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Research Paper

The Effect of Stock Volatility and Profitability on Stock Returns with Stock Liquidity as a Mediating Variable: Evidence from Energy Sector Companies Listed on the Indonesia Stock Exchange, 2021–2025

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Abstract

Energy sector stocks on the Indonesia Stock Exchange (IDX) offer high returns but are exposed to commodity prices and macroeconomic shocks, and evidence on whether firm fundamentals and market behaviour drive their returns remains mixed. This study examines the effect of stock volatility and profitability on stock returns, with stock liquidity as a mediating variable, in energy sector companies listed on the main board of the IDX in 2021–2025. Using purposive sampling and panel data, two structural equations were estimated in EViews 13 and mediation was tested with the Sobel test. The final panel comprised 85 firm-year observations from 26 companies; the return equation, estimated with an AR(1) correction, used 59 observations. Stock volatility has a positive and significant effect on liquidity ($p = 0.0000$), whereas profitability does not ($p = 0.7559$). Profitability ($p = 0.0037$) and liquidity ($p = 0.0003$) have positive and significant effects on returns, while volatility has a positive but insignificant effect ($p = 0.0607$). Liquidity mediates the effect of volatility on returns (Sobel $z = 2.884$, $p = 0.004$) but not that of profitability ($z = -0.311$, $p = 0.756$). The findings suggest that investors in energy stocks reward earnings fundamentals directly, whereas price volatility affects returns only through trading activity.

Keywords: Stock volatility; Profitability; Stock liquidity; Stock return; Energy sector; Sobel test.

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1. Introduction

Energy sector stocks are attractive to investors because they offer both capital gains and dividends, particularly when global commodity prices are high. The sector, however, carries a high level of risk because of its dependence on commodity prices, macroeconomic conditions and government policy, so investors need both external and firm-level information to assess the risk and potential return of their investments. Recent studies of the Indonesian energy sector show that its stock prices are shaped strongly by external macroeconomic conditions [1] and that coal prices are a dominant factor in the returns of coal mining companies [2].

The volatility of the sector is evident in the IDX Energy index. As Figure 1 shows, the index returned 45.6% in 2021 and 100.0% in 2022, fell by 7.8% in 2023, and rose again by 28.0% in 2024

and 65.6% in 2025, far exceeding the movements of the Composite Index [3]. Such fluctuations raise investment risk and affect the stability of returns, making volatility a critical consideration in investment decisions.

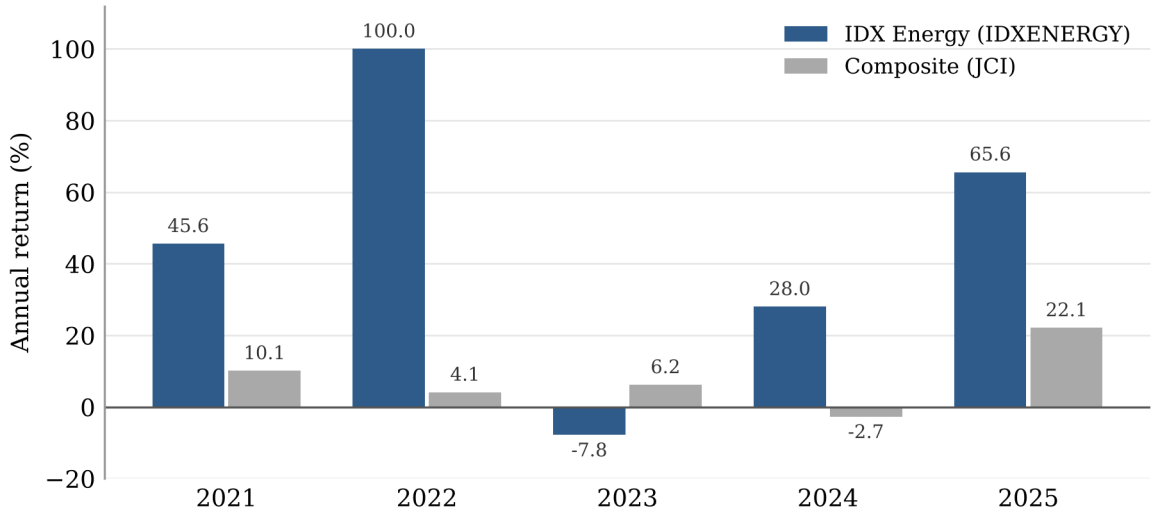


Figure 1. Annual returns of the IDX Energy index and the Composite Index, 2021–2025

