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The Effect of Fraud Heptagon Framework on Fraudulent Financial Statements: Evidence from Energy Sector Companies

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Abstract: *Fraudulent financial statements pose a significant threat to the integrity of financial information and stakeholder trust, often reflecting unresolved agency conflicts between principals and agents. From an agency theory perspective, fraudulent reporting may arise when accounting-based monitoring mechanisms fail to constrain managerial behavior effectively. Using the fraud heptagon framework as an empirical proxy of monitoring weaknesses within agency relationships, this study analyzes the determinants of fraudulent financial statements. The population of this study comprises companies listed on the Indonesia Stock Exchange (IDX) and classified in the energy sector based on the Thomson Reuters Business Classification in the Refinitiv database for the period 2020–2024. Purposive sampling was employed, resulting in 250 analysis units. Unbalanced panel data were analyzed using panel data regression with EViews 12. The results indicate that only certain fraud heptagon factors act as determinants of fraudulent financial statements, namely pressure and collusion, which exhibit a positive effect. In contrast, opportunity, rationalization, capability, arrogance, and coercion do not significantly influence fraudulent financial statements. These findings suggest that several fraud heptagon elements are more closely related to behavioral characteristics and are not directly reflected in financial reporting data, highlighting the importance of effective accounting-based monitoring in mitigating agency conflicts.*

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INTRODUCTION

Fraudulent financial statements describe intentional corporate practices that manipulate reported financial data by misstating material items or omitting essential disclosures in financial reporting. According to the 2024 Occupational Fraud report published by the Association of Certified Fraud Examiners (ACFE), fraud cases are generally classified into three primary categories: asset misappropriation, corruption, and financial statement fraud. Although incidents of financial statement fraud occur less frequently than other forms of fraud, they account for the most significant financial damage, with a reported median loss of approximately USD 766,000 [1]. Such substantial losses underscore the severe consequences of financial statement fraud for a company's long-term viability and the confidence of its stakeholders.

The ACFE's biennial survey reveals that the distribution of fraud losses is not always proportional to the number of cases occurring in each industry sector. In 2024, the mining sector recorded the highest total losses, at $550,000, although with only 24 cases, this is

relatively small compared to the banking and financial services sector [1]. This phenomenon suggests that fraud in the mining sector tends to be large-scale and involves strategic decisions made by top-level management, potentially related to complex financial report manipulation.

Several empirical studies have provided evidence of fraudulent financial reporting practices within the mining industry, a segment of the broader energy sector. The case of PT Timah Tbk. demonstrates indications of financial statement manipulation to conceal illegal activities, as reflected in high earnings opacity and a mismatch between the company's profit and cash flow [2]. Research by Christian et al. uncovered cash flow manipulation practices at PT Bumi Resources Tbk. through reduced capital expenditures and delayed payment of obligations to increase operating cash flow [3]. WorldCom, Delphi Corporation, and PT Asabri demonstrated how operating cash flow manipulation can be used to deceive investors and conceal actual financial conditions [4]. These cases demonstrate that fraudulent financial statements in the mining sector is not solely related to profit manipulation but also involves cash flow management and strategic financial transactions that are difficult to detect using conventional performance indicators.

Fraudulent financial statements can be interpreted through an agency theory perspective, which highlights conflicts of interest and information asymmetry between management, acting as agents, and shareholders, who are the principals [5]. Under conditions of financial pressure and limited oversight, management has an incentive to present biased financial statements to maintain a favorable perception of the company’s performance. Various studies have used fraud frameworks that have evolved from the fraud triangle into the fraud heptagon. The fraud heptagon broadens earlier models by integrating structural elements such as collusion and coercion, thereby offering a more holistic explanation of fraudulent behavior.

The use of financial statement-based quantitative proxies enables empirical testing, but also presents methodological limitations. Several previous studies have shown that not all fraud heptagon frameworks consistently influence fraudulent financial statements, indicating that the effectiveness of proxies in representing behavioral constructs is selective and contextual. This condition is particularly relevant in the energy sector, which exhibits high-risk characteristics, including operational cash flow volatility, concentrated ownership structures, and the intensity of related-party transactions.

