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The effect of geopolitical risk, return on assets, and debt to asset ratio on stock returns of oil and gas subsector companies on the Indonesia Stock Exchange, 2021-2025

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ABSTRACT

Geopolitical shocks have intensified since 2021 and heightened uncertainty in global energy markets, yet evidence that jointly considers geopolitical risk, profitability, and financing structure for Indonesian oil and gas issuers remains limited. To examine whether geopolitical risk, return on assets (ROA), and the debt-to-asset ratio (DAR) explain the stock returns of oil and gas subsector firms listed on the Indonesia Stock Exchange, individually and jointly. Grounded in Signaling Theory, the Efficient Market Hypothesis, and Real Options Theory, this quantitative study analyzes a balanced panel of 12 firms, selected through purposive sampling from 19 listed issuers, over 2021-2025 (60 firm-year observations). Geopolitical risk is measured with the Caldara and Iacoviello index. Model-selection tests favor the common effect model, estimated with heteroskedasticity-robust standard errors. The three variables jointly have a significant but modest explanatory power for stock returns. Individually, geopolitical risk has a positive and significant effect, contrary to the hypothesized negative direction, which is consistent with investors pricing in commodity-price gains during periods of tension. ROA and DAR have no significant individual effect, suggesting that firm fundamentals are overshadowed by external shocks. The study extends evidence on geopolitical risk to an emerging-market energy sector by integrating external risk and firm fundamentals in one framework. Investors and issuers should assess geopolitical exposure alongside profitability and leverage, although the short period and small sample warrant cautious generalization.

Keywords: geopolitical risk; return on assets; debt to asset ratio; stock return; oil and gas sector; panel data regression
JEL Classification: G12; G32

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1. Introduction

On 24 February 2022, Russia launched a large-scale military operation against Ukraine. The impact spread quickly to global financial markets: Brent crude oil prices surged above USD 122 per barrel in early March 2022, and the global Geopolitical Risk Index jumped to 318.95 in March 2022, the highest level observed in recent decades (Figure 1). This surge signaled significant pressure on the stability of global capital markets, particularly for energy-sector stocks listed on the Indonesia Stock Exchange (IDX) (Caldara & Iacoviello, 2022).



Figure 1. Global geopolitical risk index, 2020-2026
Source: Caldara & Iacoviello, 2025

Figure 1 shows that the index stayed at a relatively moderate level of around 80-100 throughout 2020-2021, spiked to 318.95 in March 2022, eased during 2022-2023, and rose again in 2024-2025, with monthly peaks above 200 in mid-2025. This pattern indicates that geopolitical tension is persistent and shows no meaningful sign of normalization during the study period.

Throughout 2021-2025, geopolitical pressure occurred in succession: Russia's invasion of Ukraine (February 2022), the Israel-Hamas conflict (October 2023), rivalry in the South China Sea, and the escalation of the Israel-Iran conflict in June 2025. The annual average GPR moved from 82.07 in 2021 to 157.58 (2022), 121.71 (2023), 134.45 (2024), and 145.40 (2025), with a monthly peak of 221.13 in June 2025, well above the long-run historical average normalized at 100 (Caldara & Iacoviello, 2025). Armed conflict, economic sanctions, and sudden policy changes among countries can trigger capital outflows from emerging markets, raise risk premia, and tighten corporate financing (Caldara & Iacoviello, 2022).

As a net oil importer, Indonesia does not fully control its domestic energy prices, because the retail prices of non-subsidized fuel refer to the Mean of Platts Singapore (MOPS) and the rupiah exchange rate (Ministry of Energy and Mineral Resources of the Republic of Indonesia [MEMR], 2022, Decree No. 245.K/MG.01/MEM.M/2022), so that price shocks pass through to the costs, margins, and cash flows of oil and gas issuers. Brent crude rose from an average of USD 70.86 per barrel in 2021 to about USD 101 in 2022 (U.S. Energy Information Administration [EIA], 2023), then returned to around USD 83 in 2023 and USD 81 in 2024 (EIA, 2024; EIA, 2025). The IDX Energy Index (IDXENERGY) rose from 740.68 in January 2021 to 2,034.88 in August 2023 (Bursa Efek Indonesia [BEI], 2024). In

2024, Indonesia imported 53.74 million tons of crude oil and its derivative products, up 3.05% from 2023 (Badan Pusat Statistik [BPS], 2025).