Source: Indonesia Stock Exchange, IDX Energy fact sheet (processed).

Firm-level performance also varied. Financial statements published on the IDX show that the profitability of PT Adaro Energy Indonesia Tbk (ADRO) reached 26.78% in 2022, fell to 17.71% in 2023 and recovered to 23.21% in 2024, while that of PT Bukit Asam Tbk (PTBA) declined steadily from 28.17% in 2022 to 16.23% in 2023 and 12.27% in 2024. Trading activity moved differently: ADRO's average trading volume fell from 7,345 million shares in 2022 to 3,560 million in 2023 before surging to 71,422 million in 2024, whereas PTBA's rose more steadily from 1,025 million to 1,206 million shares between 2023 and 2024. Heavily traded stocks are in greater demand [4], and active trading can itself increase price volatility [5].

Signaling theory explains why these variables may matter to investors: firms convey information about their quality to a market that is less informed than management, and investors interpret such information as signals of future prospects [6]. High profitability signals solid operating performance, while high liquidity reflects market confidence in a stock. Empirical evidence is, however, inconsistent. Several studies find that profitability has a positive effect on stock prices or returns [7]–[9], while others find no significant effect [10], [11]. Evidence on liquidity is similarly mixed: illiquid stocks have been found to require additional return compensation [12], whereas trading volume has also been found to have no significant effect on returns [13]. Stock volatility, for its part, has been linked to returns because it reflects the investment risk borne by investors [14].

Previous studies have generally examined these variables as direct determinants of returns. They have not tested whether liquidity acts as the channel through which volatility and profitability reach returns, even though earnings efficiency may not translate into returns if a stock is not actively traded. This study addresses that gap by placing stock liquidity as a mediating variable in the energy sector, where both price volatility and earnings fluctuate sharply. Based on signaling theory and the evidence above, the following hypotheses are proposed. Stock volatility (H1) and profitability (H2) have positive effects on stock returns; stock volatility (H3) and profitability (H4) have positive effects on stock liquidity; stock liquidity has a positive effect on stock returns (H5); stock liquidity mediates the effect of stock volatility (H6)

and of profitability (H7) on stock returns; stock volatility and profitability jointly affect stock liquidity (H8); and stock volatility, profitability and stock liquidity jointly affect stock returns (H9).

2. Method

This study uses a quantitative approach with secondary panel data consisting of annual financial reports, stock prices and trading volumes of energy sector companies listed on the IDX for 2021–2025. The operational definitions of the variables are presented in Table 1.

Table 1. Operational definitions of variables

Variable	Operational definition	Indicator	Scale
Stock volatility (X1)	Degree of fluctuation in a stock's price over a period, reflecting market risk	Standard deviation of daily returns: $\sigma = \sqrt{[\Sigma(x - \mu)^2 / N]}$	Ratio
Profitability (X2)	Ability of a company to generate net income from its assets	Return on assets = (Net income / Total assets) × 100%	Ratio
Stock liquidity (Z, mediator)	Ease with which a stock can be traded quickly without a drastic price change	Trading volume activity: TVA = Shares traded / Shares outstanding	Ratio
Stock return (Y)	Net gain or loss earned by investors from holding the stock during a year	Annual return = $(P_1 - P_0) / P_0$, where P_1 and P_0 are the closing prices at the end and start of the year	Ratio

Source: Compiled by the authors.

