

External commodity uncertainty and accounting conservatism: Evidence from Indonesian Mining Firms

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ABSTRACT

Commodity-market instability changes several aspects in extractive firms: future cash flows, asset recoverability, impairment risk, and the credibility demands. This study examines whether commodity price volatility is associated with accounting conservatism and whether that association increase significantly under political-cost exposure and environmental scrutiny. The analysis includes 198 firm-year observations from Indonesian mining firms listed on the Indonesia Stock Exchange during 2014–2024. Accounting conservatism is measured through negative accruals scaled by total assets, while commodity price volatility is calculated as the annual standard deviation of monthly log returns for the benchmark commodity matched to each firm's dominant activity. Two-way fixed-effects regressions with heteroscedasticity-robust standard errors show that commodity price volatility, political-cost exposure, and environmental scrutiny are positively associated with conservatism. Both interaction terms are also positive and significant. Economically, a one-standard-deviation increase in volatility corresponds to a 0.0066 increase in CONACC, approximately 13.5 percent of its sample mean. The marginal effect of volatility is larger at higher levels of political-cost exposure and environmental scrutiny. The findings support a conditional reporting-response explanation: external uncertainty, particularly in commodity, is associated with greater prudence, particularly when firms face stronger political visibility and environmental accountability. The study extends positive accounting, stakeholder, and legitimacy perspectives to an emerging-market extractive industry setting while recognizing that the observational design does not establish experimental causality.

Keywords: Accounting conservatism, Commodity price volatility, Environmental scrutiny, Mining firms, Political-cost exposure

JEL Classification: M41, G32, Q56, Q32

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1. Introduction

Extractive firms, particularly mining, convert various geological resources into long-lived assets. Therefore, its future cash flows are heavily dependent on commodity prices, extraction costs, discount rates, regulatory approvals, and environmental obligations. Commodity price fluctuations can therefore

affect impairment indicators, reserve economics, provisions, and the credibility of earnings estimates before those effects are fully accounted in conventional profitability or leverage ratios (Centorrino et al., 2025; Haque et al., 2014). This setting makes extractive firms a rather demanding context for financial reporting as managers must translate external price uncertainty into accounting estimates while investors, creditors, regulators, and communities assess whether reported assets and earnings are overstated.

Accounting conservatism addresses this problem by necessitating a higher verification threshold for gains than for losses and by accelerating the recognition of unfavorable economic news (Basu, 1997; Watts, 2003a). The contracting and information roles of conservatism are especially relevant when external users are not supposed to directly observe reserve quality, project economics, impairment assumptions, or future site restoration costs (LaFond & Watts, 2008). Accrual-based measures also capture persistent income-decreasing recognition patterns, although their interpretation must remain sensitive to the measurement context (Givoly & Hayn, 2000; Harakeh et al., 2024).

Previous Indonesian studies have generally modeled conservatism through firm-level determinants such as size, leverage, profitability, financial distress, ownership, and investment opportunities. Moreover, Blesia et al. (2023) proposed internal incentives are also important, including evidence consistent with the political-cost hypothesis. However, a determinant-only approach is insufficient to be applied in mining firms for three reasons: First, it does not directly measure the commodity uncertainty that changes project values and asset-recoverability assessments. Second, it often treats political visibility and environmental pressure as separate direct determinants rather than main conditions that alter the reporting response to uncertainty. Third, it provides limited insight into why firms facing the same market shock may respond differently.

This study addresses that gap by treating commodity price volatility as an external source of reporting uncertainty while also examining two institutional conditions that may strengthen its association with conservatism: political-cost exposure and environmental scrutiny. Positive Accounting Theory predicts that managers pick accounting practices in accordance to contracting and political incentives (Watts, 2003a; Watts & Zimmerman, 1978). Stakeholder and legitimacy reasoning further suggests that environmentally visible firms face stronger demands to align financial reporting with the risks and obligations communicated to external constituencies (Clarkson et al., 2008; Deegan, 2002). The theoretical contribution, therefore, lies in specifying whether commodity uncertainty serves as an important aspect, while also identifying its association with conservative reporting to some extent.