In addition to geopolitics, fundamental performance also determines stock returns. The average ROA of oil and gas issuers was negative during the pandemic and the period of low oil prices, then turned positive as oil prices recovered, so that ROA follows the oil price cycle, while the average DAR stayed consistently above 60% (61.09% across 60 observations). However, studies that integrate geopolitical risk, ROA, and DAR for Indonesian oil and gas issuers remain very limited. Sumarjo et al. (2022) examined a similar theme for 2016-2020, a period that had not experienced geopolitical shocks as intense as those since 2021, while Tambunan et al. (2023) showed that Russia's invasion of Ukraine produced significant abnormal returns on energy-sector stocks in Indonesia. In the Australian extractive industry, Rumokoy et al. (2023) found that geopolitical risk is strongly negatively related to capital expenditure but positively related to stock returns, and Rumokoy et al. (2025) found that a one-standard-deviation increase in geopolitical risk raises IPO underpricing in China by about 13.96%. Theoretically, there is also a tension between Signaling Theory, which emphasizes fundamental signals such as ROA and DAR, and the view that extreme geopolitical turbulence can obscure those signals (Caldara & Iacoviello, 2022; Zhang et al., 2024). This study aims to determine the effect of Geopolitical Risk, ROA, and DAR on the Stock Return of oil and gas subsector companies listed on the IDX during 2021-2025, both partially and simultaneously.

2. Literature review

Theoretical background

Signaling Theory was developed by Ross (1977) and examined in more depth by Connelly et al. (2011). Information that a firm conveys to investors serves as a signal that influences economic decisions, under the assumption of asymmetric information. Geopolitical Risk is viewed as a negative signal from the external environment that enlarges the risk premium, ROA as a positive signal of profitability, and DAR as a negative signal related to leverage and default risk. The Efficient Market Hypothesis (Fama, 1970) holds that a market is efficient when prices reflect all available information; the semi-strong form is the most relevant because the GPR index is built from international newspaper reporting that is open to the public (Caldara & Iacoviello, 2022), and firm-level data capture differences in responses across issuers, as Zhang et al. (2024) did through the GPR beta. Real Options Theory (Myers, 1977) views growth opportunities as call options: higher oil price volatility caused by geopolitical risk raises the value of the option to delay investment, while a high DAR creates debt overhang that restricts high-value investment, so that DAR also signals reduced investment flexibility in addition to default risk (Kasmir, 2019; Hery, 2021).

Stock return is formed from price changes (capital gain or capital loss) and dividends (Santoso et al., 2023), with the capital gain component more often used as the basis of measurement (Santoso et al., 2023). Geopolitical risk is defined as the potential economic and financial loss arising from tension among countries, terrorism, instability of the global political order, and uncertainty in international policy direction (Fahmi, 2022; Caldara & Iacoviello, 2022); Hanafi (2022) places it among the elements of country risk that are hardest to anticipate because it emerges suddenly. ROA shows the contribution of assets to generating net income (Hery, 2021), while DAR shows the share of assets financed by debt (Kasmir, 2019; Hery, 2021). DAR is chosen over the Debt to Equity Ratio

(DER) because its denominator (total assets) is more stable and always positive, whereas equity in DER can be eroded by losses and produce extreme values (Brigham & Houston, 2022), and because DAR fits the capital-intensive character of the oil and gas industry (Kasmir, 2019; Hery, 2021). This consideration is consistent with Arrahman et al. (2023), who used DAR alongside ROA.

Hypothesis development and research model

Rising geopolitical concern depresses stock returns and drives capital out of developing countries (Caldara & Iacoviello, 2022). Empirical evidence largely supports this negative relationship: Boungou and Yatié (2022), using data from 94 countries, found a consistently negative relationship between the Russia-Ukraine war and world stock market returns; Tran and Bui (2026) found a significant negative relationship in Vietnam over 2010-2023; and Zhang et al. (2024) found that stocks with lower exposure to geopolitical risk consistently outperformed in China over 2006-2022. Evidence for Indonesia is mixed: Saputra et al. (2024) showed that Ukrainian and United States geopolitical risk depressed the Indonesia Composite Index (IHSG), whereas Chinese and Russian risk pushed it up; Tambunan et al. (2023) found significant abnormal returns on energy-sector stocks around Russia's invasion of Ukraine; Sumarjo et al. (2022) found no significant effect of geopolitical risk, profitability, and leverage on the returns of six oil and gas companies over 2016-2020; and Payung et al. (2024) found a negative but insignificant partial effect on the value of exporting companies over 2019-2023. For oil and gas issuers, this risk travels through energy prices: higher oil prices benefit upstream revenue, but the unclear duration of conflicts, the potential for follow-up sanctions, and the risk of further supply disruption weigh more heavily on investor perception, so that high uncertainty raises the risk premium and depresses stock returns, in line with the finding of Rumokoy et al. (2023) that companies postpone capital expenditure when geopolitical risk is high.

