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Total Asset Turnover, Asset Growth, Capital Structure, Liquidity, and Earnings Volatility: Board Gender Diversity as Moderator in Indonesian Energy Firms

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Abstract

This study examines the influence of total asset turnover, asset growth, capital structure, and liquidity on earnings volatility, with good corporate governance proxied by board gender diversity as a moderating variable, in energy-sector companies listed on the Indonesia Stock Exchange during 2020–2024. The study uses a quantitative approach and secondary data obtained from financial statements and annual reports. The population consisted of 91 energy-sector companies, while purposive sampling produced 31 companies and 155 firm-year observations. Data were analyzed using panel-data regression and Moderated Regression Analysis with Stata 17. The results show that total asset turnover and asset growth have positive and significant effects on earnings volatility, whereas capital structure and liquidity do not have significant effects. Simultaneously, the independent variables significantly affect earnings volatility. Board gender diversity significantly moderates the effects of total asset turnover and asset growth, with the interaction with total asset turnover weakening its positive effect and the interaction with asset growth strengthening its effect. However, board gender diversity does not significantly moderate the effects of capital structure and liquidity. The findings emphasize the importance of efficient asset management and inclusive corporate governance in managing earnings volatility in the energy sector.

Keywords : *Total Asset Turnover; Asset Growth; Capital Structure; Liquidity; Earnings Volatility; Board Gender Diversity*

I. INTRODUCTION

The energy sector holds a strategic position in the economy because it covers the commodities and energy sources that support economic activity. However, the financial performance of energy companies is strongly influenced by changes in commodity prices, government policy, and global political and economic conditions. During 2020–2024, the average profit before tax of energy-sector companies rose from IDR 9.85 billion in 2020 to IDR 50.30 billion in 2024, but profit growth fluctuated sharply: –28% in 2020, 128% in 2021, 92% in 2022, 3% in 2023, and 13% in 2024 (Fig. 1). This shows that a nominal increase in profit does not always reflect earnings stability.

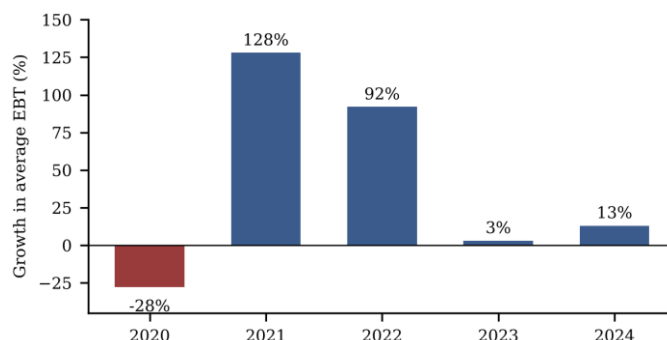


Fig. 1. Growth in average profit before tax, energy sector, 2020–2024.

Earnings volatility reflects how much earnings rise and fall over time and is one indicator of corporate risk (Octaviani et al., 2021). This study focuses on four financial factors: total asset turnover (TATO), asset growth (AG), capital structure proxied by the debt to asset ratio (DAR), and liquidity proxied by the cash ratio (CR). In addition, good corporate governance (GCG) is proxied by board gender diversity (BGD) to test whether gender diversity on the board can strengthen or weaken the relationship between these financial factors and earnings volatility.

The research gap lies in the limited number of studies that specifically test earnings volatility as an internal risk by including TATO, AG, DAR, and CR simultaneously, with GCG as a moderating variable. Earlier studies have more often used systematic risk, stock price volatility, or financial distress as the dependent variable. This study therefore aims to determine the effect of TATO, AG, DAR, and CR on earnings volatility and to test the ability of BGD to moderate each of these relationships.

A. Literature Review and Hypothesis Development

Signaling theory. Signaling theory explains that information asymmetry makes it necessary for management to give signals to external parties about the condition and prospects of the firm (Spence, 1973).

Pecking order theory. Pecking order theory explains that firms tend to prefer internal funds first, then debt, and equity issuance as the last choice (Myers & Majluf, 1984; Sudana, 2015).