The empirical analysis includes 198 firm-year observations from Indonesian mining firms over 2014–2024. The findings show positive associations between conservatism and commodity price volatility, political-cost exposure, and environmental scrutiny, while the interaction effects are also positive. The one-standard-deviation effect of volatility equals approximately 13.5 percent of the mean conservatism measure, implying that the result is not only statistically detectable but also economically meaningful. The study contributes industry-specific evidence to the conservatism literature, clarifies the conditional role of institutional scrutiny, and provides implications for users evaluating mining-sector estimates during volatile commodity cycles. The next section develops the five hypotheses, followed by the methodology, results, discussion, and conclusion.

2. Theoretical Framework and Hypotheses Development

Accounting conservatism in extractive industries

Positive Accounting Theory views accounting choices as responses to practicality needs related to contracting, monitoring, taxation, litigation, and political incentives rather than as mechanically

neutral applications of standards (Watts & Zimmerman, 1978). Conservatism is one such response because timely loss recognition can constrain managerial optimism, improve the enforceability of contracts, and reduce information asymmetry (LaFond & Watts, 2008; Watts, 2003a). In extractive industries, these functions become salient because exploration and evaluation expenditures, mine development assets, impairment tests, and rehabilitation obligations require forecasts that are difficult for external users to verify. Evidence from Indonesia also shows that extractive-industry accounting rules and exploration behavior are related with measured conservatism (Yantiana et al., 2021).

This study uses an accrual-based conservatism measure which captures the cumulative tendency of accruals to reduce accounting income relative to operating cash flow, but does not identify every form of conditional loss recognition. Conditional conservatism models based on asymmetric news recognition therefore represent a distinct measurement approach (Ball & Shivakumar, 2005; Khan & Watts, 2009). Accordingly, the present results are interpreted as prudence in accrual reporting rather than as a universal measure of all conservative accounting behavior (Givoly & Hayn, 2000; Harakeh et al., 2024).

Commodity price volatility and accounting conservatism

Positive Accounting Theory further implies that managers adjust reporting choices when uncertainty increases the expected contracting and monitoring costs of optimistic estimates. Commodity price volatility affects mining firms through expected selling prices, reserve economics, recoverable amounts, financing capacity, and the probability that previously viable projects become impaired. Mining valuation research confirms that commodity price uncertainty materially changes project values and subsequently, investment decisions (Haque et al., 2014; Haque et al., 2017).

The theoretical mechanism is an asymmetric reporting response. Greater volatility widens the range of possible future cash flows and increases the likelihood of adverse revisions. Recognizing losses and provisions earlier reduces the risk that assets or earnings remain overstated when prices reverse. Prior conservatism research similarly associates uncertainty and information asymmetry with an increased demand for timely bad-news recognition (LaFond & Watts, 2008; Watts, 2003b). Therefore, after controlling for firm performance and financial condition, increased commodity price volatility is expected to be associated with higher accrual-based conservatism.

H₁: Commodity price volatility has a positive effect on accounting conservatism.

Political-cost exposure and accounting conservatism

The political-cost hypothesis within Positive Accounting Theory predicts that large and visible firms face stronger pressures to avoid reporting outcomes that intensify regulatory, tax, labor, or public claims (Watts & Zimmerman, 1978). This mechanism is particularly relevant to mining because firms extract publicly salient natural resources, pay royalties and taxes, employ large number of workforces, and operate under licensing and community obligations. Firm size therefore represents more than operating scale, as it also proxies the visibility of accounting numbers to external parties.

When political visibility is high, conservative recognition can reduce the appearance of unusually high or persistent profitability, while at the same time also demonstrate that management has not ignored downside risk. Indonesian evidence linking political-cost proxies to accounting conservatism provides empirical support for this argument (Blesia et al., 2023). Thus, firms with greater political-cost exposure are expected to report more conservatively.

H₂: Political-cost exposure has a positive effect on accounting conservatism.

