Information Sciences and Technological Innovations

www.isti.reapress.com

Inf. Sci. Technol. Innov. Vol. 2, No. 1 (2025) 46–47.

Paper Type: Original Article

The Relationship between Oil Price Uncertainty and Earnings Management in Refining and Petrochemical Companies of Tehran Stock Exchange

Vadood Azizi[1],*, Seyyed Mohammad Javadi[1], Seyyed Abdollah Razavi[1]

[1] Departmant of Petroleum, Petroleum University of Technology, Tehran, Iran; vadood.azizi@gmail.com; javadi@put.ac.com; srazavi@put.ac.com.

Citation:

Received: 11 August 2024 *Revised: 18 October 2024* *Accepted: 06 Desember 2024*	Azizi, V., Javadi, S. M., & Razavi, S. A. (2025). The relationship between oil price uncertainty and earnings management in refining and petrochemical companies of tehran stock exchange. *Information Sciences and Technological Innovations*, *2*(1), 46-47.

Abstract

Given the importance of oil as a key factor in the economy of oil-producing countries, changes in oil prices can have widespread effects on the economic performance of these countries. These fluctuations not only affect macroeconomic growth, but can also influence the financial and managerial decision-making of companies operating in these countries. The main objective of this study is to examine the relationship between oil price volatility and earnings management in the refining and petrochemical companies listed on the Tehran stock exchange. Oil price volatility, as a key indicator of economic uncertainty, may encourage managers to use various earnings management techniques to mitigate the negative impacts of these fluctuations on financial reports and corporate performance. By analyzing financial data from 15 refining and petrochemical companies listed on the Tehran stock exchange over the period from 2012 to 2021, this study seeks to clarify this relationship and provide practical findings for managers, investors, and other stakeholders. To measure earnings management, we use the modified Jones model, and for oil price volatility, we use the standard deviation of daily oil price returns. The results show that there is a significant relationship between oil price volatility and earnings management.

Keywords: Earnings management, Oil price volatility, Modified Jones model, Stock exchange.

1 | Introduction

Oil, recognized as a strategic commodity, plays a pivotal role in shaping the economic trajectories of nations worldwide. Numerous studies have extensively explored its connections to economic growth [1–3], financial

Corresponding Author: vadood.azizi@gmail.com

markets [4], [5] and corporate strategies [6], [7]. The volatility of oil prices significantly affects industrialized economies, where oil serves as a cornerstone of production processes.

For oil-exporting nations, it represents a primary source of national revenue, making economic activities highly sensitive to price fluctuations. Elevated uncertainty in oil prices not only complicates projections of future economic performance but also disrupts market stability by obscuring demand trends for goods and services [8]. Addressing these uncertainties remains crucial for policymakers to mitigate their adverse impacts on both macroeconomic stability and industrial performance.

According to [9], earnings management is primarily associated with two key approaches: the capital market approach and the contractual (credit-based) approach. In market-driven economies, managers face dual objectives seeking profitable investments while navigating financial constraints. In such contexts, managers may resort to issuing equity or debt instruments to secure the necessary funding. Credit-based contracts often include a range of financial expectations, and failing to meet these benchmarks may signal poor performance and undermine the company's creditworthiness.

Managers may exploit their discretion in adjusting reported earnings to secure financing under more favorable terms [10]. Additionally, findings from studies on oil price volatility and its influence on the oil sector's investment activities indicate that fluctuations in oil prices significantly affect corporate investment rates [11].

Building on this foundation, investigated the relationship between oil price volatility and earnings management in financial companies across Gulf Cooperation Council (GCC) countries, including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE [11]. However, in the Iranian context, limited research has addressed the nexus between oil price volatility and earnings management, highlighting a notable gap in the literature that warrants further exploration.

Managers often use accounting figures and reports to mitigate losses or mask poor performance. In other words, they possess significant discretion in selecting accounting methods that enhance reported earnings. Conversely, when earnings exceed a predefined threshold in the managerial compensation plan, managers may opt to implement income-reducing strategies [12].

There are also scenarios where earnings fall so substantially below the target that achieving the desired profit becomes unattainable, regardless of the accounting practices employed. In such cases, managers may exercise discretion to either defer revenues or accelerate expenses, effectively reducing current earnings to smooth future performance.