Asset turnover and asset growth. A high TATO shows that assets are used more intensively to generate sales (Maulidina et al., 2021). Asset growth reflects expansion of the asset base and is related to the confidence of external parties in the firm (Sutarman et al., 2022).

Capital structure and liquidity. A higher capital structure reflects greater use of debt, which in theory can raise risk through interest expense. High liquidity can lower risk, but excessive and unproductive cash can also signal inefficient asset allocation. On these grounds, the study tests the effect of DAR and CR on earnings volatility.

Board gender diversity as a moderator. GCG, proxied by BGD, is expected to improve the quality of supervision and broaden perspectives in decision making. Gender diversity on the board can be a monitoring mechanism that reduces unnecessary risk taking. BGD is therefore tested as a variable that can moderate the relationship of TATO, AG, DAR, and CR with earnings volatility (Fig. 2).

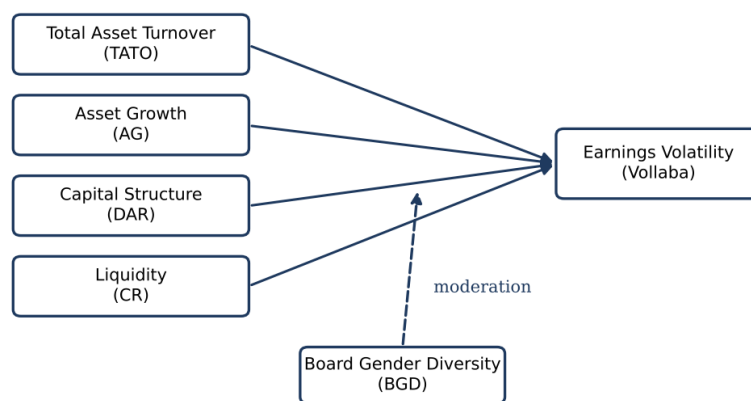


Fig. 2. Conceptual framework.

II. METHOD

This study uses a quantitative method with secondary data in the form of financial statements and annual reports of energy-sector companies listed on the Indonesia Stock Exchange during 2020–2024. The population comprises 91 companies. Purposive sampling, based on the completeness of data for the research variables and the presence of female board members throughout the observation period, yielded 31 companies, or 155 firm-year observations (Table I).

TABLE I. SAMPLE SELECTION CRITERIA

Criterion	Number
Energy-sector companies listed on the IDX, 2020–2024	91
Incomplete data or reports	(32)
No female board members	(28)
Selected sample	31
Observations (31 companies × 5 years)	155

Source: Authors' research data (2026).

The dependent variable is earnings volatility (Vollaba), measured as the standard deviation of earnings before interest and taxes relative to total assets. TATO is sales divided by total assets. AG is the change in current-year total assets relative to prior-year total assets. DAR is total debt divided by total assets. CR is the cash ratio, that is, cash relative to the relevant liabilities. BGD is the proportion of female board members to all board members.

Data were analyzed using descriptive statistics, panel model selection through the Chow, Hausman, and Lagrange Multiplier tests, and panel data regression. The selected model is the Random Effect Model (REM). Moderated Regression Analysis (MRA) was then performed by adding the interactions TATO×BGD, AG×BGD, DAR×BGD, and CR×BGD.

III. RESULTS AND DISCUSSION

A. Descriptive Statistics

Table II shows 155 observations for every variable. The mean of TATO is 0.746 with a standard deviation of 0.640, while AG has a mean of 1.094 and a standard deviation of 0.288. DAR has a mean of 0.459, CR 0.553, and BGD 0.170. Earnings volatility has a mean of 0.203 and a standard deviation of 0.385, which shows considerable variation in earnings volatility across observations.

TABLE II. DESCRIPTIVE STATISTICS

Variable	Obs.	Mean	Std. Dev.	Min	Max
Vollaba	155	0.203	0.385	0.009	2.932
TATO	155	0.746	0.640	0.010	3.183
AG	155	1.094	0.288	0.258	2.724
DAR	155	0.459	0.227	0.039	0.961
CR	155	0.553	0.458	0.004	1.870
BGD	155	0.170	0.090	0.048	0.500

Source: Stata 17 output (processed by the authors, 2026).