Environmental scrutiny and accounting conservatism

Stakeholder and legitimacy perspectives explain why environmental scrutiny may influence financial reporting practices. Firms whose operations affect land, water, ecosystems, or local communities depend on maintained approval and support from regulators, investors, lenders, and other affected stakeholders. Environmental disclosures and visible environmental commitments increase the consistency expected between sustainability narratives and accounting estimates for reclamation, decommissioning, contingencies, and impairment (Deegan, 2002; Deegan et al., 2002).

The mechanism itself as a whole is a credibility constraint for extraction firms. Essentially, greater environmental scrutiny incurs higher reputational costs when financial statements understate probable obligations or overstate recoverable benefits. International evidence links firm-level climate exposure and conservative reporting, although results differ across risk measures and institutional settings (Ferdous et al., 2024; Khalifa et al., 2024). This mixed evidence reinforces the need for context-specific testing. In Indonesian mining firms, stronger environmental scrutiny is expected to increase the demand for cautious accrual recognition.

H₃: Environmental scrutiny has a positive effect on accounting conservatism.

The moderating role of political-cost exposure

Political-cost exposure also potentially associated with the volatility effect. Commodity price volatility creates accounting uncertainty for all mining firms, but the consequences of an optimistic estimate are increased when the firm is large and publicly visible. During a commodity boom, visible firms may face claims that reported profits are excessive; while during a downturn, they may face scrutiny over delayed impairment or understated obligations. Greater visibility therefore raises the expected political cost of failing to incorporate downside commodity information into financial reports.

This mechanism predicts complementarity between uncertainty and political visibility. Volatility supplies the adverse-information risk, while political-cost exposure raises the external consequences of the reporting choice. Thus, the marginal association between volatility and conservatism should be stronger for firms with higher political-cost exposure.

H₄: Political-cost exposure strengthens the positive effect of commodity price volatility on accounting conservatism.

The moderating role of environmental scrutiny

Environmental scrutiny can similarly amplify the reporting effect of commodity price volatility. Volatile commodity prices can alter firms' capacity to finance environmental programs and, subsequently, affect the economic assumptions underlying mine plans, closure provisions, and asset recoverability tests. When environmental visibility is high, stakeholders are more likely to compare financial estimates with the firm's disclosed environmental commitments and exposure. Legitimacy theory predicts that the cost of inconsistency is greater under such scrutiny (Clarkson et al., 2008; Deegan et al., 2002).

Consequently, environmental scrutiny increases the credibility benefit of cautious recognition when commodity uncertainty rises. The expected interaction is positive: meaning the marginal effect of volatility on conservatism should be larger among firms with higher environmental scrutiny.

H₅: Environmental scrutiny strengthens the positive effect of commodity price volatility on accounting conservatism.

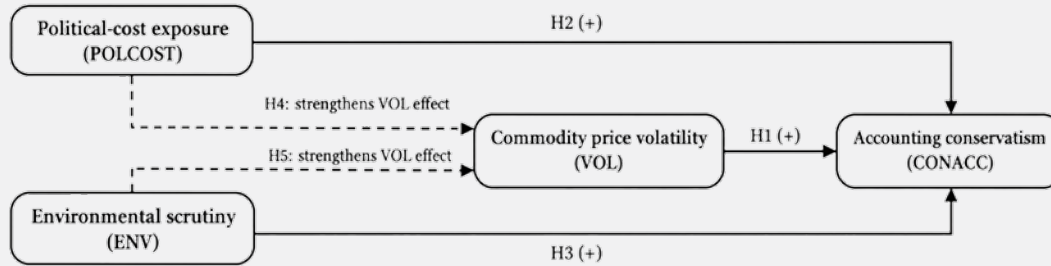


Figure 1. Conceptual framework

Figure 1 distinguishes the three direct relationships (H1–H3) from the two conditional relationships (H4–H5). Political-cost exposure and environmental scrutiny are modeled both as direct determinants of conservatism and as moderators of the volatility–conservatism association.

3. Methodology

Research design, sampling frame, and data sources

This study applies a quantitative explanatory design using firm-year panel data. The population comprises mining-sector firms listed on the Indonesia Stock Exchange during 2014–2024. Purposive sampling was utilized to establish a consistent analytical panel. The firms are included if these eligibility criteria are met: observable throughout the study period, the availability of audited annual reports and financial statements for each year from 2014 to 2024, the dominant operating commodity could be consistently matched to a corresponding monthly benchmark price series, and the availability of complete data for the dependent, independent, moderating, and control variables. Applying these eligibility criteria yielded 18 firms observed over 11 years, producing a balanced panel of 198 firm-year observations. Table 1 summarizes the sample eligibility criteria and final panel composition.