H_1: Geopolitical Risk is hypothesized to have a partial negative effect on the Stock Return of oil and gas subsector companies listed on the Indonesia Stock Exchange.

A high ROA shows that assets are used efficiently to generate profit and is read by investors as a signal of confidence. This is supported by Munthe et al. (2024), Arifudin (2023) for mining companies, Arya Gus Putra and Arita (2025) for the energy sector, and Fauzan and Witono (2026) for food and beverage companies, who found a significant effect of ROA on stock returns. The evidence is not uniform, however: Hendrawan et al. (2025) found that profitability, the exchange rate, and liquidity had no significant effect on the returns of oil and gas companies, either partially or simultaneously.

H_2: Return on Assets is hypothesized to have a partial positive effect on the Stock Return of oil and gas subsector companies listed on the Indonesia Stock Exchange.

A high DAR means heavy dependence on external financing and greater interest burden and default risk, which reduces investor confidence, especially when oil prices correct, as found by Ramadhani and Desmiza (2025) for 34 consumer goods industry companies and in line with Kasmir (2019) and Hery (2021). By contrast, Munthe et al. (2024) found DAR insignificant partially, and Arrahman et al. (2023), with firm value as the dependent variable, found both ROA and DAR insignificant partially.

H_3: Debt to Asset Ratio is hypothesized to have a partial negative effect on the Stock Return of oil and gas subsector

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companies listed on the Indonesia Stock Exchange.

Together, the three variables give a more comprehensive picture: geopolitical risk affects macro conditions, ROA reflects profitability efficiency, and DAR describes capital structure. Hendrawan et al. (2025) found no significant simultaneous effect, whereas Munthe et al. (2024) and Arrahman et al. (2023) found that ratios that are insignificant partially become significant when tested together.

H_4: Geopolitical Risk, Return on Assets, and Debt to Asset Ratio are hypothesized to have a simultaneous significant effect on the Stock Return of oil and gas subsector companies listed on the Indonesia Stock Exchange.

The research framework summarizes the transmission path: geopolitical tension raises world oil prices, which through the MOPS benchmark changes the cost structure, margins, and cash flows of oil and gas issuers; investors read these changes together with the ROA and DAR signals (Signaling Theory), and in line with the Efficient Market Hypothesis the adjustment enters stock prices and forms the variation in stock returns. The partial (H1-H3) and simultaneous (H4) relationships are mapped in Figure 2.

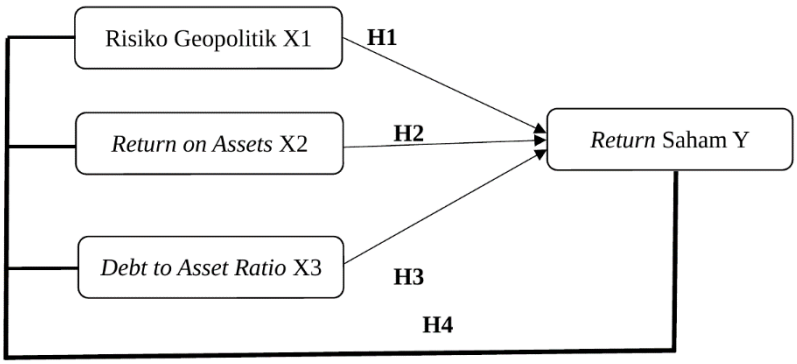


Figure 2. Research model

3. Research method

This study uses a quantitative approach with an associative-explanatory research type, namely research that aims to determine the effect or relationship between two or more variables (Sugiyono, 2023), relying on numerical data (Arikunto, 2022) and statistical analysis techniques (Iba & Wardhana, 2023). The unit of analysis is the annual financial report of oil and gas subsector companies listed on the IDX; each annual report of each sample company in 2021-2025 is treated as one observation unit, giving 60 observations (12 companies × 5 years). The population (Sugiyono, 2023) comprises all companies in the Oil & Gas Industry (A11) under the IDX Industrial Classification (IDX-IC), namely the sub-industries Oil & Gas Production & Refining (A111) and Oil & Gas Storage & Distribution (A112), totaling 19 companies. The sample (Sugiyono, 2023) was selected by purposive sampling with three criteria: (1) the company is an oil and gas subsector issuer listed on the IDX for 2021-2025; (2) the company was not delisted and not newly listed after the start of the observation period; and (3) the company has complete stock price data over the observation period. Table 1 shows the selection result for each of the 19 companies. SUGI fails the second criterion because it was delisted, while RATU, HUMI, CGAS, and GTSI fail it because they conducted IPOs after 2020 and thus

lack complete data for 2021-2025. HITS and MTFN fail the third criterion because their available share price data cannot be used consistently to measure annual stock returns. This yields 12 sample companies (Table 1).