In light of these circumstances, this research seeks to assess the effectiveness of multiple proxies derived from the fraud heptagon framework in identifying fraudulent financial statements among companies operating in the energy sector. Specifically, this study offers a methodological contribution by using operational cash flow fluctuations as a proxy for pressure, which represents fundamental liquidity instability and expands the measurement of pressure beyond profit-based indicators. Furthermore, this study uses sector classifications based on the Thomson Reuters Business Classification (TRBC) within the Refinitiv database to ensure data consistency and comparability. Accordingly, this study aims to provide a more context-specific insight into the applicability and limitations of proxy-based measurements within the fraud heptagon framework for explaining fraudulent financial reporting, particularly in the energy industry.

LITERATURE REVIEW

Agency Theory

Agency theory explains the contractual arrangement between principals (owners) and the agents (management), where the agent has greater access to information regarding the company's condition. According to Jensen & Meckling [5], the information superiority held by agents has the potential to create information asymmetry, allowing agents to act non-transparently or withhold certain information. Differing interests between agents and principals subsequently trigger agency conflicts that can hinder the achievement of company goals. Therefore, agency theory is used to explain the mechanism by which the principal's interests can align with the agent's actions amidst potential conflicts and information asymmetry.

Fraudulent Financial Statements

According to the ACFE 2022 [6], fraudulent financial statements involve intentional actions by employees to distort reported financial data or conceal material supporting disclosures, ultimately leading to financial losses for the firm. Such practices generate serious adverse consequences. In general, fraudulent reporting is carried out through manipulation, falsification, or deliberate exclusion of relevant financial data, causing reported figures to deviate from the company's actual economic conditions.

Fraud Heptagon Framework

The fraud heptagon framework is a conceptual framework used to identify and map the factors that trigger fraud, particularly fraudulent financial statements. This framework is developed from the fraud hexagon proposed by Vousinas 2019 [7]. The fraud heptagon adds more complex dimensions of behavior and interest relationships. The fraud heptagon encompasses seven main elements: pressure, opportunity, rationalization, capability, arrogance, collusion, and coercion. These elements represent the conditions, attitudes, and interactions that can lead to fraud. The fraud heptagon framework is used to help identify the most empirically relevant determinants of fraud, taking into account company characteristics and the research environment.

The Effect of Pressure on Fraudulent financial statements

Pressure refers to situations that encourage unethical behavior, which commonly stem from financial or psychological stress experienced by individuals [8]. Measuring pressure through fluctuations in operating cash flow is rarely used. Fluctuations in operating cash flow reflect unstable company performance, which increases pressure on management, as an agent, to meet the principal's expectations. This condition represents an element of pressure, where financial pressure drives individuals to seek shortcuts through distorted financial reporting. Large fluctuations in operating cash flow create a need for liquidity, challenging performance targets, and pressure to maintain the appearance of financial stability in statements.

Prior studies by Tarjo et al. and Ahmed and Sulong report that volatility in operating cash flows is positively associated with the occurrence of fraudulent financial statements [4], [9]. Similarly, findings from Novira et al. as well as Robiansyah et al. indicate that negative operating cash flows and specific cash flow patterns are linked to fraudulent financial reporting practices [10], [11]. In contrast, Husni et al. find no significant relationship between operating cash flow and fraudulent financial statements [12]. Based on this description, the following hypothesis is proposed:

H1: Pressure has a positive effect on fraudulent financial statements.

The Effect of Opportunity on Fraudulent Financial Statements

Opportunity is a weakness in internal controls that creates a vulnerability to fraudulent acts. E-procurement refers to an electronic system for the acquisition of goods and services that is designed to reduce opportunities for price markups, fictitious transactions, and kickback practices. Within the fraud heptagon framework, the lack of e-procurement implementation in a firm is considered to increase the opportunity for fraudulent behavior. According to agency theory, the absence of e-procurement indicates weak internal controls and increasing information asymmetry between principals and agents. Previous study suggests that e-procurement is an effective tool for preventing fraud [13], [14]. However, research by Suprapto & Agustia [15] report that e-procurement does not have a significant effect on fraudulent financial statements.