Table 1. Sample eligibility criteria and final panel composition

Stages	Screening Description	Outcomes
Population scope	Mining-sector firms listed on the Indonesia Stock Exchange during 2014–2024	Population identified from IDX annual directories
Criterion 1	Being observable throughout the study period	Required for inclusion
Criterion 2	Audited annual reports and financial statements available for all 2014–2024	Required for inclusion
Criterion 3	Dominant operating commodity consistently matched to an appropriate monthly benchmark price series	Required for inclusion
Criterion 4	Complete data for CONACC, VOL, POLCOST, ENV, ROA, LEV, LIQ, GROWTH, and DISTRESS	Required for inclusion
Final eligible firms	Firms met all joint eligibility criteria	18 firms
Observation period and structure	Annual observations from 2014 to 2024; each eligible firm observed in every study year	11 years; balanced panel
Final analytical sample	11 years annual reports from 18 firms (11 × 18)	198 firm-year observations

Firm-level accounting data are obtained from audited annual reports and financial statements available through the IDX and company's investor-relations sites. Monthly benchmark prices are drawn from globally reported commodity series and matched with the firm's dominant operating exposure: coal producers to thermal-coal prices, oil and gas producers to energy-price benchmarks, gold producers to gold prices, and metal/mineral producers to the relevant metal benchmark. The matching rule is applied consistently across years so that VOL represents the external price environment most closely related to each firm's principal activity.

Variable measurement

Accounting conservatism (CONACC) is measured as negative accruals scaled by total assets:

$$\text{CONACC} = -[(\text{NI} + \text{DEP} - \text{CFO})/\text{TA}]$$

With NI is net income, DEP is depreciation and amortization, CFO is cash flow from operating activities, and TA is total assets. A higher value indicates more income-decreasing accruals and therefore greater accrual-based conservatism (Givoly & Hayn, 2000).

Commodity price volatility (VOL) is the annual standard deviation of the 12 monthly log returns of the commodity benchmark matched to firm i's dominant subsector. Political-cost exposure (POLCOST) is the natural logarithm of total assets. Environmental scrutiny (ENV) is the proportion of applicable environmental items disclosed in annual and sustainability reports, including environmental policy and compliance, emissions and energy, water and waste, biodiversity and land disturbance, reclamation or closure responsibilities, environmental provisions, and external assurance. The score equals disclosed items divided by applicable checklist items and therefore ranges from zero to one.

The controls are profitability (ROA), leverage (LEV), liquidity (LIQ), sales growth (GROWTH), and financial condition (DISTRESS). ROA is net income divided by total assets. LEV is total liabilities divided by total equity, consistent with the values reported in the dataset. LIQ is current assets divided by current liabilities. GROWTH is the annual percentage change in sales. DISTRESS is an Altman-type Z-score, with lower values representing weaker financial condition. Variable definitions are fixed across the sample period.

Table 2. Variable measurement

Variables	Symbols	Measurement Description	Expected Sign
Accounting conservatism	CONACC	$-\text{[(net income} + \text{depreciation and amortization} - \text{operating cash flow)} / \text{total assets}]$	Dependent
Commodity price volatility	VOL	Annual standard deviation of monthly log returns of the matched commodity benchmark	+
Political-cost exposure	POLCOST	Natural logarithm of total assets	+
Environmental scrutiny	ENV	Environmental disclosure or scrutiny index based on environmental information in annual and sustainability reports	+
Profitability	ROA	Net income / total assets	+/-
Leverage	LEV	Total liabilities / total equity	+/-
Liquidity	LIQ	Current assets / current liabilities	+/-
Growth	GROWTH	Annual percentage change in sales	+/-
Financial condition	DISTRESS	Altman-type Z-score; lower values indicate greater distress	+/-

