dummy variable equal to 1 if Z″ ≤ 2.60 (grey & distress zones) and 0 if Z″ > 2.60 (solvent zone)	Altman (1995/2000); Borensztein & Ye (2021)
DISTRESS × FAR	Multiplicative interaction term: DISTRESS × FAR (also verified via mean-centered interaction)	Borensztein & Ye (2021); Chen & Duchin (2021)
Firm Size (SIZE)	Natural logarithm of Total Assets: ln(Total Assets)	Borensztein & Ye (2021)
Leverage (LEV)	Total Liabilities ÷ Total Assets	Cui (2022)
Growth (GROWTH)	Annual change in operating profit ratio: ΔEBIT ÷ Total Assets	Geng et al. (2025)
Liquidity (CASH)	Current Assets ÷ Total Assets	Gupta & Mahakud (2023)
Profitability (ROA)	Net Income After Tax ÷ Total Assets	Halder & Kannadhasan (2025)
Commodity Vol. (COMVOL)	Annualized monthly standard deviation of benchmark HBA coal / crude oil price in year t	Halder & Kannadhasan (2025)
Year Effects (YEAR)	Year dummy variables (2020–2024) capturing common macroeconomic shocks	Cui (2022)

Source: Compiled by the authors from prior literature, 2026

Based on these variables, two panel regression models are formulated. Model 1 tests H1, and Model 2 incorporates the FAR regime dummy and multiplicative interaction term to test H2:

$$CAPEX_{it} = \alpha + \beta_1 DISTRESS_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 GROWTH_{it} + \beta_5 CASH_{it} + \beta_6 ROA_{it} + \beta_7 COMVOL_t + \Sigma YEAR_t + \varepsilon_{it} \quad (1)$$

$$CAPEX_{it} = \alpha + \beta_1 DISTRESS_{it} + \beta_2 FAR_{it} + \beta_3 (DISTRESS_{it} \times FAR_{it}) + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 GROWTH_{it} + \beta_7 CASH_{it} + \beta_8 ROA_{it} + \beta_9 COMVOL_t + \Sigma YEAR_t + \varepsilon_{it} \quad (2)$$

Panel model selection is conducted using the Chow test (F-test for fixed firm effects), the Hausman test (Fixed vs. Random Effects), and the Breusch-Pagan Lagrange Multiplier (LM) test (Common vs. Random Effects). Diagnostic checks evaluate residual normality (One-Sample Kolmogorov-Smirnov test), multicollinearity (Variance Inflation Factor/VIF with a threshold of 10), heteroskedasticity (Glejser and Breusch-Pagan tests), and panel serial correlation (Durbin-Watson, Runs test, and Wooldridge first-difference test). When heteroskedasticity or within-firm error dependence is detected, final statistical inference relies on Firm-Clustered Robust Standard Errors estimated via Generalized Estimating Equations (GENLIN clustered by firm ID) in IBM SPSS Statistics.

RESULTS AND DISCUSSION

Descriptive statistics for all research variables across the full sample (N = 120) and partitioned by risk regime—Solvent firms (FAR = 0; N = 91 or 75.8%) versus Firms-at-Risk (FAR = 1; N = 29 or 24.2%)—are presented in Table 3. Across the full sample, gross capital expenditure scaled by total assets (CAPEX_TA) averages 0.0369 (3.69% of total assets) with a standard deviation of 0.1391. The minimum value of −0.9134 occurred at PT Pelayaran Nasional Bina Buana Raya Tbk in 2020 (BBRM 2020) due to fleet disposal and debt restructuring during the pandemic, whereas the maximum of 0.3433 was recorded by PT Buana Lintas Lautan Tbk in 2020 (BULL 2020). When winsorized at the 1st and 99th percentiles (CAPEX_TA_W199), the range narrows to −0.4594 to 0.3400 (mean = 0.0408, SD = 0.1168), and at the 2.5th and 97.5th percentiles (CAPEX_TA_W) to −0.2359 to 0.2778 (mean = 0.0443, SD = 0.0949), while Net CAPEX (CAPEX_Net_TA) averages −0.0117 (SD = 0.1405). The inverse distress score (DISTRESS) averages −4.6273 (SD = 5.9849), reflecting a positive mean Altman Z″-Score of 4.6039 (SD = 6.3395).