Building on prior research, which primarily focused on GCC countries [11], this study shifts the focus to Iran. By analyzing Iranian data, this paper aims to explore the unique relationship between oil price volatility and earnings management practices within a distinct economic and institutional framework. This approach not only broadens the geographical scope of existing literature but also provides valuable insights into an underexplored region.

In this study, we selected petrochemical and refining companies listed on the Tehran stock exchange as our sample because, firstly, the performance of this industry is highly influenced by oil price fluctuations. Secondly, the stock exchange market is one of the key and influential components of any country's economy, reflecting its economic status. This market facilitates capital accumulation and its transfer to individuals and companies in need of funds, thereby playing a crucial role in corporate financing. Various factors can affect earnings management in listed companies, and instability in these factors can complicate decision-making for both companies and investors. Therefore, identifying fluctuations in these variables can assist investors in future planning.

The remainder of this paper proceeds as follows. Section 2 reviews the literature and the development of the research hypotheses and is followed by Section 3, which describes the data, variables and empirical methods used in this study. Sections 4 and 5 present and discuss the findings and conclusions, respectively.

2 | Literature Review and Hypothesis Development

The literature review of this study draws heavily on the foundational work of [13], in 'Does oil price uncertainty affect earnings management? evidence from GCC markets.

2.1 | Earnings Management

Earnings management, as defined by [9] is driven by two primary incentives: capital market motivations and contractual motivations. In market economies, managers not only aim for profitable investments but also face financial constraints. In such environments, companies may issue equity or debt to secure necessary capital. Lending agreements often include financial covenants, and violating these covenants may indicate poor corporate performance and reduced credibility. To secure financing on more favorable terms, managers may adjust reported earnings through discretionary actions [10], [13].

Compensation plans for managers are frequently tied to accounting figures, with bonuses directly linked to earnings. Thus, managers are often motivated to use accounting methods that enhance reported income. However, earnings may sometimes fall below the acceptable threshold or exceed the predefined upper limit of a manager's bonus plan. In such cases, managers may engage in income-decreasing practices to build "cookie jar" reserves [12]. On occasions, earnings may be so low that reaching target earnings becomes impossible, regardless of accounting methods used. Under these circumstances, managers may choose to reduce current earnings by deferring revenues or accelerating write-offs, a practice known as "taking a bath."

Previous studies have demonstrated that a country's economic conditions impact firms' earnings management decisions [14]. Agarwal et. al [14] examined earnings management behavior among Japanese banks during different economic conditions: high growth, stagnant growth, and severe recession. They found that earnings management occurred during high- and stagnant-growth periods through the use of loss-loan provisions, but not during recessions. This observation was supported by [15], who found that economic contraction led to more conservative accounting practices, thereby increasing the value-relevance of earnings. The more conservative reporting during recessions helps firms minimize litigation risks and regulatory scrutiny.

Additionally, Ahmad-Zaluki et al [16] discovered that firms conducting Initial Public Offerings (IPOs) engaged in income-increasing earnings management during the Asian financial crisis. On the other hand, Saleh and Ahmed [17] found that financially distressed firms engaged in income-decreasing earnings management during the Malaysian financial crisis. Similarly, Miranda-Lopez and Valdovinos-Hernandez [18] observed that listed companies in Mexico used income smoothing techniques during the global economic crisis.

Persakis and Iatridis [19] examined the impact of the global financial crisis on earnings quality in publicly listed companies from advanced economies, focusing on investor protection. They concluded that earnings management declined during the crisis, particularly in countries with weak or moderate shareholder protection. Rusmin et al [20] also found evidence of income smoothing behavior among transportation firms in seven Asian countries. The findings indicate that managers smoothed income to meet earnings targets and engage in big-bath practices.

Habib et al. [21] studied whether financially distressed firms engaged in earnings management during financial crises. They found that managers in distressed firms were likely to adopt income-decreasing earnings-management strategies. Filip and Raffournier [22] noted significant reductions in income smoothing and improved accrual quality among European firms during global financial crises. Similar trends were observed by [23] and [24].

2.2 | Earnings Management

Previous research examining the relationship between oil prices and earnings management is limited. Abdullah et al. [11], in their study "does oil price uncertainty affect earnings management? evidence from GCC

markets," provided foundational insights into this area. Other studies have investigated the effects of significant events, such as the Persian Gulf crisis [25], hurricanes Katrina and Rita [26], and the Arab spring [27], on the earnings management practices of oil and gas companies.