This study measures opportunity using e-procurement, a procurement control system, where a higher value reflects a weaker opportunity. Therefore, a higher e-procurement value indicates a weaker opportunity. Thus, empirically, a negative relationship is expected between e-procurement and fraudulent financial statements, conceptually representing a positive influence of opportunity on fraudulent financial statements. Based on this description, the following hypothesis is proposed:

H2: Opportunity has a positive effect on fraudulent financial statements.

The Effect of Rationalization on Fraudulent Financial Statements

Rationalization is a factor in the fraud heptagon framework that describes management's justification for manipulative actions. Management tends to view financial statement manipulation as reasonable or justifiable. In this research, rationalization is proxied by the TATA (Total Accrual to Total Assets) ratio, which captures the magnitude of accrual-based components embedded in a firm’s reported earnings. A high TATA value indicates that reported profits are not fully supported by operating cash flow, thus reflecting management's tendency to manipulate accruals. Previous studies show that higher accrual levels are positively related to the occurrence of fraudulent financial statements [16], [17]. In contrast, findings by Djami and Murtanto, as well as Junus et al., indicate that total accruals have no significant influence on fraudulent financial reporting [18], [19]. Based on this description, the following hypothesis is proposed:

H3: Rationalization has a positive effect on fraudulent financial statements.

The Influence of Capability on Fraudulent Financial Statements

Capability reflects the perpetrator's ability actually to commit fraud. In agency theory, director experience enhances an agent's ability to comprehend systems, identify control gaps, and understand the complexity of financial reporting, thereby strengthening the agent's technical and structural capabilities. This condition aligns with the capability framework within the fraud heptagon, which emphasizes that fraud requires not only intent but also adequate competence and position. Harjanto et al. demonstrated that competence and experience enhance an individual's technical ability to understand processes and systems, although their utilization is highly dependent on the individual's goals [20]. Additionally, the ACFE 2019 survey reports that individuals involved in fraudulent activities typically have more than six years of tenure [21]. However, research by Jati & Setiyani and Dewi & Anisykurlillah found that director experience has no effect on fraudulent financial statements [22], [23]. Based on this description, the following hypothesis is proposed:

H4: Capability has a positive effect on fraudulent financial statements.

The Effect of Arrogance on Fraudulent Financial Statements

Arrogance is an attitude characterized by an individual's belief in their own superiority, which can lead them to violate regulations. One proxy for arrogance is the affiliation of directors with commissioners. In agency theory, this affiliation will reduce the independence of commissioners as supervisors and the principal's right-hand man. Within the fraud heptagon framework, director affiliation increases the likelihood of committing fraudulent financial statements. Sukmadilaga et al. report that arrogance is positively associated with the likelihood of fraudulent financial statements. [24]. Research by Sari et al. [25] found no effect of CEO duality, as proxied by director affiliation, on fraudulent financial statements. Based on this description, the following hypothesis is proposed:

H5: Arrogance has a positive effect on fraudulent financial statements.

The Effect of Collusion on Fraudulent Financial Statements

Collusion refers to coordinated actions between two or more parties who conspire to engage in unlawful activities while mutually shielding one another from potential consequences [8]. Related party transactions (RPTs) serve as a proxy for measuring the potential for collusion because they involve complex economic relationships and lack transparency. In agency theory, RPTs exacerbate information asymmetry because principals struggle to assess the fairness of transactions. This condition allows management to collude with related parties to manipulate revenue, expenses, or assets. Within the fraud heptagon framework, fraud is committed collectively, making it more difficult to detect. Research by Bader et al. and Daresta & Suryani suggests that collusion, as indicated by RPTs, has a positive impact on fraudulent financial statements [26], [27]. However, research by Jaunanda & Silaban indicates that RPTs do not affect fraudulent financial statements [17]. Based on this description, the following hypothesis is proposed:

H6: Collusion has a positive effect on fraudulent financial statements.