Table 3. Descriptive statistics and group means by risk status (N = 120)

Variable	Minimum	Maximum	Mean (Full, N=120)	Std. Dev. (Full)	Mean Solvent (N=91)	Mean FAR=1 (N=29)
CAPEX_TA	-0.9134	0.3433	0.0369	0.1391	0.0619	-0.0416
CAPEX_Net_TA	-1.0703	0.3165	-0.0117	0.1405	0.0110	-0.0829
CAPEX_TA_W199	-0.4594	0.3400	0.0408	0.1168	0.0617	-0.0250
CAPEX_TA_W	-0.2359	0.2778	0.0443	0.0949	0.0606	-0.0067
Z_Score (Z″)	-19.7549	18.7989	4.6039	6.3395	7.0748	-3.1496
DISTRESS (−Z″)	-14.4593	16.0570	-4.6273	5.9849	-7.0105	2.8511
FAR	0.0000	1.0000	0.2417	0.4300	0.0000	1.0000
DISTRESS × FAR	-2.3081	16.0570	0.6890	3.3393	0.0000	2.8511
SIZE	27.0078	32.3798	29.9714	1.5494	30.3446	28.8005
LEV	0.1682	2.0439	0.6214	0.3850	0.4916	1.0289
GROWTH	-0.1948	0.2637	0.0184	0.0895	0.0176	0.0207
CASH	0.1446	0.6152	0.3317	0.1345	0.3445	0.2916
ROA	-0.2495	0.2818	0.0380	0.1072	0.0648	-0.0460
COMVOL	6.1800	58.7400	34.5380	23.4823	31.9866	42.5441

Source: Processed from IBM SPSS Statistics output, 2026.

The regime comparison in Table 3 highlights a stark divergence between high-risk and solvent issuers. The Firms-at-Risk group (FAR = 1; N = 29) experienced an average gross investment contraction of −0.0416 (−4.16% of total assets; SD = 0.2026) and a net CAPEX contraction of −0.0829 (SD = 0.2196), accompanied by a positive mean DISTRESS score of 2.8511 (mean Z″ = −3.1496), high average leverage of 1.0289 (reflecting negative book equity at CNKO and BOSS), lower liquidity (CASH = 0.2916), and negative average profitability (ROA = −0.0460). Conversely, the Solvent group (FAR = 0; N = 91) maintained positive average fixed asset expansion of +0.0619 (+6.19% of total assets; SD = 0.1009), a low DISTRESS mean of −7.0105 (mean Z″ = 7.0748), moderate leverage of 0.4916, higher current asset liquidity of 0.3445, and positive profitability (ROA = 0.0648).

Table 4. Panel data model selection: statistics (p-values)

Model Specification	Chow Test (F)	Hausman Test (χ^2)	Breusch-Pagan LM (χ^2)	Selected Estimator
Model 1 (Baseline H1)	2.245 (0.004)**	14.650 (0.145) [10 df] / 14.650 (0.023)* [6 df]	2.156 (0.142)	FE & CE (Side-by-Side)
Model 2 (Interaction H2)	2.119 (0.007)**	14.650 (0.145) [10 df] / 14.650 (0.023)* [6 df]	2.156 (0.142)	FE & CE (Side-by-Side)

Notes: * $p < 0.05$, ** $p < 0.01$.
Source: Processed from IBM SPSS Statistics output, 2026..

Table 4 reports the panel model selection tests. The Chow test via UNIANOVA strongly rejects the null hypothesis of pooled homogeneity for both Model 1 (F = 2.245, p = 0.004, Partial Eta Squared = 0.375) and Model 2 (F = 2.119, p = 0.007, Partial Eta Squared = 0.367), confirming significant unobserved firm-specific fixed effects. While the Hausman test on the 6 core time-varying firm regressors rejects Random Effects in favor of Fixed Effects ($\chi^2 = 14.650$, p = 0.0232), the full 10-degree-of-freedom specification yields p = 0.1453 and the Breusch-Pagan LM test yields $\chi^2 = 2.156$ (p = 0.1420). Because the three tests do not converge on a single pooled versus random specification, Common Effect (Pooled OLS) and Two-Way Fixed Effect (LSDV) estimates are presented side-by-side to ensure complete transparency.