Empirical model and estimator selection

The empirical model uses two-way fixed effects. Pooled OLS was excluded because it treats unobserved firm characteristics as part of the error term and cannot control for persistent differences in asset structure, ownership background, reporting culture, and commodity specialization. Random effects was also not preferred because its consistency requires those unobserved firm characteristics to be uncorrelated with POLCOST, ENV, financial condition, and the other regressors in which consist an assumption that is unlikely to emerge in this setting. The fixed-effects estimator allows such correlation and identifies the coefficients from within-firm changes over time. Year effects are included to absorb common macroeconomic, regulatory, and commodity-market shocks. This comparative estimator rationale supports the use of firm and year fixed effects.

$$CONACC_{it} = \alpha + \beta_1 VOL_{jt} + \beta_2 POLCOST_{it} + \beta_3 ENV_{it} + \beta_4 (VOL_{jt} \times POLCOST_{it}) + \beta_5 (VOL_{jt} \times ENV_{it}) + \gamma' CONTROLS_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

In the equation, *i* indexes firms, *j* indexes the matched commodity, and *t* indexes years. α is the intercept; β_1 – β_5 are the coefficients for the focal variables and interactions; γ is the vector of control-variable coefficients; μ_i represents firm fixed effects; λ_t represents year fixed effects; and ε_{it} is the idiosyncratic error. VOL, POLCOST, and ENV are mean-centered before the interaction terms are formed. The main VOL coefficient therefore represents the volatility effect when both moderators are at their sample means.

Heteroscedasticity-robust standard errors are used for statistical inference. H1–H3 are supported when β_1 , β_2 , and β_3 are positive and statistically significant; H4 and H5 are supported when β_4 and β_5 are positive and significant. Statistical significance is evaluated together with approximate 95 percent confidence intervals, one-standard-deviation economic effects, and conditional marginal effects so that coefficient precision and practical magnitude are considered jointly.

Outlier treatment, endogeneity, and sensitivity analysis

The final data panel retains all 198 observations without applying ex post winsorization. The wide ranges of LEV, LIQ, and DISTRESS are disclosed since mining firms may legitimately exhibit high debt-to-equity ratios, substantial current-asset buffers, and broad variation in Altman-type scores. No observation is excluded solely because of its magnitude. Variable definitions are applied consistently, heteroscedasticity-robust standard errors are used, and the coefficient magnitudes are interpreted cautiously so that extreme but economically plausible observations do not receive an unqualified interpretation.

Three endogeneity concerns remain relevant. First, omitted time-varying factors, such as auditor changes or enforcement intensity, may affect both scrutiny and conservatism. Second, ENV may partly reflect a firm's broader reporting culture, creating simultaneity. Third, measurement error may arise when a diversified firm is matched to a single dominant commodity. Firm and year effects, financial controls, consistent commodity matching, and the reported robust inference mitigate some concerns, but do not eliminate them entirely (Roberts & Whited, 2013). Reverse causality is less compelling for VOL because an individual Indonesian firm's accounting policy cannot determine global benchmark-price volatility. Nevertheless, the results are described as conditional associations, not experimental causal effects.

Sensitivity is evaluated in three complementary ways: (1) approximated 95 percent confidence intervals derived from the coefficients and robust t-statistics; (2) one-standard-deviation changes expressed in units and percentages of mean CONACC; and (3) marginal effects of VOL at one standard deviation above and below the means of POLCOST and ENV. These calculations assess coefficient precision, economic relevance, and whether the interaction terms materially change the volatility slope. The direction and substantive interpretation of the findings remain consistent across the three calculations.

4. Results

Table 3 presents descriptive statistics for the 198 firm-year observations. CONACC has a mean of 0.049 and a standard deviation of 0.063. Its negative and positive values indicate that accrual reporting differs across firms and years; the statistics themselves do not determine the appropriate estimator. VOL ranges from 0.041 to 0.382, with a mean of 0.158 and a standard deviation of 0.079, indicating substantial variation in commodity-price uncertainty across commodities and years.