The Effect of Coercion on Fraudulent Financial Statements

Coercion is the use of force, threat, or pressure that can lead to fraud. Coercion is often proxied through ownership concentration, which creates a power imbalance between controlling shareholders and both management and minority shareholders. In agency theory, dominant shareholders can pressure management to achieve specific goals, including reporting performance that appears better than actual performance. Within the fraud heptagon framework, this condition reflects the element of coercion, where fraud occurs due to pressure or coercion from parties with greater power. Majority shareholders have a positive influence on fraudulent financial statements [28]–[30]. However, Riandani & Rahmawati stated that there is no influence between ownership concentration and fraudulent financial statements [31]. Based on this description, the following hypothesis is proposed:

H7: Coercion has a positive effect on fraudulent financial statements.

METHOD

This study utilizes secondary data from the annual reports of firms listed on the Indonesia Stock Exchange (IDX) that are categorized within the energy sector according to the Thomson Reuters Business Classification (TRBC) in the Refinitiv database, covering the period from 2020 to 2024. The sampling method applied is purposive sampling, whereby observations are selected based on predetermined criteria. Details of the sampling criteria are presented in Table 1, resulting in a final sample of 250 observation units.

Table 1. Research Sample Criteria

No	Criteria	2020	2021	2022	2023	2024	Total
1.	Companies listed on the IDX and classified as the energy sector based on Refinitiv TRBC	58	63	63	63	63	310
2.	Energy sector companies that did not have complete annual financial reports	(16)	(16)	(13)	(8)	(7)	(60)
3.	Energy sector companies that did not provide data related to research variable	0	0	0	0	0	(0)
	Total						250

Hypothesis testing was performed using panel data regression analysis with a significance level of 5%. The data were processed using EViews 12, and the panel regression model applied in this study is presented as follows:

FFS = α + β1*OCFV + β2*PROC + β3*TATA + β4*DE + β5*DA + β6*RPT + β7*KK

Table 2. Variable Operational Definition

Variable	Operational Definition	Measurement	Scale
Fraudulent financial statements (FFS)	Material misstatements arising from fraudulent activities in financial statements	F-score Dechow et al [32]	Ratio
Pressure (OCFV)	Financial pressure can drive management to commit fraud	$OCFV_{i,t} = \frac{StdDev\ (CFO_{i,t-4} \ldots CFO_{i,t})}{Total\ Assets_{i,t}}$ Dechow & Dichev [33]	Ratio
Opportunity (PROC)	Weakness in internal controls that provide an opportunity to commit fraud	Dummy: company uses e-procurement; Yes= 1; No=0 Sukmadilaga et al. [24]	Nominal
Rationalization (TATA)	Justification or moral justification for fraudulent acts	$TATA = \frac{(Net\ Income - OCF)}{Total\ Assets}$ Bhaktiar & Setyorini [34]	Ratio
Capability (DE)	Individual capacity to commit fraud	$DE = \frac{\Sigma Director\ Tenure}{Number\ of\ Directors}$ Dewi & Anisykurlillah [23]	Ratio
Arrogance (DA)	Feeling superior to others may lead to rule violations	Dummy: affiliated relationship between the board of directors and the board of commissioners; Yes=1; No;0 Vousinas [7]	Nominal
Collusion (RPT)	Fraud that is planned and carried out collaboratively	$RPT = \frac{Total\ RPT}{Total\ Assets}$ Jacob [35]	Ratio
Coercion (KK)	Pressure or intimidation by a party to commit fraud	$KK = \frac{\text{Number of the largest share ownership}}{\text{Total shares outstanding}}$ Alwan [36]	Ratio

Source: Various supporting research literature (2025)

RESULT AND DISCUSSION

Result

The descriptive statistical results reveal the minimum and maximum values of each research variable, as presented in Table 3. Most variables exhibit standard deviation values that exceed their respective means, suggesting a heterogeneous data distribution with substantial variability. In contrast, the pressure (OCFV), capability (DE), and coercion (KK) variables display standard deviations lower than their mean values, indicating more homogeneous distributions with relatively limited dispersion.