Table 5. Classical assumption and panel diagnostic tests

Diagnostic Test	Model / Residual Tested	Test Statistic	Prob. (Sig.)	Diagnostic Conclusion
One-Sample K-S (Normality)	RES_GROSS_H1 / H2	D = 0.139 / 0.152	0.000 / 0.000	Non-normal (extreme disposal outliers)
One-Sample K-S (Normality)	RES_WIN_H1 / H2	D = 0.115 / 0.114	0.001 / 0.001	Non-normal; requires robust inference
Multicollinearity (Max VIF)	Model 1 (Baseline H1)	VIF = 8.423 (Tol = 0.119)	-	No multicollinearity (all VIF < 10)
Multicollinearity (Interaction)	Model 2 Raw / Centered	VIF = 14.577 / 8.146	-	Centered VIF < 10 (identical B = −0.021)
Glejser Test (|u|)	Model 1 / Model 2 Raw	F = 2.217 / 2.579	0.038 / 0.010	Heteroskedasticity detected
Breusch-Pagan Test (u^2)	Model 1 / Model 2 Raw	F = 2.963 / 2.322	0.007 / 0.020	Heteroskedasticity detected
Durbin-Watson & Runs Test	Model 1 / Model 2	DW = 1.726 / 1.828; Z = −4.034	0.000 (Runs)	Non-random within-firm clustering
Wooldridge First-Diff AR(1)	d_CAPEX / LAG_RES_FD	F = 4.166 / F = 0.071	0.001 / 0.791	Requires firm-clustered robust SE

Source: Processed from IBM SPSS Statistics output, 2026.

Table 5 summarizes the diagnostic test results. The One-Sample Kolmogorov-Smirnov test indicates residual non-normality ($p \leq 0.001$) due to episodic asset liquidations. In Model 1, all Variance Inflation Factors remain below the threshold of 10 (highest VIF = 8.423 on DISTRESS; LEV = 7.407; ROA = 2.312; CASH = 1.745; SIZE = 1.484; GROWTH = 1.262; COMVOL = 1.029). In Model 2, introducing the uncentered interaction term raises the VIF on DISTRESS to 14.577 (while VIF on FAR is 2.629 and on DISTRESS × FAR is 4.546); however, mean-centering (DISTRESS_C × FAR) reduces the interaction VIF to 8.146 (< 10) while leaving the interaction coefficient and significance completely unchanged (B = −0.021, t = −2.938, p = 0.004). Because both Glejser (p = 0.038 and p = 0.010) and Breusch-Pagan (p = 0.007 and p = 0.020) tests detect heteroskedasticity and the Runs test ($p < 0.001$) confirms within-firm error clustering, all final hypothesis evaluations rely on Firm-Clustered Robust Standard Errors. Table 6 reports the primary

regression estimates for H1 and H2, and Table 7 presents the sensitivity checks across alternative specifications.

Table 6. Panel regression estimates for capital expenditure (dependent variable: CAPEX_TA, N =120)