B. Model Selection and Classical Assumption Tests

The Chow test gives Prob > F of 0.000, so the Fixed Effect Model is better than the Common Effect Model. The Hausman test gives a p -value of 0.080, so the Random Effect Model is chosen over the Fixed Effect Model. The Lagrange Multiplier test gives a p -value of 0.000, so the Random Effect Model is again the more suitable model. Table III summarizes the multicollinearity and heteroskedasticity tests. Multicollinearity is considered a problem when VIF exceeds 10 (Ghozali, 2018). All VIF values lie between 1.021 and 1.123, with a mean VIF of 1.067, far below the cutoff, so the model shows no multicollinearity. The heteroskedasticity test (Breusch–Pagan/Cook–Weisberg criterion; Prob > F greater than 0.05 indicates no heteroskedasticity; Ghozali, 2018) gives $F = 2.022$ and Prob > F of 0.094, which is above 0.05. The model therefore shows no sign of heteroskedasticity.

TABLE III. MULTICOLLINEARITY AND HETEROSKEDASTICITY TESTS

Variable	VIF	1/VIF	Coef.	p-value
TATO	1.123	0.891	-0.006	0.727
CR	1.065	0.939	0.030	0.183
AG	1.058	0.945	0.054	0.128
DAR	1.021	0.980	-0.081	0.069
Mean VIF	1.067	—	—	—
F-test	—	—	2.022	0.094

Source: Stata 17 output (processed by the authors, 2026). Coef. and p-value refer to the heteroskedasticity test.

C. Panel Data Regression

TABLE IV. PANEL DATA REGRESSION RESULTS (REM)

Variable	Coef.	Std. Error	t	p-value	Decision
TATO	0.167	0.063	2.63	0.008	Significant
AG	0.056	0.019	2.99	0.003	Significant
DAR	0.070	0.096	0.73	0.466	Not significant
CR	0.087	0.069	1.26	0.207	Not significant
Constant	-0.063	0.050	-1.27	0.203	—

Source: Stata 17 output (processed by the authors, 2026). Dependent variable: earnings volatility.

The regression equation is:

$$\text{Vollaba} = -0.063 + 0.167 \text{ TATO} + 0.056 \text{ AG} + 0.070 \text{ DAR} + 0.087 \text{ CR} + \varepsilon \quad (1)$$

TATO has a positive and significant effect on earnings volatility ($p = 0.008$). AG also has a positive and significant effect ($p = 0.003$). In contrast, DAR and CR have no significant effect, with p -values of 0.466 and 0.207. The overall R^2 of the main model is 0.023; TATO, AG, DAR, and CR together explain 2.3% of the variation in earnings volatility, and the remaining 97.7% is explained by other factors outside the model. Although explanatory power is small, the simultaneous test gives a chi-square of 14.011 with Prob > chi2 of 0.007, so the four variables jointly have a significant effect on earnings volatility.

D. Moderated Regression Analysis

TABLE V. MODERATED REGRESSION ANALYSIS RESULTS

Variable	Coef.	Std. Error	t	p-value	Interpretation
TATO	0.316	0.052	6.04	0.000	Positive, significant
AG	-0.022	0.026	-0.85	0.393	Not significant
DAR	0.066	0.116	0.57	0.568	Not significant
CR	0.109	0.110	0.99	0.321	Not significant
TATO × BGD	-1.041	0.153	-6.81	0.000	Moderates; weakens
AG × BGD	0.491	0.197	2.49	0.013	Moderates; strengthens
DAR × BGD	-0.410	0.482	-0.85	0.395	Does not moderate
CR × BGD	-0.173	0.324	-0.53	0.593	Does not moderate
Constant	-0.018	0.044	-0.40	0.689	—

Source: Stata 17 output (processed by the authors, 2026). Dependent variable: earnings volatility.