POLCOST ranges from 26.840 to 32.150, while ENV ranges from 0.120 to 0.870. The control variables also vary materially, and ROA includes both loss and profit observations. LEV, LIQ, and DISTRESS have relatively wide ranges, with maximum values of 4.250, 9.840, and 18.520, respectively. These ranges are economically interpretable in a heterogeneous mining sample and are reported transparently. The full data panel is retained without ex post winsorization, and heteroscedasticity-robust standard errors are used in the regression analysis.

Table 3. Descriptive statistics

Variable	N	Minimum	Maximum	Mean	Std. deviation
CONACC	198	-0.118	0.214	0.049	0.063
VOL	198	0.041	0.382	0.158	0.079
POLCOST	198	26.840	32.150	29.410	1.210
ENV	198	0.120	0.870	0.462	0.196
ROA	198	-0.184	0.438	0.071	0.104
LEV	198	0.030	4.250	0.928	0.708
LIQ	198	0.301	9.840	2.050	1.620
GROWTH	198	-0.611	1.435	0.112	0.359
DISTRESS	198	-0.916	18.520	4.892	3.806

Fixed-effects regression results

Table 4 reports the two-way fixed-effects estimates with heteroscedasticity-robust standard errors. VOL is positive and significant ($\beta = 0.084$, $t = 2.410$, $p = 0.017$), thus supporting H1. POLCOST is positive and significant ($\beta = 0.006$, $t = 2.080$, $p = 0.039$), thus supporting H2. ENV is also positive and significant ($\beta = 0.041$, $t = 2.920$, $p = 0.004$), thus supporting H3.

Both moderating coefficients are positive. VOL $\times$ POLCOST has a coefficient of 0.011 ($t = 2.370$, $p = 0.019$), thus supporting H4. VOL $\times$ ENV has a coefficient of 0.096 ($t = 2.660$, $p = 0.009$), thus supporting H5. The adjusted R^2 is 0.341. Because the model contains interaction terms, the main VOL coefficient

should be read at the mean levels of POLCOST and ENV, while the interaction coefficients indicate how the VOL slope changes as the moderators increase.

Table 4. Two-way fixed-effects regression

Variable	Predicted	Coefficient	Approx. robust SE (β/t)	Approx. 95% CI	t-statistic	p-value	Decision
VOL	+	0.084	0.0349	0.016–0.152	2.410	0.017	H ₁ supported
POLCOST	+	0.006	0.0029	0.000–0.012	2.080	0.039	H ₂ supported
ENV	+	0.041	0.0140	0.013–0.069	2.920	0.004	H ₃ supported
VOL × POLCOST	+	0.011	0.0046	0.002–0.020	2.370	0.019	H ₄ supported
VOL × ENV	+	0.096	0.0361	0.025–0.167	2.660	0.009	H ₅ supported
Controls		Included					
Firm fixed effects		Included					
Year fixed effects		Included					
Adjusted R ²		0.341					
Observations		198					

Economic significance and marginal effects

The coefficient magnitudes indicate economically meaningful associations. A one-standard-deviation increase in VOL (0.079) is associated with a 0.0066 increase in CONACC (0.084×0.079), equal to 13.5 percent of the mean CONACC of 0.049. A one-standard-deviation increase in POLCOST is associated with a 0.0073 increase, or 14.8 percent of mean CONACC. The corresponding ENV effect is 0.0080, or 16.4 percent of mean CONACC.

Table 5. Economic significance and interaction slopes

Effect	Change / condition	Estimated effect	Interpretation
VOL	1 SD = 0.079	0.0066	13.5 percent of mean CONACC
POLCOST	1 SD = 1.210	0.0073	14.8 percent of mean CONACC
ENV	1 SD = 0.196	0.0080	16.4 percent of mean CONACC
Marginal VOL at low POLCOST	Mean – 1 SD	0.0707	Lower volatility slope
Marginal VOL at high POLCOST	Mean + 1 SD	0.0973	Higher volatility slope
Marginal VOL at low ENV	Mean – 1 SD	0.0652	Lower volatility slope
Marginal VOL at high ENV	Mean + 1 SD	0.1028	Higher volatility slope

The interaction terms materially change the volatility slope. Holding ENV at its mean, the marginal effect of VOL is 0.0707 when POLCOST is one standard deviation below its mean and 0.0973 when it is one standard deviation above the mean. While holding POLCOST at its mean point, the VOL slope is 0.0652 at low ENV and 0.1028 at high ENV. These comparisons support the substantive interpretation that visibility and environmental scrutiny amplify the association between commodity price volatility and conservative accrual reporting.