Variable	M1 CE: B (SE OLS | Clust.)	M1 FE: B (SE LSDV | Clust.)	M2 CE: B (SE OLS | Clust.)	M2 FE: B (SE LSDV | Clust.)
(Constant)	-0.299 (0.275 | 0.237)	-2.198 (1.644 | 2.278)	0.060 (0.280 | 0.365)	-0.499 (1.738 | 1.903)
DISTRESS (H1)	-0.012 (.006* | .007†)	-0.032 (.012* | .007***)	0.005 (0.007 | 0.006)	-0.010 (0.014 | 0.015)
FAR	-	-	-0.140 (.043** | .059*)	-0.180 (.072* | .065**)
DISTRESS×FAR (H2)	-	-	-0.021 (.007** | .012†)	-0.043 (.018* | .027)
SIZE	0.007 (0.009 | 0.009)	0.071 (0.058 | 0.081)	-0.003 (0.009 | 0.012)	0.017 (0.061 | 0.067)
LEV	0.197 (.084* | .106†)	0.118 (0.191 | 0.206)	0.212 (.081* | .100*)	0.321 (0.199 | .180†)
GROWTH	-0.161 (0.150 | .092†)	0.022 (0.168 | 0.129)	-0.192 (0.143 | .103†)	-0.096 (0.169 | 0.126)
CASH	-0.222 (.117† | 0.177)	-0.578 (.224* | .118***)	-0.067 (0.122 | 0.127)	-0.422 (.227† | .132**)
ROA	0.487 (.169** | .291†)	0.292 (0.211 | 0.293)	0.681 (.174*** | .333*)	0.427 (.212* | 0.298)
COMVOL/Year FE	0.000 (0.001 | 0.001)	Included (Firm & Year)	-0.000 (0.000 | 0.001)	Included (Firm & Year)
R^2 / Adjusted R^2	0.175 / 0.124	0.500 / 0.309	0.265 / 0.205 (ΔR^2=.089)	0.542 / 0.351
Model F (p-value)	3.404 (0.002)**	2.611 (0.000)***	4.402 (0.000)***	2.841 (0.000)***

Source: Processed from IBM SPSS Statistics output, 2026. Notes: Standard errors in parentheses report (Conventional OLS/LSDV SE | Firm-Clustered Robust SE). † p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 7. Summary of robustness checks determining H1 and H2 conclusions

Specification & Sensitivity Test	Estimator	Coef. B	p (OLS/LSDV) | p (Cluster)	Robustness Verdict
H1: Baseline CAPEX_TA (N = 120)	Common Effect	-0.012	0.045* | 0.080†	Not robust to clustering
H1: Excluding BBRM 2020 outlier (N = 119)	Common Effect	-0.000	0.934 (R^2 = 0.084)	Driven by 1 outlier
H1: CAPEX Winsorized 2.5/97.5 (N = 120)	Common Effect	-0.003	0.515 (R^2 = 0.142)	Not significant
H1: CAPEX Winsorized 1/99 (N = 120)	Common Effect	-0.006	0.243 (R^2 = 0.137)	Not significant
H1: Baseline CAPEX_TA (N = 120)	Fixed Effect	-0.032	0.012* | 0.000***	H1 Robustly Supported
H1: CAPEX Winsorized 2.5/97.5 (N = 120)	Fixed Effect	-0.017	0.026* (R^2 = 0.582)	H1 Robustly Supported
H1: CAPEX Winsorized 1/99 (N = 120)	Fixed Effect	-0.023	0.025* (R^2 = 0.512)	H1 Robustly Supported
H1: Net CAPEX (CAPEX_Net_TA, N = 120)	Fixed Effect	-0.035	0.007** (R^2 = 0.475)	H1 Robustly Supported
H2: DISTRESS × FAR Raw (N = 120)	Common Effect	-0.021	0.004** | 0.074†	Fragile under clustering
H2: DISTRESS × FAR Raw (N = 120)	Fixed Effect	-0.043	0.018* | 0.112	Not robust to clustering
H2: DISTRESS × FAR Winsorized 2.5/97.5	Fixed Effect	-0.010	0.382 (R^2 = 0.605)	Not significant
H2: DISTRESS × FAR Winsorized 1/99	Fixed Effect	-0.023	0.134 (R^2 = 0.540)	Not significant