Table 1. Population, sample selection, and final sample of oil and gas subsector companies listed on the IDX (as of April 2026)

No.	Stock code	Sub-industry	Sample status
1	MEDC	A111	Included
2	ENRG	A111	Included
3	SURE	A111	Included
4	SUGI	A111	Excluded: delisted (criterion 2)
5	RATU	A111	Excluded: IPO after 2020 (criterion 2)
6	HITS	A112	Excluded: incomplete stock price data (criterion 3)
7	PGAS	A112	Included
8	AKRA	A112	Included
9	RAJA	A112	Included
10	SHIP	A112	Included
11	BULL	A112	Included
12	SOCI	A112	Included
13	LEAD	A112	Included
14	KOPI	A112	Included
15	MTFN	A112	Excluded: incomplete stock price data (criterion 3)
16	INPS	A112	Included
17	GTSI	A112	Excluded: IPO after 2020 (criterion 2)
18	HUMI	A112	Excluded: IPO after 2020 (criterion 2)
19	CGAS	A112	Excluded: IPO after 2020 (criterion 2)

Source: idx.co.id and Bursa Efek Indonesia (2024), processed, 2026. Selection criteria: (1) oil and gas subsector companies listed on the IDX for 2021-2025 (19 companies); (2) not delisted and not newly listed after the start of the observation period (5 companies excluded); (3) complete stock price data over the observation period (2 companies excluded). Final sample = 12 companies × 5 years = 60 observations.

Data were collected through documentation (Sugiyono, 2023; Arikunto, 2022) and are quantitative data (Sugiyono, 2023) of a secondary nature (Iba & Wardhana, 2023), in the form of a balanced panel. The sources are annual financial reports from www.idx.co.id, monthly closing share prices from Yahoo Finance, and the GPR index of Caldara and Iacoviello (2022) from www.matteoiacoviello.com in monthly format, converted into annual values through the arithmetic mean of 12 months. An operational definition is an instruction on how a variable is measured (Singarimbun & Effendi, 2011); all variables are measured on a ratio scale.

Stock Return (Y) is measured through the capital gain component only, without dividends, based on the December closing price of each year:

$$SR_{it} = \frac{P_{it} - P_{i,t-1}}{P_{i,t-1}} \times 100\%$$

where SR_{it} is the stock return of company i in year t, P_{it} is the December closing price of company i in year t, and $P_{i,t-1}$ is the December closing price of company i in year $t-1$.

Geopolitical Risk (X1) is the risk associated with events that threaten the order of international relations and world peace (Caldara & Iacoviello, 2022), measured with the GPR index constructed from international newspaper reporting (among others The Boston Globe, The Chicago Tribune, The Daily Telegraph, Financial Times, and The Washington Post).

Return on Assets (X2) is measured as:

$$ROA_{it} = \frac{NI_{it}}{TA_{it}} \times 100\%$$

where ROA_{it} is the return on assets of company i in year t, NI_{it} is the net income of company i in year t, and TA_{it} is the total assets of company i in year t.

Debt to Asset Ratio (X3) is measured as:

$$DAR_{it} = \frac{TD_{it}}{TA_{it}} \times 100\%$$

where DAR_{it} is the debt to asset ratio of company i in year t, TD_{it} is the total debt (total liabilities) of company i in year t, and TA_{it} is the total assets of company i in year t.

The panel data regression model estimated is Stock Return = $\alpha + \beta_1 GPR + \beta_2 ROA + \beta_3 DAR + \varepsilon$. Basuki (2021) explains that estimation can be carried out with the Common Effect Model (CEM), the Fixed Effect Model (FEM), or the Random Effect Model (REM). Model selection proceeds hierarchically (Basuki, 2021): the Chow test chooses between CEM and FEM (Basuki, 2021); if FEM is selected, the Hausman test chooses between FEM and REM; if CEM is selected, the Lagrange Multiplier test chooses between CEM and REM, with H0 rejected if the probability is $< \alpha = 0.05$.