Table 6. Summary of hypothesis testing

Hypothesis	Relationship	Expected sign	Result	Conclusion
H ₁	Commodity price volatility -> accounting conservatism	+	Positive and significant	Supported
H ₂	Political-cost exposure -> accounting conservatism	+	Positive and significant	Supported
H ₃	VOL x POLCOST -> accounting conservatism	+	Positive and significant	Supported
H ₄	VOL x ENV -> accounting conservatism	+	Positive and significant	Supported

5. Discussion

Commodity price volatility and conservatism (H1)

Positive Accounting Theory proposes that reporting choices respond to economic uncertainty when optimistic estimates increase contracting and monitoring costs. Consistent with this mechanism, the positive VOL coefficient shows that conservatism increases as the matched commodity benchmark becomes more volatile. The economic effect, which accounted for 13.5 percent of mean CONACC for a one-standard-deviation change suggests that the association is substantial.

The result is compatible with mining-valuation evidence that commodity uncertainty changes project value and investment decisions (Haque et al., 2014; Haque et al., 2017) and with the information role of conservatism under uncertainty (LaFond & Watts, 2008). It expands previous Indonesian research by showing that an industry-level external exposure explains reporting variation beyond conventional firm ratios. For users of mining-company statements, the implication is that accrual patterns should be interpreted alongside commodity conditions, particularly when asset recoverability depends on volatile price assumptions.

An alternative explanation is that volatility triggers actual impairment and provision events rather than a discretionary reporting preference. The accrual measure cannot fully detach mandatory economic recognition from managerial prudence. The finding therefore supports a reporting-response association but does not necessarily imply that every increase in CONACC reflects voluntary conservatism.

Political-cost exposure and conservatism (H2)

The political-cost hypothesis predicts that large and visible firms face stronger pressures over reported earnings and assets. The positive POLCOST coefficient is consistent with this prediction. A one-standard-deviation increase in firm size is associated with a 14.8 percent increase relative to mean CONACC, indicating that visibility has substantive reporting relevance in this setting.

This result further supports Indonesian study result regarding political-cost proxies and its association with conservatism (Blesia et al., 2023). In mining, firm size can attract greater attention from tax authorities, licensing bodies, creditors, local communities, and environmental stakeholders. Conservative recognition may reduce the credibility costs of appearing to overstate performance or delay adverse information. Simultaneously, firm size also proxies operating complexity, audit intensity, and the scale of long-lived assets. These correlated mechanisms mean that the coefficient should not be interpreted as a pure political-cost effect.

Environmental scrutiny and conservatism (H3)

Stakeholder and legitimacy reasoning predicts stronger reporting discipline when firms are obliged to maintain approvals among environmentally concerned constituencies. The positive ENV coefficient supports this mechanism and has an effect equivalent to 16.4 percent of mean CONACC for a one-standard-deviation change. Therefore, environmental scrutiny is associated with both sustainability communication and with accrual-based financial reporting.

The result is consistent with evidence regarding firm-level climate exposure can increase conservatism (Ferdous et al., 2024), although other developing-country conversely reports a negative association for broader country-level climate risk (Khalifa et al., 2024). The contrast suggests that the magnitude and interpretation of the risk measure are important. The present ENV measure captures firm disclosure and visibility, not physical climate damage alone. A practical implication is that auditors and investors should evaluate whether environmental narratives are consistent with provisions, impairment assumptions, and closure obligations.

A competing explanation is that firms with stronger overall reporting systems may produce both greater environmental disclosure and more conservative accruals. Firm fixed effects can reduce bias arising from persistent differences in reporting culture but cannot fully account for time-varying improvements in governance. This limitation warrants a cautious associational interpretation of the findings.