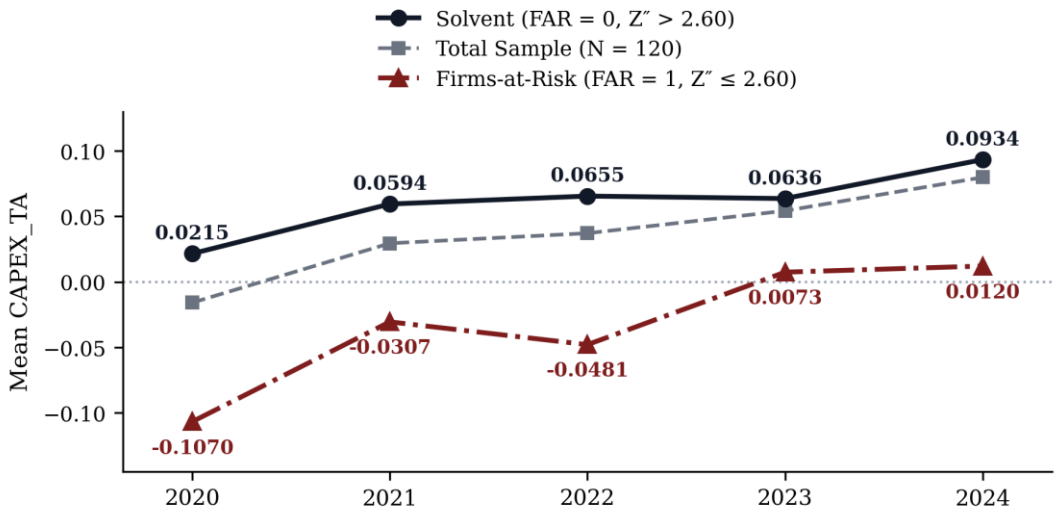
Source: Processed from IBM SPSS Statistics output, 2026. Notes: † p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.

To complement the regression estimates and address the descriptive trajectory of investment across the 2020–2024 multi-crisis period, Table 8 and Figure 2 present the annual mean CAPEX_TA comparison between the Firms-at-Risk group (FAR = 1) and the Solvent group (FAR = 0). Throughout all five years, the average capital expenditure of high-risk issuers consistently remained below that of solvent firms, recording an overall group mean of −0.0416 versus +0.0619 (an average gap of −10.35 percentage points of total assets). During the 2020 pandemic shock, Firms-at-Risk (N = 7) suffered a severe average contraction of −0.1070 (−10.70% of total assets), whereas Solvent firms (N = 17) maintained positive capital additions of +0.0215. During the 2021–2022 commodity boom, recovering issuers such as BUMI and ENRG transitioned into the solvent zone and accelerated CAPEX (raising the solvent group mean to 0.0594 in 2021 and 0.0655 in 2022), whereas issuers trapped in the high-risk regime continued to contract (−0.0307 in 2021 and −0.0481 in 2022). In the 2023–2024 normalization phase, the remaining distressed issuers (CNKO, BOSS, ARII, and BULL; N = 4) recorded marginally positive maintenance outlays (0.0073 in 2023 and 0.0120 in 2024), trailing far behind the solvent group's expansion (0.0636 in 2023 and 0.0934 in 2024).

Table 8. Annual mean CAPEX_TA by risk group (2020–2024)

Year	Firms-at-Risk (FAR = 1)	Solvent Firms (FAR = 0)	Total Sample (N = 24)	Group Difference (FAR − Solv.)
2020	-0.1070 (N=7; SD=0.3580)	0.0215 (N=17; SD=0.1425)	-0.0160 (N=24; SD=0.2261)	-0.1284 (-12.84%)
2021	-0.0307 (N=8; SD=0.1153)	0.0594 (N=16; SD=0.0963)	0.0294 (N=24; SD=0.1094)	-0.0901 (-9.01%)
2022	-0.0481 (N=6; SD=0.2125)	0.0655 (N=18; SD=0.1094)	0.0371 (N=24; SD=0.1456)	-0.1135 (-11.35%)
2023	0.0073 (N=4; SD=0.0304)	0.0636 (N=20; SD=0.0394)	0.0542 (N=24; SD=0.0432)	-0.0563 (-5.63%)
2024	0.0120 (N=4; SD=0.0466)	0.0934 (N=20; SD=0.0951)	0.0798 (N=24; SD=0.0934)	-0.0814 (-8.14%)
Total	-0.0416 (N=29; SD=0.2026)	0.0619 (N=91; SD=0.1009)	0.0369 (N=120; SD=0.1391)	-0.1035 (-10.35%)

Source: Processed from IBM SPSS Statistics output, 2026.