Table 3. Result of Descriptive Statistical Analysis

	N	Min	Max	Mean	Std. Dev
FFS	250	-2.655824	9.745841	0.253483	1.389575
OCFV	250	0.000437	0.736908	0.089500	0.082782
PROC	250	0.000000	1.000000	0.076000	0.265530
TATA	250	-0.717481	0.581138	-0.049836	0.122708
DE	250	0.000000	30.000000	4.850025	4.435064
DA	250	0.000000	1.000000	0.452000	0.498689
RPT	250	0.000000	1.112873	0.074122	0.151243
KK	250	0.053062	0.999987	0.494974	0.184332

Source: Eviews 12 Output (2025)

Based on the three estimation methods used, the Random Effects Model (REM) was chosen based on the results of the Hausman and Lagrange Multiplier tests, indicating that it is the most suitable specification for the panel data regression analysis in this study. When the REM is adopted, classical assumption testing is not required. REM employs the GLS estimation technique, which still yields a BLUE estimator even when the data contains autocorrelation [37].

The independent variables, comprising pressure, opportunity, rationalization, capability, arrogance, collusion, and coercion, have a significant effect on explaining fraudulent financial statements, accounting for 10.59% of the variance, with the remaining 89.41% attributed to variables outside the scope of the study. The relatively low explanatory power indicates that fraudulent financial statements are influenced by a wide range of factors beyond those captured by financial-statement-based proxies. This finding is consistent with prior fraud literature, which emphasizes the latent and behavioral nature of fraud, particularly in high-risk sectors such as energy. The following is a summary of the results of the hypothesis test using panel data regression analysis (Table 4).

Table 4. Hypothesis Testing

Hypothesis	β	Sig	Result
H1: Pressure has a positive effect on fraudulent financial statements	2.3168	0.0336	Accepted
H2: Opportunity has a positive effect on fraudulent financial statements	-0.3185	0.3522	Rejected
H3: Rationalization has a positive effect on fraudulent financial statements	-1.0192	0.1784	Rejected
H4: Capability has a positive effect on fraudulent financial statements	0.0114	0.6014	Rejected
H5: Arrogance has a positive effect on fraudulent	-0.1017	0.5937	Rejected

	financial statements			
H6:	Collusion has a positive effect on fraudulent financial statements	2.5568	0.0001	Accepted
H7:	Coercion has a positive effect on fraudulent financial statements	0.5856	0.2451	Rejected

Source: Eviews 12 Output (2025)

Discussion

The Effect of Pressure on Fraudulent Financial Statements

The results of this study indicate that pressure has a positive effect on fraudulent financial statements. This result aligns with agency theory and the fraud heptagon framework. Agents commit fraud due to pressure to maintain the appearance of stable operating cash flows. Cash flow fluctuations are a measure of company performance, so agents attempt to conceal this uncertainty. This finding supports research by Ahmed & Sulong [9], which shows that cash flow fluctuations can influence earnings management. Other studies have shown that a company's cash flow patterns and all cash flow fraud ratios can predict fraudulent financial statements [4], [10].

The Effect of Opportunity on Fraudulent Financial Statements

The results of this study indicate that opportunity does not affect fraudulent financial statements. From an agency theory perspective, the opportunity for fraud arises from information asymmetry and weak oversight of management actions. E-procurement is designed to reduce information asymmetry in procurement activities by increasing transparency and traceability of transactions. However, the finding show that the presence or absence of e-procurement as a proxy for opportunity is unable to differentiate the level of opportunity for fraudulent financial statements. This outcome may be attributed to the limited variation in e-procurement adoption among energy sector firms, which constrains its statistical effectiveness as an indicator of opportunity. This finding aligns with research by Suprapto & Agustia [15], which found that e-procurement does not affect fraudulent financial statements.

The Effect of Rationalization on Fraudulent Financial Statements

The results of this study indicate that rationalization does not affect fraudulent financial statements. This result indicates that the rationalization variable, represented by TATA, does not contribute to fraudulent financial statements. This finding aligns with research conducted by the following studies [19], [38], [39]. This condition is likely because TATA comprehensively reflects the company's operational conditions, so its value is highly dependent on normal business activities. It does not always reflect manipulative intent in financial reporting. Rationalization is generally related to management integrity, which is difficult to measure using financial statement figures. Managers with high integrity tend to remain honest in rationalizing decisions, thus preventing fraudulent practices [39].