These studies consistently indicate that income-decreasing earnings management is prevalent in the aftermath of such crises. Byard et al. [26] and Han and Wang [25] explain this phenomenon using the political cost hypothesis, which suggests that firms adopt conservative accounting practices to mitigate political scrutiny and potential penalties. However, Hsiao et al. [27] propose an alternative explanation, highlighting the role of income smoothing as a potential incentive in these contexts.

There is a strong association between oil prices and economic activity in GCC countries, as highlighted by [23], [28]. This is primarily due to the heavy dependence of these economies on oil income. Two contrasting perspectives exist regarding the relationship between oil price volatility and earnings management. On one hand, it can be argued that during economic downturns, auditors are likely to adopt a more conservative approach due to heightened risks of litigation and client bankruptcy. Additionally, the negative market reaction to poor performance tends to diminish, weakening incentives to inflate earnings [22].

On the other hand, alternative research provides a different perspective. Liao et al. [29] suggest that economic turbulence increases information asymmetry, offering managers greater opportunities to exercise accounting discretion. Similarly, studies by [17] and [30] demonstrate that managers may engage in "big bath" practices when anticipating poor operational performance. Furthermore, prior research indicates that oil companies, during periods of high oil prices, may employ income-decreasing earnings management strategies to mitigate political costs [26].

This dynamic provides a compelling rationale for expecting increased earnings management during periods of high oil price volatility, particularly among non-financial firms operating in economies heavily reliant on oil income. Considering both perspectives, it is hypothesized that oil price volatility positively influences earnings management practices. Accordingly, the following hypothesis is proposed:

H1: there is a positive correlation between oil price volatility and earnings management.

2.3 | Income-Increasing and Income-Decreasing Earnings Management

During periods of economic uncertainty, earnings management can manifest as either income-decreasing or income-increasing practices. Income-increasing strategies may be rational when oil prices are volatile, particularly for firms striving to meet profit targets. Such practices allow companies to project an image of operational efficiency compared to their competitors during uncertain times. This perspective aligns with Degeorge et al. [31], who argue that managers are incentivized to manage earnings upward to exceed or match prior-year profits. Empirical evidence further supports this notion, indicating that financially distressed firms often adopt income-increasing strategies [32], [33]. Similarly, Ahmad-Zaluki et al. [16] observed a link between the Asian financial crisis and income-increasing earnings management practices.

Conversely, in oil-dependent economies, income-decreasing earnings management may represent a rational response to oil price instability. Ghazali et al. [34] suggest that firms employ downward earnings management during crises to build future buffers, as stakeholders already expect poor performance in such conditions. Managers can attribute disappointing earnings to the volatile economic environment, while companies with significant debt may use this strategy to facilitate favorable debt renegotiations. For example, Saleh and Ahmed [17] documented extensive use of Discretionary Accruals (DAs) among financially distressed firms during Malaysia's financial crisis, attributing this behavior to advantages in restructuring negotiations.

Firms may later reverse negative accruals to report improved results, a phenomenon described as big bath behavior. Rusmin et al. [20] observed this pattern among transportation firms during the Asian financial crisis. Similarly, Kjærland et al. [35] provided evidence that oil price shocks promote income-decreasing earnings management among oil and gas companies, consistent with big bath accounting practices.

Given the heightened risk associated with upward earnings management during periods of uncertainty, managers are expected to favor income-decreasing strategies, particularly big bath accounting. Based on these insights, the following hypothesis is proposed:

H2: high oil price volatility induces companies to engage in income-decreasing earnings management.

3 | Methodology

3.1 | Sample

The statistical population of this study consists of 15 refining and petrochemical companies listed on the Tehran stock exchange. The period under review spans 10 consecutive years, from 2012 to 2021. The data required for testing the research hypotheses have been collected from the financial statements and accompanying notes of the companies through various sources, including the website of the Tehran Stock Exchange. The analysis of the research hypotheses will be conducted based on actual data from these years. The aim of this research is to examine information relevant to this period, and only companies that were active in the Tehran stock exchange during this time frame will be included in the hypothesis testing.

3.2 | Measuring Accrual-Based Earnings Management

Accounting accruals are divided into discretionary and non-discretionary components. Non-DAs arise from mandatory accounting adjustments, whereas DAs reflect managerial discretion. Following Hribar and Collins [36], this study defines Total Accruals (TA) as the difference between earnings and Operating Cash Flows (OCFs).