Source: Processed from IBM SPSS Statistics output, 2026.

Figure 2. Annual mean CAPEX/total assets trend: Firms-at-Risk vs. Solvent firms (2020–2024)

Financial Distress and Corporate Investment Contraction (H1)

The central empirical finding on the first hypothesis (H1) is that the negative effect of financial distress on corporate investment decisions is statistically robust when unobserved firm-specific heterogeneity is controlled via the Two-Way Fixed Effect estimator (B = −0.032; LSDV SE = 0.012, t = −2.555, p = 0.012; Clustered SE = 0.0074, Wald χ^2 = 18.086, p < 0.001, R^2 = 0.500). By contrast, in the Pooled OLS (Common Effect) specification, the apparent significance of DISTRESS (B = −0.012, t = −2.032, p = 0.045) collapses completely when the single extreme vessel disposal observation BBRM 2020 is excluded (B = −0.000, p = 0.934), when CAPEX_TA is winsorized at the 2.5/97.5 percentiles (p = 0.515) or 1/99 percentiles (p = 0.243), and when evaluated under firm-clustered standard errors (p = 0.080). Econometrically, this divergence corroborates the argument of Cui (2022) and Chen and Duchin (2021) that baseline structural characteristics across energy firms—such as mining concession scale, reserve depletion profiles, and offshore vessel intensity—correlate strongly with solvency scores. Once time-invariant cross-sectional differences are absorbed by firm fixed effects (within-firm estimation), year-over-year deteriorations in an energy firm's Z″-Score robustly compress capital expenditure across all sensitivity checks, including winsorized 1/99 CAPEX (B = −0.023, p = 0.025), winsorized 2.5/97.5 CAPEX (B = −0.017, p = 0.026), and Net CAPEX (B = −0.035, p = 0.007).

From a corporate finance perspective, the robust support for H1 under Fixed Effects confirms the dominance of Debt Overhang Theory (Myers, 1977) and asymmetric information constraints

under Pecking Order Theory (Myers & Majluf, 1984) in Indonesia's energy sector. As a firm's financial health deteriorates (rising DISTRESS), prospective cash flows from new capital projects are disproportionately claimed by senior creditors to service legacy debt and cover working capital deficits, prompting shareholders and managers to defer or cancel capital outlays. This finding aligns closely with international evidence documented by Cui (2022) in Europe, Borensztein and Ye (2021) across emerging markets, Gupta and Mahakud (2023) in India, as well as Li et al. (2023) and Halder and Kannadhasan (2025) on the investment-suppressing effects of distress costs in energy-intensive industries

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Threshold Regime Shift versus Slope Moderation in Firms-at-Risk (H2)

In testing the second hypothesis (H2), the panel estimates reveal a nuanced duality between a highly robust regime intercept shift (level effect of the FAR dummy) and a fragile continuous interaction slope (slope effect of DISTRESS × FAR). The dummy variable FAR is consistently negative and statistically significant under both Common Effect (B = −0.140; OLS p = 0.001; Clustered SE = 0.0588, Wald χ^2 = 5.669, p = 0.017) and Fixed Effect (B = −0.180; LSDV p = 0.015; Clustered SE = 0.0646, Wald χ^2 = 7.764, p = 0.005) specifications. This confirms the regime non-linearity thesis of Borensztein and Ye (2021): energy issuers that cross below the $Z'' \leq 2.60$ threshold experience an immediate downward shift in average capital expenditure of 14.0% to 18.0% of total assets compared to solvent periods. However, the multiplicative slope interaction (DISTRESS × FAR), despite appearing significant under conventional unclustered errors (B = −0.021, p = 0.004 in CE; B = −0.043, p = 0.018 in FE), fails to maintain statistical significance at the 5% level when corrected for firm-clustered robust standard errors (Clustered p = 0.074 in CE; Clustered p = 0.112 in FE) or when extreme disposal outliers are winsorized in Fixed Effects (p = 0.382 at 2.5/97.5 and p = 0.134 at 1/99). Consequently, H2 is not robustly supported as a continuous slope accelerator.