Classical assumptions are tested through multicollinearity, that is, linear relationships among independent variables (Basuki, 2021), using the Centered Variance Inflation Factor (VIF, threshold 10; Sihombing et al., 2024), and heteroskedasticity using the Breusch-Pagan/Cook-Weisberg test (H0: homoskedastic residuals; Sihombing et al., 2024). If heteroskedasticity is present, the model is re-estimated with Robust Standard Errors (Huber-White Sandwich Estimator). Hypotheses are tested with the t-test, the F-test, and the Adjusted R-squared using STATA 17 (2026).

4. Result and discussion

4.1 Results

The oil and gas industry is among the energy sectors most vulnerable to geopolitical turbulence. Brent prices during 2024 moved within a relatively narrow range (EIA, 2025), yet geopolitical risk from high-risk countries remains a significant factor affecting the IHSG (Saputra et al., 2024), and Russia's invasion of Ukraine clearly affected world stock market returns (Boungou & Yatié, 2022) as well as energy prices for importing countries such as Indonesia. National oil and gas production continues to decline because existing wells are aging: SKK Migas, as cited by the Indonesian Petroleum Association (2024), recorded 2024 crude oil lifting of only 576 thousand barrels per day (year-end projection 595 thousand), far below the state budget target of 635 thousand barrels per day, and about 70 percent of wells are mature. Tambunan et al. (2023) confirmed that the Indonesian capital market reacts to such turbulence, including in the energy sector. Of the 19 population companies, the 12 that meet all criteria became the research object (Table 1), covering sub-industries A111 and A112, with a balanced panel structure of 60 observations.

Table 2 summarizes the development of the four research variables over 2021-2025. Panel A reports the annual average GPR, and Panels B to D report ROA, DAR, and stock return for each of the 12 sample companies, with the annual average in the last row of each panel. The following subsections describe each variable in turn.

Table 2. Development of the research variables, 2021-2025

Code	2021	2022	2023	2024	2025
Panel A. Geopolitical risk (annual average GPR index)					
GPR	82.07	157.58	121.71	134.45	145.40
Panel B. Return on assets (ROA, %)					
MEDC	0.83	7.66	4.43	4.63	1.21
ENRG	3.78	5.59	5.00	4.76	5.02
PGAS	4.05	4.53	4.21	5.29	3.46
AKRA	4.73	8.84	9.18	6.72	6.76
RAJA	0.92	3.39	7.79	7.71	5.70
SHIP	4.61	4.98	4.27	3.60	3.33
BULL	-37.87	-11.65	7.47	3.90	6.61
SOCI	0.86	1.02	1.48	2.84	1.27
KOPI	1.30	2.67	0.69	-10.54	0.97
SURE	-5.68	-6.95	-11.92	-11.23	-2.40
LEAD	-1.94	-4.48	-4.17	2.72	11.56
INPS	-7.51	-24.08	0.19	-11.54	-9.94
Average	**-2.66**	**-0.71**	**2.38**	**0.74**	**2.80**
Panel C. Debt to asset ratio (DAR, %)					
MEDC	78.37	74.79	72.85	70.34	71.78
ENRG	57.81	56.89	57.25	58.49	54.85
PGAS	56.26	52.16	46.35	42.77	42.11
AKRA	51.94	51.61	53.65	55.83	57.31
RAJA	49.05	48.92	52.98	48.13	46.42
SHIP	53.65	54.60	54.77	54.15	58.76
BULL	81.53	68.40	60.69	54.38	44.91
SOCI	41.60	40.99	36.70	33.57	32.62
KOPI	35.60	62.00	70.91	77.87	74.59
SURE	46.38	52.88	52.89	75.72	85.38
LEAD	74.24	78.21	81.61	65.60	48.02
INPS	77.44	93.77	92.87	112.50	126.59
Average	**58.66**	**61.27**	**61.13**	**62.45**	**61.95**

Code	2021	2022	2023	2024	2025
Panel D. Stock return (%)					
MEDC	-21.02	117.81	13.79	-4.76	22.27
ENRG	-20.93	188.24	-25.17	4.55	595.65
PGAS	-16.92	28.00	-35.80	40.71	20.13
AKRA	29.25	70.32	5.36	-24.07	12.50
RAJA	-27.78	474.18	34.93	92.91	124.26
SHIP	63.33	-10.20	18.75	-3.35	378.22
BULL	-32.00	-25.21	-13.48	-22.08	250.00
SOCI	-25.76	-7.65	1.10	-8.74	198.20
KOPI	27.72	-3.88	-43.23	66.19	-49.40
SURE	-21.34	-13.57	-36.05	117.27	11.72
LEAD	12.00	21.43	-8.82	58.06	57.14
INPS	-54.10	-34.08	-85.76	-22.62	184.62
Average	**-7.30**	**67.12**	**-14.53**	**24.51**	**150.44**

Source: Caldara & Iacoviello (2025) for GPR; company annual reports via Bursa Efek Indonesia (2024) for ROA and DAR; monthly closing stock prices from Yahoo Finance and RTI Business for stock return; processed, 2026. Minimum and maximum values: ROA = -37.87 (BULL, 2021) and 11.56 (LEAD, 2025); DAR = 32.62 (SOCI, 2025) and 126.59 (INPS, 2025, where total liabilities exceeded total assets); stock return = -85.76 (INPS, 2023) and 595.65 (ENRG, 2025).