The TATO×BGD interaction has a coefficient of -1.041 and a *p*-value of 0.000, showing that BGD significantly moderates and weakens the positive effect of TATO on earnings volatility. Based on the reported coefficients, the implied effect of TATO ($0.316 - 1.041 \times \text{BGD}$) falls to zero at a BGD of about 0.30. The AG×BGD interaction has a coefficient of 0.491 and a *p*-value of 0.013, so BGD significantly moderates and strengthens the effect of asset growth on earnings volatility. DAR×BGD and CR×BGD are not significant, with *p*-values of 0.395 and 0.593. The MRA model has an overall R^2 of 0.065, so the variables and interactions explain 6.5% of the variation in earnings volatility, and the simultaneous test gives Prob > chi2 of 0.000, so all variables and interactions jointly have a significant effect.

TABLE VI. SUMMARY OF FINDINGS

Independent variable	Direct effect (Model 1)	Moderation by BGD
TATO	Positive, significant	Yes; weakens
AG	Positive, significant	Yes; strengthens
DAR	Not significant	No
CR	Not significant	No

Source: Summary of Tables IV and V.

E. Discussion

TATO. The positive and significant effect of TATO shows that the higher the asset turnover, the greater the tendency toward earnings volatility in energy-sector companies. Asset efficiency can raise operating activity, but in an industry facing commodity price changes and shifting market conditions, greater operating intensity can also be followed by earnings fluctuations. This finding is in line with research showing a relationship between TATO and corporate risk (Maulidina et al., 2021).

Asset growth. Asset growth has a positive and significant effect on earnings volatility. Aggressive asset expansion can raise operating capacity but also brings investment, depreciation, and fixed costs. If revenue is not yet stable, changes in these expenses can increase earnings fluctuations. This finding shows that asset growth needs to be followed by effective management and use of assets (Sutarman et al., 2022).

Capital structure and liquidity. Capital structure has no significant effect on earnings volatility, which indicates that the use of debt in the sample firms is not yet a dominant factor explaining changes in earnings volatility. In the context of pecking order theory, external financing may remain at a manageable level, so that the financial burden is not strong enough to affect earnings volatility (Myers & Majluf, 1984). Liquidity also has no significant effect. Greater cash availability does not automatically guarantee earnings stability, because its effect depends on how effectively working capital is allocated. High liquidity helps meet short-term obligations, but if funds are not placed in productive activities, its impact on earnings stability is not always visible.

The moderating role of BGD. The moderating role of BGD on the TATO relationship shows that gender diversity on the board can weaken the impact of higher asset turnover on earnings volatility. This finding supports the view that a more

diverse board perspective can improve the quality of supervision and reduce unnecessary operating risk taking. For asset growth, BGD instead strengthens the relationship with earnings volatility, which indicates that the moderating role of governance is contextual to a firm's expansion decisions (Anggraeni et al., 2025; Nasir et al., 2023). BGD does not moderate the relationship of DAR or CR with earnings volatility. This suggests that funding and liquidity management decisions in energy companies during the study period were driven more by technical and operational needs than by board gender diversity. Gender diversity should therefore be seen as one governance mechanism, not as the only determinant of financial risk.

IV. CONCLUSIONS

TATO and asset growth have a positive and significant effect on the earnings volatility of energy-sector companies on the IDX in 2020–2024. Capital structure and liquidity have no significant effect on earnings volatility. Simultaneously, the independent variables significantly affect earnings volatility. Good corporate governance, proxied by board gender diversity, moderates the effect of TATO and asset growth on earnings volatility: the TATO×BGD interaction weakens the positive effect of TATO, while the AG×BGD interaction strengthens the effect of asset growth. BGD does not moderate the effect of capital structure or liquidity.

For company management, efficient asset management and growth strategy need to be balanced by effective board supervision. Companies are also advised to make use of gender diversity as part of their governance mechanism, particularly in operating and expansion decisions. For investors, fundamental analysis should consider asset efficiency and governance quality in addition to traditional financial ratios. Future research may add control variables such as firm size and profitability, extend the observation period, and use a wider range of GCG proxies. The low explanatory power of the models (overall R^2 of 2.3% and 6.5%) also suggests that other determinants of earnings volatility should be examined.

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