Two substantive mechanisms explain why the regime effect manifests as a discrete intercept shift rather than a continuous slope steepening. First, within the firms-at-risk subsample (29 observations across 9 issuers), the steep unclustered OLS slope is driven by episodic, large-scale physical asset liquidations and collateral seizures in a handful of firm-years—specifically BBRM's fleet restructuring in 2020 (−91.34%), BULL's vessel disposals in 2022 (−47.55%), and BOSS's leased equipment repossessions in 2021 (−21.37%). For the majority of chronically distressed observations (such as CNKO, whose Z''-Score ranged between −13.45 and −19.75 throughout 2020–2024), capital expenditure was already frozen near the zero lower bound of minimal maintenance CAPEX, leaving little room for further linear reductions as Z'' deteriorated deeper into negative territory. Second, consistent with Bai et al. (2024) and Chen and Duchin (2021), behavioral responses within the grey and distress zones are heterogeneous: certain issuers possessing viable coal or oil reserves (such as ARII and ENRG) sustained essential productive CAPEX to capture commodity recovery, offsetting the aggregate downward slope within the high-risk cluster.

Control Variables and Study Limitations

Among the control variables in the Fixed Effect specifications, current asset liquidity (CASH) exhibits a statistically significant negative association with CAPEX in both Model 1 (B = −0.578, LSDV p = 0.012, Clustered p < 0.001) and Model 2 (B = −0.422, Clustered p = 0.001), indicating a resource substitution trade-off between accumulating short-term working capital buffers (cash, receivables, and coal/oil inventories) and committing funds to illiquid fixed assets.

Leverage (LEV) displays a positive coefficient once balance sheet solvency is controlled via DISTRESS (B = 0.212, Clustered p = 0.033 in CE Model 2), reflecting project finance debt drawdowns used to fund capital additions after bankruptcy risk is isolated by component X_4. Profitability (ROA) is positively associated with investment (B = 0.681, Clustered p = 0.041 in CE Model 2; B = 0.427, LSDV p = 0.048 in FE Model 2), reinforcing Pecking Order reliance on internal earnings.

Several methodological limitations warrant consideration when interpreting these findings. First, the Firms-at-Risk subgroup comprises 29 firm-year observations concentrated across 9 issuers, which widens firm-clustered standard errors on the moderation term and reduces statistical power. Second, based on consistent account availability across audited disclosures, operating growth (GROWTH) is proxied by ΔEBIT/Total Assets and liquidity (CASH) by Current Assets/Total Assets, the latter including trade receivables and inventories that are less liquid than pure cash equivalents. Third, as emphasized in the literature review, CAPEX/Total Assets measures physical investment expenditure volume rather than project risk composition; hence, the non-significance of the clustered interaction slope cannot be interpreted as direct refutation or confirmation of asset-substitution risk-shifting without granular project-level risk data (Chen & Duchin, 2021; Zhang, 2022).

CONCLUSION

This study demonstrates that financial distress significantly and robustly depresses corporate capital expenditure (CAPEX) among Indonesian energy sector issuers over the 2020–2024 period once unobserved firm-specific heterogeneity is controlled via Two-Way Fixed Effects. Within the same energy firm over time, rising financial distress forces management to curtail fixed asset investment as operating cash flows and liquidity buffers are absorbed by debt servicing and working capital deficits, validating Debt Overhang Theory and Pecking Order Theory in a capital-intensive emerging-market industry. Furthermore, behavioral divergence between high-risk issuers (firms-at-risk, $Z'' \leq 2.60$) and solvent issuers ($Z'' > 2.60$) operates primarily as a discrete downward threshold regime shift in investment levels (−14.0% to −18.0% of total assets) rather than a robust continuous acceleration of the negative slope within the distress zone, because capital outlays among chronically distressed issuers are already compressed near the minimum maintenance floor.