Geopolitical risk index

Panel A of Table 2 shows a fluctuating GPR: the lowest point of 82.07 in 2021, a jump to 157.58 in 2022 (the sharpest increase, with a peak of 318.95 in March 2022), easing to 121.71 in 2023, then rising to 134.45 in 2024 and 145.40 in 2025 at a gentler pace. The level of global geopolitical risk has not returned to its 2021 low.

Return on Assets

Based on Panel B of Table 2, average ROA was negative in 2021 (-2.66%) and 2022 (-0.71%), mainly because of large losses at BULL (-37.87% in 2021) and the collapse of INPS (-24.08% in 2022). The average rose to 2.38% in 2023 thanks to BULL's recovery (7.47%) and the stable performance of AKRA, RAJA, and ENRG, weakened to 0.74% in 2024 because of KOPI's loss (-10.54%) and the losses of SURE and INPS, and reached its highest point of 2.80% in 2025 owing to LEAD's ROA jump to 11.56%.

Debt to Asset Ratio

Panel C of Table 2 shows that average DAR was relatively stable at around 60%: 58.66% (2021), 61.27% (2022), 61.13% (2023), a peak of 62.45% (2024), and 61.95% (2025). INPS recorded the most consistent rise in leverage, from 77.44% to 126.59% in 2025, exceeding 100% since 2024 (112.50%), meaning its total liabilities exceeded its total assets, whereas SOCI fell from 41.60% to 32.62%.

Stock return

Panel D of Table 2 shows highly fluctuating average stock returns: -7.30% (2021), 67.12% (2022; driven by RAJA at 474.18% and ENRG at 188.24%), -14.53% (2023; INPS -85.76%), 24.51% (2024;

SURE 117.27% and RAJA 92.91%), and a peak of 150.44% (2025; ENRG 595.65%, SHIP 378.22%, BULL 250.00%). The range from -85.76% to 595.65% indicates high price volatility.

Descriptive statistics

Table 3 presents the descriptive statistics (N = 60). Stock Return has a mean of 44.0473 and a median of only 4.96, with a standard deviation (122.3315) that exceeds its mean, indicating a wide and asymmetric distribution. Geopolitical Risk has a mean of 128.2434 and a standard deviation of 26.1742, the most proportionate dispersion among the variables studied. ROA has a low mean (0.5104) compared with its median (3.3601), and a standard deviation of 8.2880 indicates a distribution skewed negatively by sizable losses at several sample companies. DAR has a mean of 61.0891 with a median of 56.0476 and a standard deviation of 18.2174, indicating companies with leverage far above the majority of the sample.

Table 3. Descriptive statistics of research variables (N = 60)

Variable	Mean	Median	Std. Dev.	Min	Max
Stock Return (%)	44.0473	4.96	122.3315	-85.76	595.65
Geopolitical Risk	128.2434	n/a	26.1742	82.07	157.58
ROA (%)	0.5104	3.3601	8.2880	-37.87	11.56
DAR (%)	61.0891	56.0476	18.2174	32.62	126.59

Source: Results processed with STATA 17, 2026.

Panel regression model selection

The Chow test and the Lagrange Multiplier test both select the CEM (Table 4, Panel A); the Hausman test, which is needed only if the Chow test selects FEM, was not performed. The CEM is therefore used for the subsequent analysis.

Classical assumption tests

The Centered VIF values of all variables are far below 10 (ROA 1.43, DAR 1.41, GPR 1.04; mean 1.29; Table 4, Panel B), so there is no serious multicollinearity, whereas the Breusch-Pagan/Cook-Weisberg test (chi2(1) = 14.58; Prob > chi2 = 0.0001 < 0.05) rejects homoskedasticity. The CEM was therefore re-estimated with Robust Standard Errors.