The sample was selected by purposive sampling (Table 2). Companies on the main board were chosen because they are established issuers with significant market capitalisation and active trading; companies outside the main board were excluded to avoid biases from illiquid stocks and extreme price distortions. Of the 91 energy companies listed on the IDX, 27 met all criteria, giving 135 potential firm-year observations. After outlying observations were removed to satisfy the normality assumption of the residuals, the usable unbalanced panel comprised 85 observations from 26 companies. Estimating the return equation with a first-order autoregressive term further reduced that equation to 59 observations from 23 companies for 2022–2025.

Table 2. Sample selection

No.	Criterion	Number
1	Energy sector companies listed on the IDX in 2021–2025	91
2	Companies not listed on the main board	(56)
3	Companies that did not publish complete annual reports for 2021–2025	(4)
4	Companies not yet listed at the start of the observation period	(4)
	Companies meeting the criteria	27
	Observation years	5
	Potential observations (27 × 5)	135
	Usable observations after removing outliers (26 companies)	85

Source: Data processed (2026).

The analysis comprised descriptive statistics, selection of the best panel model (Chow, Hausman and Lagrange multiplier tests), classical assumption tests, significance tests of the parameters and path analysis using the Sobel test. The model consists of two structural equations:

Structural 1: $LIQ_{it} = \beta_0 + \beta_1 VS_{it} + \beta_2 PROF_{it} + e_{1it}$ (1)

Structural 2: $RET_{it} = \alpha_0 + \alpha_1 VS_{it} + \alpha_2 PROF_{it} + \alpha_3 LIQ_{it} + e_{2it}$ (2)

where LIQ is stock liquidity, VS is stock volatility, PROF is profitability and RET is stock return for company i in year t. All estimations were performed in EViews 13, and the Sobel test was computed from the coefficients and standard errors of the two equations.

3. Results and Discussion

Descriptive Statistics

Table 3 summarises the 85 observations. Stock volatility (X1) has a mean of 0.0271 and a median of 0.0268, ranging from 0.0107 to 0.0492 with a standard deviation of 0.0085, which indicates low variation across firms. Profitability (X2) has a mean of 0.1026 and a median of 0.0740, ranging from 0.0017 to 0.2970. Stock liquidity (Z) has a mean of 0.0022 and a median of 0.0018, with a minimum close to zero, showing that a small proportion of outstanding shares is traded. Stock return (Y) has a mean of 0.2653 and a median of 0.1973, ranging from 0.0000 to 0.9286.

Table 3. Descriptive statistics (N = 85)

Statistic	X1	X2	Z	Y
Mean	0.027104	0.102579	0.002170	0.265298
Median	0.026805	0.074021	0.001827	0.197264
Maximum	0.049171	0.296974	0.007317	0.928579
Minimum	0.010741	0.001673	0.000001	0.000000
Std. deviation	0.008491	0.078493	0.001726	0.232915
Observations	85	85	85	85

Source: EViews 13 output (processed, 2026).

Model Selection and Classical Assumption Tests

For structural equation 1, the Chow test rejected the common effect model in favour of the fixed effect model, but the Hausman test (p = 0.0743) indicated that the random effect model (REM) is appropriate. The REM is estimated by generalised least squares, which accounts for heteroskedasticity and autocorrelation in the panel structure. For structural equation 2, the Chow test (p = 0.8653) favoured the common effect model (CEM), and the Breusch–Pagan Lagrange multiplier test (p = 0.3605) confirmed the CEM over the REM (Table 4).

Table 4. Model selection and diagnostic tests

Test	Statistic	Prob.	Decision
Equation 1: Chow (cross-section F)	3.246 (25, 57)	0.0001	FEM over CEM
Equation 1: Hausman (χ^2, df = 2)	5.198	0.0743	REM
Equation 1: Jarque–Bera	5.572	0.0617	Normal
Equation 2: Chow (cross-section F)	0.667 (25, 56)	0.8653	CEM
Equation 2: Breusch–Pagan LM	0.836	0.3605	CEM
Equation 2: Jarque–Bera	4.986	0.0827	Normal

Source: EViews 13 output (processed, 2026).