Practically, management of energy firms operating in the grey or distress zones should prioritize short-term liability restructuring, debt maturity extensions, or debt-to-equity conversions and quasi-reorganizations to eliminate retained earnings deficits prior to committing to expansionary CAPEX, while establishing counter-cyclical cash reserve buffers during commodity windfall booms. Investors and banking creditors are advised to combine the Modified Altman Z″-Score (using the 2.60 cutoff) with IDX Special Notation monitoring as an early warning screening tool and to inspect fixed asset footnotes to distinguish productive capacity additions from distress-driven vessel or equipment liquidations. Capital market regulators (IDX and OJK) are encouraged to mandate disaggregated reporting of maintenance CAPEX, growth CAPEX, and fixed asset disposals for issuers under Special Notation or negative equity. Future research should expand the sample across broader extractive industries and longer panels, employ pure cash equivalents and market-to-book growth proxies, and incorporate direct project-risk indicators—such as exploration outlay shares or post-investment cash flow volatility—to test the risk-shifting hypothesis directly.

REFERENCES

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance, 23*(4), 589–609. https://doi.org/10.1111/j.1540-6261.1968.tb00843.x

Altman, E. I. (2000). *Predicting financial distress of companies: Revisiting the Z-score and ZETA models* [Working paper]. Stern School of Business, New York University.

Andrade, G., & Kaplan, S. N. (1998). How costly is financial (not economic) distress? Evidence from highly leveraged transactions that became distressed. *The Journal of Finance, 53*(5), 1443–1493. https://doi.org/10.1111/0022-1082.00062

Anh, D. L. T., Quang, N. T. T., & Anh, N. T. (2024). Investment decision and efficiency: Global insights on manufacturing firms amidst energy uncertainties. *Energy Economics, 137*, Article 107793. https://doi.org/10.1016/j.eneco.2024.107793

Bai, M., Zhang, Y., & Yu, C.-F. (2024). Do firms gamble for resurrection from COVID-19? *Economics Letters, 241*, Article 111835. https://doi.org/10.1016/j.econlet.2024.111835

Borensztein, E., & Ye, L. S. (2021). Corporate debt overhang and investment in emerging economies: Firm-level evidence. *International Finance, 24*(1), 18–39. https://doi.org/10.1111/infi.12382

Chen, Z., & Duchin, R. (2024). Do nonfinancial firms use financial assets to take risk? *The Review of Corporate Finance Studies, 13*(1), 1–37. https://doi.org/10.1093/rcfs/cfac040

Cui, W. (2022). Macroeconomic effects of delayed capital liquidation. *Journal of the European Economic Association, 20*(4), 1683–1742. https://doi.org/10.1093/jeea/jvac023

Geng, H., Zhu, H., Lau, W. T., Mohd Nor, N., & Ab Razak, N. H. (2025). How does investment efficiency affect financial distress risk? Evidence from China. *Journal of Behavioral and Experimental Finance, 45*, Article 101024. https://doi.org/10.1016/j.jbef.2025.101024

Gupta, G., & Mahakud, J. (2023). Impact of financial distress on investment-cash flow sensitivity: Evidence from emerging economy. *International Journal of Managerial Finance, 19*(4), 713–743. https://doi.org/10.1108/IJMF-03-2022-0102

Halder, A., & Kannadhasan, M. (2025). Energy uncertainty and corporate bankruptcy risk: International evidence. *Energy Economics, 151*, Article 108908. https://doi.org/10.1016/j.eneco.2025.108908

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X

Li, L., Chen, H., & Xiang, J. (2023). Oil price uncertainty, financial distress and real economic activities: Evidence from China. *Pacific-Basin Finance Journal, 81*, Article 102103. https://doi.org/10.1016/j.pacfin.2023.102103

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics, 5*(2), 147–175. https://doi.org/10.1016/0304-405X(77)90015-0

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187–221. https://doi.org/10.1016/0304-405X(84)90023-0

Ye, D., Ji, W., & Sun, N. (2025). Corporate diversification strategies and bankruptcy risk: A re-examination based on COVID-19. *Journal of Asian Economics, 99*, Article 101954. https://doi.org/10.1016/j.asieco.2025.101954

Zhang, E. Q. (2022). Why are distressed firms acquisitive? *Journal of Corporate Finance, 72*, Article 102126. https://doi.org/10.1016/j.jcorpfin.2021.102126