The Effect of Capability on Fraudulent Financial Statements

The results of this study indicate that capability does not affect fraudulent financial statements. According to the ACFE 2019 survey, individuals involved in fraudulent activities typically have more than six years of work experience [21]. In contrast, the data in this study show that the average tenure of board members is approximately 4.8 years. This finding indicates that the experience level of the board of directors may be insufficient to detect weaknesses in internal control systems and business processes that could facilitate

fraud [22]. The board of commissioners oversees the performance of the board of directors, utilizing its experience to resolve company problems. In practice, oversight of the board of directors is carried out by the board of commissioners, whose experience is employed to address organizational issues. Meanwhile, the experience of the board of directors is primarily directed toward improving performance and securing their positions within the firm [23].

The Effect of Arrogance on Fraudulent Financial Statements

The results of this study suggest that arrogance does not affect fraudulent financial statements. Many energy sector companies still practice affiliation between directors and commissioners. This condition is because family relationships own many companies. The findings of this study do not align with agency theory, which posits that agents are driven by incentives to secure higher compensation based on the performance of the firms they manage. This research aligns with the work of Sari et al. [25], which suggests that director-commissioner affiliation, serving as a proxy for CEO duality, does not indicate fraud because the positions are typically filled by competent and experienced individuals, thereby making the affiliation accountable.

The Effect of Collusion on Fraudulent Financial Statements

The results of this study indicate that collusion has a positive effect on fraudulent financial statements. The regression coefficient value of 2.5587 indicates a unidirectional relationship. The greater the number of transactions with related parties, the greater the potential for fraudulent financial statements. This study aligns with agency theory, which argues that related-party transactions are susceptible to manipulation due to management's tendency to exploit shareholder wealth [27]. This research aligns with Bader et al [26] study, which states that related-party transactions can indicate fraud and manipulation in a company's financial statements.

The Effect of Coercion on Fraudulent Financial Statements

The results of this study suggest that coercion does not affect fraudulent financial statements. This result is evident from the lowest value of -2.66, indicating that SMRU was the company with the lowest fraud risk in 2024, with a concentrated ownership of 52.30%. Meanwhile, the highest fraud risk level, at 9.74, was ARTI in 2024, with concentrated ownership of 33.06%. This result suggests that ownership concentration does not influence the likelihood of fraudulent financial statements. This study is consistent with research by Riandani & Rahmawati [31], which states that there is no influence between ownership concentration and fraudulent financial statements.

CONCLUSION

The results of this study indicate that not all proxies within the fraud heptagon framework are relevant in influencing fraudulent financial statements. The findings suggest that pressure, as measured by fluctuations in operating cash flow, and collusion, as indicated by related party transactions, have a positive impact on fraudulent financial statements. In contrast, opportunity, rationalization, capability, arrogance, and coercion have no significant effect. This study suggests that the application of the fraud heptagon framework, utilizing financial statement-based proxies, is selective, with proxies representing financial pressure and structural factors better explaining fraudulent financial statements than behavioral constructs, particularly in the energy sector.

Methodologically, this study enriches the literature on the determinants of fraudulent financial statements by employing the fraud heptagon framework approach. Practically,

this research suggests that auditors and regulators should prioritize attention to fluctuations in operating cash flow and related-party transactions as key indicators in their efforts to prevent and detect fraudulent financial statements. One limitation of this study is the lack of firms that have been formally identified as having engaged in fraudulent activities. This constraint stems from the limited availability of verified information, as no official disclosures have been issued regarding companies that have been proven to commit financial fraud. Future research may address this limitation by utilizing data from firms that have been officially sanctioned or confirmed to have engaged in financial fraud by stock exchange authorities or other regulatory bodies. Using companies that have committed fraud would make the research results more authentic and accurate.

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