The Jarque–Bera probabilities of both equations exceed 0.05, so the residuals are normally distributed. The correlation between stock volatility and profitability is −0.152, between volatility and liquidity 0.390, and between profitability and liquidity −0.161, all well below 0.80, so neither equation suffers from multicollinearity. Heteroskedasticity detected in equation 2 was corrected using White heteroskedasticity-consistent standard errors, and autocorrelation was corrected by adding an AR(1) term, after which the Durbin–Watson statistic was 1.864.

Hypothesis Testing

Table 5 presents the estimates of both structural equations. For equation 2, the estimate with White standard errors but without the AR(1) term is also reported to show how the results change once autocorrelation is corrected.

Table 5. Panel regression results

Variable	Eq. 1: Z (REM)	Eq. 2: Y (CEM, White)	Eq. 2: Y (CEM, White + AR(1))
Constant	−0.0002 (0.0006)	−0.0868 (0.0808)	−0.1232 (0.0889)
Stock volatility (X1)	0.0864*** (0.0200)	7.7822*** (2.8177)	6.1544* (3.2131)
Profitability (X2)	−0.0007 (0.0021)	0.7932** (0.3270)	0.9457*** (0.3114)
Stock liquidity (Z)	–	27.5389 (17.9395)	60.7910*** (15.7118)
AR(1)	–	–	−0.1734* (0.0956)
Observations (companies)	85 (26)	85 (26)	59 (23)
R^2	0.183	–	0.390
F-statistic (prob.)	9.162 (0.0003)	–	8.640 (0.0000)
Durbin–Watson	1.269	–	1.864

*Source: EViews 13 output (processed, 2026). Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

In equation 1, stock volatility has a positive and significant effect on stock liquidity (coefficient 0.0864, t = 4.326, p = 0.0000), so H3 is supported, whereas profitability has no significant effect (−0.0007, p = 0.7559), so H4 is not supported. Together, the two variables significantly affect liquidity (F = 9.162, p = 0.0003), supporting H8, although they explain only 18.3% of its variation.

In the final equation 2, profitability (0.9457, p = 0.0037) and stock liquidity (60.791, p = 0.0003) have positive and significant effects on stock returns, supporting H2 and H5. Stock volatility has a positive coefficient (6.1544) but is significant only at the 10% level (p = 0.0607), so H1 is not supported at the 5% level. The three variables jointly affect returns (F = 8.640, p = 0.0000), supporting H9, and explain 39.0% of their variation. Without the AR(1) correction, volatility and profitability were both significant and liquidity was not, so the relative roles of volatility and liquidity are sensitive to the treatment of autocorrelation.

Mediation Test

The Sobel test (Table 6) shows that stock liquidity mediates the effect of stock volatility on stock returns (z = 2.884, p = 0.004), supporting H6. Because the direct effect of volatility on returns is not significant at the 5% level while the indirect effect is, the mediation is full. Liquidity does not mediate the effect of profitability on returns (z = −0.311, p = 0.756), so H7 is not supported. Table 6 also summarises all hypothesis tests.

Table 6. Sobel test and summary of hypothesis testing

Hypothesis	Path / test	Result	Decision
H1	X1 → Y	6.1544, p = 0.0607	Not supported
H2	X2 → Y	0.9457, p = 0.0037	Supported
H3	X1 → Z	0.0864, p = 0.0000	Supported
H4	X2 → Z	−0.0007, p = 0.7559	Not supported
H5	Z → Y	60.7910, p = 0.0003	Supported
H6	X1 → Z → Y (Sobel)	z = 2.884, p = 0.0039	Supported (full mediation)
H7	X2 → Z → Y (Sobel)	z = −0.311, p = 0.7558	Not supported
H8	X1, X2 → Z (F-test)	F = 9.162, p = 0.0003	Supported

Hypothesis	Path / test	Result	Decision
H9	X1, X2, Z → Y (F-test)	F = 8.640, p = 0.0000	Supported

Source: Data processed (2026).