Panel regression results

The estimated Common Effect Model with Robust Standard Errors yields the following regression equation:

$$SR_{it} = -111.7796 + 1.485965\ GPR_t + 1.513460\ ROA_{it} - 0.581297\ DAR_{it} + e_{it}$$

where SR_{it} is the stock return of company i in year t, GPR_t is the annual geopolitical risk index in year t, ROA_{it} is the return on assets, DAR_{it} is the debt to asset ratio, −111.7796 is the estimated constant, 1.485965, 1.513460, and −0.581297 are the estimated coefficients of GPR, ROA, and DAR, and e_{it} is the residual.

The results of the partial t-test, the simultaneous F-test, and the coefficient of determination are presented in Table 4 (Panels C and D). Table 4 also reports the model-selection tests (Panel A) and the classical assumption tests (Panel B).

Table 4. Panel regression diagnostics and estimation results (common effect model, robust standard errors)

Test / variable	Statistic or coefficient	Prob.	Decision
Panel A. Panel model selection			
Chow test (CEM vs. FEM)	F(11,45) = 0.82	0.6197	H0 accepted: CEM selected
Lagrange Multiplier test (CEM vs. REM)	chibar2(01) = 0.00	1.0000	H0 accepted: CEM selected
Panel B. Classical assumption tests			
Centered VIF: GPR	1.04	n/a	No multicollinearity (VIF < 10)
Centered VIF: ROA	1.43	n/a	No multicollinearity (VIF < 10)
Centered VIF: DAR	1.41	n/a	No multicollinearity (VIF < 10)
Breusch-Pagan/Cook-Weisberg test	chi2(1) = 14.58	0.0001	Heteroskedasticity; robust standard errors applied
Panel C. Estimation results (CEM, robust standard errors)			
Constant	-111.7796	n/a	n/a
Geopolitical risk (X1)	1.485965	0.004	Significant; H1 rejected (positive direction, not negative as hypothesized)
Return on assets (X2)	1.513460	0.279	Not significant; H2 rejected
Debt to asset ratio (X3)	-0.581297	0.525	Not significant; H3 rejected
Panel D. Simultaneous test and coefficient of determination			
F-test (simultaneous)	F(3,56) = 3.74	0.0161	Significant; H4 supported
Adjusted R-squared	0.0872 (8.72%)	n/a	n/a

Source: Results processed with STATA 17, 2026. Decision rule: reject H0 if probability < alpha = 0.05 (Panel A); a variable is significant if probability < alpha = 0.05 (Panels C and D). Mean VIF = 1.29. Because the Chow test selected CEM over FEM, the Hausman test was not required.

GPR has a probability of 0.004 (< 0.05) and therefore a significant effect, but its coefficient is positive whereas H1 predicts a negative effect, so H1 is rejected. ROA (p = 0.279) and DAR (p = 0.525) are above 0.05, so H2 and H3 are rejected. The F-test yields F(3, 56) = 3.74 with Prob > F = 0.0161 (< 0.05), so the three variables have a significant simultaneous effect. Because there is more

than one independent variable, the reference is the Adjusted R-squared of 0.0872 (8.72%); the remaining 91.28% is explained by factors outside the model.

4.2 Discussion

Effect of geopolitical risk on stock return.

Geopolitical Risk has a positive and significant effect (coefficient 1.485965; probability 0.004), different from the initial hypothesis that predicted a negative relationship. The positive direction can be interpreted through the characteristics of the oil and gas industry: geopolitical tension raises uncertainty in global energy supply and drives changes in commodity prices, which affect market expectations of the revenue and prospects of oil and gas companies. The average GPR reached 128.2434, with a maximum of 157.5832. This direction is in line with Rumokoy et al. (2023), who linked it to investors' opportunity to profit from uncertainty that raises commodity prices, and with Boungou and Yatié (2022), Zhang et al. (2024), Saputra et al. (2024), and Tran and Bui (2026), who also found an effect of geopolitical risk on stock returns even though the direction differs from the negative findings in some of those studies; Saputra et al. (2024) showed that the direction varies by source of risk. The result differs from Sumarjo et al. (2022), who found no significant effect, and this difference may relate to sample characteristics, period, and the focus on oil and gas companies that are sensitive to energy market conditions. This positive result does not mean that geopolitical risk has a positive impact on all companies or sectors.

Effect of return on assets on stock return

ROA has no significant effect (positive coefficient 1.513460; probability 0.279), so the hypothesis on ROA is not supported. The positive direction is consistent with Signaling Theory, but profitability information is not strong enough to explain changes in Stock Return: the average ROA of 0.510445 with a standard deviation of 8.288021 shows very high variation across companies and years, and the 2021-2025 period brought high external dynamics (geopolitics, energy prices, market sentiment, macroeconomics). This result does not mean that profitability is unimportant. It is in line with Sumarjo et al. (2022) and Hendrawan et al. (2025), but differs from Arifudin (2023), Arya Gus Putra and Arita (2025), and Fauzan and Witono (2026), and these differences may relate to the period, sample, market conditions, and external factors of each study.