Political-cost moderation (H4)

H4 combines the uncertainty mechanism of H1 with the visibility mechanism of H2. The positive interaction indicates that commodity price volatility is more strongly associated with conservatism among politically visible firms. The marginal VOL slope increases from 0.0707 at low POLCOST to 0.0973 at high POLCOST, a difference of approximately 37.6 percent.

This result provides a more specific theoretical explanation than separated direct effects. Volatility creates the possibility of adverse revisions, while visibility increases the cost of an optimistic reporting error. For regulators and creditors, the findings suggest that large mining firms may adjust accrual recognition more substantially across commodity cycles. Comparisons of reporting quality across firms should therefore account for both market conditions and firm visibility rather than interpreting a single conservatism level individually.

The interaction could also reflect stronger auditor scrutiny or more sophisticated internal controls in large firms. These mechanisms are consistent with greater prudence, but are not directly measured yet. Future work should test whether audit quality, state ownership, or regulatory attention explains part of the moderating effect.

Environmental scrutiny moderation (H5)

H5 predicts that environmental scrutiny raises the credibility benefit of conservative reporting when volatility increases. The positive $VOL \times ENV$ coefficient supports this prediction. The marginal VOL slope rises from 0.0652 at low ENV to 0.1028 at high ENV, an increase of approximately 57.7 percent. This is the largest moderation difference reported in the study.

The result is consistent with legitimacy reasoning since volatile commodity conditions can drive environmental spending, closure plans, and recoverability estimates under extra pressure. Firms with high environmental visibility face stronger consequences if financial reports appear inconsistent with

disclosed responsibilities. Accordingly, conservative accrual recognition may help preserve reporting credibility when both commodity and environmental risks are salient.

The implication should remain bounded to the measured disclosure-based ENV construct. More disclosure may indicate scrutiny, but it may also represent proactive transparency or better environmental performance. Direct measures of regulatory sanctions, emissions, reclamation liabilities, or media attention would help distinguish these explanations.

Broader implications and contextual limits

For investors and creditors, the findings indicate that commodity price volatility affects both expected operating performance and the pattern of accrual recognition. For analysts, it is recommended to examine impairment assumptions, exploration and evaluation assets, provisions, and environmental obligations alongside commodity-price scenarios. For auditors, it is implied that periods of high volatility combined with high visibility or environmental scrutiny warrant greater professional skepticism over recoverable amounts and completeness of obligations. For regulators, the results support attention to the consistency between sustainability disclosure and financial-statement estimates in extractive firms, particularly mining.

The result of this study is based on a balanced data panel comprised of 18 Indonesian listed mining firms, yielding 198 firm-year observations over 2014–2024; hence should not be generalized to unlisted firms, other countries, or other sectors with different asset structures. The balanced data panel criteria favor firms with continuous listing and complete data throughout the observation period and may provide less representation of newly listed or intermittently reporting firms. The study also relies on one dominant commodity per firm, a disclosure-based ENV measure, and an accrual proxy for conservatism. These boundaries qualify the broader institutional interpretation.

6. Conclusion

This study examines whether external commodity price volatility is associated with accounting conservatism in Indonesian mining firms and whether political-cost exposure and environmental scrutiny condition that association. Using 198 firm-year observations over 2014–2024, the two-way fixed-effects results support all five hypotheses. Commodity price volatility, political-cost exposure, and environmental scrutiny are positively associated with accrual-based conservatism, and both moderators strengthen the volatility effect.

The main contribution is a conditional reporting-response explanation. Commodity price volatility is not treated merely as industry background; it is modeled as an external source of uncertainty by which reporting association depends on institutional visibility. The economic effect calculations show that the relationships are substantial relative to average CONACC, while the marginal effects demonstrate that the volatility slope is materially greater at high political-cost exposure and environmental scrutiny.

The findings are relevant to investors, creditors, auditors, and regulators for evaluating estimates in extractive firms. Nevertheless, the observational design, balanced-panel selection, dominant-commodity matching, disclosure-based ENV proxy, and accrual measure prevent a strong causal claim. Future research should utilize alternative conservatism measures, direct environmental-enforcement data, multi-commodity exposure weights, auditor and governance variables, and cross-country designs with stronger identification strategies.

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