Discussion

The positive effect of profitability on returns is consistent with signaling theory: a high return on assets signals operational efficiency and good prospects, and in a sector exposed to commodity cycles the ability to maintain profitability reflects solid fundamentals. The finding agrees with studies that found a positive effect of profitability on returns or prices **[7]–[9], [15]** and differs from those that found none **[10], [11]**. That profitability affects returns directly but not through liquidity suggests that earnings information is absorbed into prices regardless of how actively a stock is traded; fundamentally oriented investors tend to hold rather than trade on profitability announcements.

Volatility, by contrast, works through trading activity. Stocks with dynamic price movements attract market participants, particularly short-term traders, and the resulting rise in trading volume increases liquidity, consistent with the close link between trading volume and price volatility reported in earlier studies **[4], [5]**. Higher liquidity in turn raises returns: actively traded stocks allow investors to enter and exit easily at low transaction risk, which supports demand for them. This positive relationship differs from the liquidity premium documented for manufacturing firms, where illiquid stocks command higher returns **[12]**, and from findings in banking that trading volume does not affect returns **[13]**, suggesting that in the energy sector trading attention, rather than compensation for illiquidity, dominates. The weak direct effect of volatility on returns is also consistent with evidence that energy stock returns are driven largely by commodity prices and macroeconomic conditions **[1], [2], [16]**.

Two limitations should be noted. First, the removal of outlying observations and the AR(1) correction reduced the sample, and the two equations used in the Sobel test were estimated on samples of different sizes (85 and 59 observations). Second, the results for volatility and liquidity changed when autocorrelation was corrected, so the mediation finding should be confirmed with a larger sample and alternative mediation tests.

4. Conclusion

Stock volatility increases the liquidity of energy sector stocks, and liquidity in turn increases returns, so liquidity fully mediates the effect of volatility on returns. Profitability has a direct, positive effect on returns but does not affect liquidity, and liquidity does not mediate its effect. Volatility and profitability jointly affect liquidity, and the three variables jointly affect returns. These results indicate that investors in energy stocks reward earnings fundamentals directly, whereas price volatility affects returns only through trading activity.

Investors are advised to focus on companies with strong and stable earnings, which consistently drive returns regardless of how actively the shares are traded. Future research should examine other mediators with strong signaling power in the commodity sector, such as dividend policy or capital structure, include commodity prices and macroeconomic variables as controls, and use a longer period and larger sample to reduce the need to discard outlying observations.

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Authors' contributions and responsibilities

Rosni Yusri: conceptualization, data curation, formal analysis, writing – original draft. Agusmadi: methodology, validation of statistical analyses, writing – review & editing. Isthafan Najmi: supervision, validation, writing – review & editing. All authors have read and approved the final manuscript.

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Availability of data and materials

The financial statements and stock trading data used in this study are publicly available from the Indonesia Stock Exchange (www.idx.co.id). The processed dataset is available from the corresponding author upon reasonable request.

Competing interests

The authors declare no competing interests.

Ethical approval

This study uses only publicly available secondary data on listed companies and does not involve human or animal subjects; therefore, ethical approval was not required.

Declaration of generative AI use

The authors made limited use of generative AI to edit the English language and improve the presentation of the manuscript. The research design, data analysis and interpretation of the findings were carried out by the authors, who reviewed all content and take full responsibility for it.

Additional information

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References

[1] D. F. Almadi and A. Herusetya, "Analysis of internal and external factors affecting stock prices in the energy sector listed on the Indonesia Stock Exchange during 2020–2024," *Jurnal Ilmiah Akuntansi Kesatuan*, vol. 13, no. 6, pp. 2179–2190, 2025, doi: 10.37641/jiakes.v13i6.4748.

[2] S. R. Sampurnaningsih, A. Indrasari, M. Sova, and L. Hakim, "Coal prices as a dominant factor in stock return models: An empirical study of coal mining companies on the Indonesia Stock Exchange," *JPPI (Jurnal Penelitian Pendidikan Indonesia)*, vol. 11, no. 3, pp. 246–257, 2025, doi: 10.29210/020256089.