Effect of debt to asset ratio on stock return

DAR has no significant effect (negative coefficient -0.581297; probability 0.525, far above the 5% and 10% levels), so the hypothesis on DAR is not supported, although the negative direction matches the initial expectation. This direction relates to the real options theory of Myers (1977): debt limits a company's ability to exploit investment opportunities. The average DAR is high (61.0891%), and one company recorded 126.5921% in 2025 when its liabilities exceeded its assets. Investors consider more than the level of debt, and the data characteristics (60 observations with varied DAR across companies and years) also help explain the insignificance. The result is in line with Munthe et al. (2024), who found DAR insignificant partially but significant simultaneously, a pattern that also appears here, but differs from Ramadhani and Desmiza (2025) in the consumer goods industry sector, which may be due to sector characteristics, period, and sample companies.

Simultaneous effect of geopolitical risk, ROA, and DAR on stock return

In contrast to the partial results, the three variables jointly have a significant effect (F(3,56) = 3.74; Prob > F = 0.0161), so the simultaneous hypothesis is supported. The Stock Return of oil and gas companies is related to a combination of external conditions (geopolitical risk) and internal conditions (ROA and DAR), and the partial insignificance of ROA and DAR does not mean they are unrelated, because they are part of a model that is significant as a whole. The Adjusted R-squared of 0.0872 (8.72%) shows that 91.28% of the variation is explained by other factors, such as overall stock market conditions, energy commodity prices, the exchange rate, interest rates, government policy, and investor sentiment, in line with the semi-strong form of the Efficient Market Hypothesis (Fama, 1970). This result differs from Hendrawan et al. (2025), who found no significant simultaneous effect, and the difference may relate to variables, period, company characteristics, and market conditions.

5. Conclusion

This study examined the effect of geopolitical risk, return on assets (ROA), and the debt to asset ratio (DAR) on the stock returns of 12 oil and gas subsector companies listed on the Indonesia Stock Exchange during 2021-2025 (60 firm-year observations), using common effect model regression with robust standard errors. Geopolitical risk has a positive and significant partial effect, contrary to the hypothesized negative direction, which is consistent with the view that, for commodity-linked issuers, heightened tension is accompanied by higher energy prices that investors price in as a profit opportunity, although this channel was not tested directly. ROA and DAR have no significant partial effect, although their signs match expectations, and the three variables jointly have a significant but modest effect, so most of the variation in returns lies outside the model. Theoretically, geopolitical risk is therefore not uniformly a negative signal (Caldara & Iacoviello, 2022); the weak roles of ROA and DAR are in line with the semi-strong form of the Efficient Market Hypothesis (Fama, 1970), and the insignificant effect of DAR leaves the real options argument on debt overhang (Myers, 1977) unsupported in the partial tests. Practically, investors should not treat geopolitical tension as uniformly bearish for oil and gas stocks and should read it together with world oil prices rather than relying on ROA and DAR alone for short-horizon decisions; issuers are advised to maintain profitability, keep leverage from rising further, and prepare risk-management strategies and investor communication for geopolitical turbulence; and regulators and the exchange may consider encouraging disclosure of issuers' exposure to commodity price and geopolitical risk.

These findings should be read in light of several limitations. The sample is small (12 firms) and the period is short (2021-2025), which coincides with the post-pandemic recovery and major armed conflicts; the GPR index is a global measure averaged annually and identical across firms within a year, so it does not capture firm-specific exposure; the commodity-price explanation is interpretive because oil prices, the exchange rate, and market returns were not modeled; stock return is measured by capital gain only, and the data contain extreme values in stock returns and leverage without outlier treatment or alternative specifications; and the low explanatory power indicates omitted determinants. Future research could extend the period and widen the sample to other energy and mining subsectors or emerging markets, and compare the production and refining subsector with storage and distribution; add oil prices, the exchange rate, and market returns as controls or

mediators to test the commodity-price channel directly; use country-specific geopolitical risk indices or a firm-level exposure measure such as the GPR beta (Zhang et al., 2024); and strengthen robustness through outlier treatment, total returns that include dividends, dynamic panel estimators, or quantile regression, while event-study designs around specific conflict episodes (Tambunan et al., 2023) would complement the annual panel approach used here.

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