[3] Indonesia Stock Exchange, "IDX Sector Energy (IDXENERGY) fact sheet," Jakarta, Indonesia, 2026. [Online]. Available: https://www.idx.co.id

[4] M. Li, "The impact of trading volume on stock price volatility," *Highlights in Business, Economics and Management*, vol. 32, pp. 117–121, 2024, doi: 10.54097/wasnyj47.

[5] Y. Cahyani and W. N. Hidayah, "The influence of trading volume, earnings volatility, firm size, and order imbalance on stock price volatility," *Jurnal Mahasiswa Ekonomi & Bisnis*, vol. 5, no. 2, pp. 1146–1161, 2025, doi: 10.37481/jmeb.v5i2.1352.

[6] H. Al Amosh and S. F. A. Khatib, "Theories of corporate disclosure: A literature review," *Corporate Governance and Sustainability Review*, vol. 6, no. 1, pp. 46–59, 2022, doi: 10.22495/cgsrv6i1p5.
[7] A. S. Dewi and I. Fajri, "Pengaruh likuiditas dan profitabilitas terhadap return saham pada perusahaan manufaktur yang terdaftar di Bursa Efek Indonesia," *Jurnal Pundi*, vol. 3, no. 2, pp. 79–90, 2019, doi: 10.31575/jp.v3i2.150.
[8] F. V. M. Wulan and B. A. Syahzuni, "Pengaruh profitabilitas, leverage, dan ukuran perusahaan terhadap return saham," *Innovative: Journal of Social Science Research*, vol. 3, no. 5, pp. 3249–3265, 2023, doi: 10.31004/innovative.v3i5.5253.
[9] M. Z. Septiani and Suhono, "Pengaruh rasio profitabilitas terhadap harga saham," *Jurnal USAHA*, vol. 6, no. 1, pp. 64–72, 2025, doi: 10.30998/juuk.v6i1.3974.
[10] D. Nurdiana, "Pengaruh profitabilitas dan kebijakan dividen terhadap return saham," *Jurnal Rekaman*, vol. 4, no. 1, pp. 84–91, 2020.
[11] S. N. A. Reswari and S. Hasnawati, "Pengaruh profitabilitas, likuiditas, struktur modal dan ukuran perusahaan terhadap return saham perusahaan industri batubara," *Jurnal Syntax Transformation*, vol. 4, no. 3, 2023, doi: 10.46799/jst.v4i3.700.
[12] V. D. Febrianti and S. Saadah, "Stock liquidity and stock returns: The moderating role of financial constraints," *Journal of Accounting and Investment*, vol. 24, no. 2, pp. 292–305, 2023, doi: 10.18196/jai.v24i2.16483.
[13] F. Ardhiansyah and A. B. Prasetyo, "Pengaruh likuiditas terhadap returns saham (studi empiris perusahaan sektor perbankan yang terdaftar di BEI tahun 2021–2023)," *Diponegoro Journal of Accounting*, vol. 14, no. 2, 2025.
[14] C. Nurdiansyah and Indawati, "The influence of stock price volatility, trading volume, and free cash flow on stock returns," *Jurnal Mahasiswa Manajemen dan Akuntansi*, vol. 4, no. 2, pp. 524–535, 2025, doi: 10.30640/jumma45.v4i2.5110.
[15] R. Tarmizi, H. G. Soedarsa, Indrayenti, and D. Andrianto, "Pengaruh likuiditas dan profitabilitas terhadap return saham," *Jurnal Akuntansi dan Keuangan*, vol. 9, no. 1, pp. 21–33, 2018, doi: 10.36448/jak.v9i1.996.
[16] G. Laksono and A. P. R. Z. Putri, "The impact of coal and nickel shocks on stock volatility throughout the dynamic era," *Keunis*, vol. 12, no. 2, pp. 203–209, 2024, doi: 10.32497/keunis.v12i2.5627.