To measure accrual-based earnings management, this research employs the modified Jones model, as proposed by [37], which has been widely utilized in prior studies [38], [39]. The modified Jones model is particularly effective in capturing a significant portion of managed accruals while addressing limitations found in earlier models [40], [41]. The DAs are estimated using the following formula:

$$\mathrm{TAccy_{it}} = \mathrm{a_1}\frac{1}{\mathrm{Assets_{it-1}}} + \mathrm{a_2}\frac{\Delta\mathrm{Rev_{it}} - \Delta\mathrm{AR_{it}}}{\mathrm{Assets_{it-1}}} + \mathrm{a_3}\frac{\mathrm{PPE_{it}}}{\mathrm{Assets_{it-1}}} + \varepsilon_{\mathrm{it}}$$

To calculate DAs, the following key variables and adjustments are considered:

I. TAccr: TA, calculated as earnings before extraordinary items minus OCFs.

II. DRev: the change in sales during the period.

III. DAR: the change in accounts receivable during the period.

IV. PPE: Property, Plant, and Equipment.

Each variable is scaled by the total assets at the beginning of the fiscal year to account for the size of the firm. The estimated coefficients a1a_1a1, a2a_2a2, and a3a_3a3 from the regression model are used to calculate non-DAs, while DAs are derived as the difference between TA and non-DAs. Since earnings management can occur in either direction (upward or downward), the absolute value of DAs is taken as a proxy for accrual management.

To enhance the model's robustness and account for firm characteristics, additional variables are incorporated:

I. Market-to-book ratio: as suggested by [24], this controls for variations in firm profitability.

II. OCF: as recommended by [42], this accounts for firms with extreme performance, improving model specification.

With these enhancements, the modified model is expressed in *Eq. (2)* to estimate DA2 as an alternative proxy for earnings management.

$$TAcc\gamma_{it} = a_1 \frac{1}{Assets_{it-1}} + a_2 \frac{\Delta Rev_{it} - \Delta AR_{it}}{Assets_{it-1}} + a_3 \frac{PPE_{it}}{Assets_{it-1}} + a_4 MTB_{it} + a_5 \frac{OCF_{it}}{Assets_{it-1}} + \varepsilon_{it} \quad (2)$$

where MTB is the market value to the book value of the firm for firm i, in year t, and OCF is the OCF. The remaining variables in *Eq. (2)* have been previously defined.

To test hypothesis H2, DAs are divided into two categories: positive DAs (Dapostv = DA>0), indicating income-increasing earnings management, and negative DAs (DANegv = DA<0), indicating income-decreasing earnings management.

3.3 | Measuring Oil Price Volatility

The data for spot oil prices were provided by the US energy information administration. In this study, oil price instability is measured using the West Texas Intermediate (WTI) crude oil prices in Cushing, Oklahoma, following the methodology of [43]. WTI prices are commonly used as benchmarks for both crude oil and its derivatives. To measure annualized oil price volatility, the standard deviation of daily oil price returns is employed, calculated using the following formula:

$$\delta_t = \sqrt{\frac{1}{N-1}\sum_{E=1}^{N}[r_t - \tilde{r}]^2} \times \sqrt{N},$$

where rt comprises the daily oil price return, and N denotes the number of trading days per annum.

3.4 | Control Variables

This study incorporates several control variables in *Models (4)* and *(5)* to account for firm-specific characteristics. These include Return on Assets (ROA), defined as net income to lagged total assets, to control for performance variations. Firm size, measured by the natural logarithm of total assets, addresses size heterogeneity [44]. Asset growth is included, as high-growth firms may have stronger incentives for earnings management [45]. Leverage, OCF, and financial distress are also considered, as previous studies [46] have found these factors to be correlated with earnings management.

3.5 | Empirical Models

Model (4) examines the relationship between oil price volatility (Vol) and DAs as follows:

$$DA_{it} = B_0 + B_1 Vol_{it} + B_2 Size_{it} + B_3 ROA_{it} + B_4 Leverage_{it} + B_5 Growh_{it} + B_6 OCF_{it} + B_7 PPE_{it} + B_8 Year_{it} + \varepsilon_{it} \quad (4)$$

Model (4) defines DADADA as the absolute value of DAs calculated using the modified Jones model. Key variables are defined as follows:

I. Vol: Annualized standard deviation of daily oil price returns from *Eq. (3)*.

II. Size: Natural logarithm of the firm's total assets.

III. ROA: ROA, calculated as net income divided by total assets.

IV. Leverage: Ratio of total liabilities to total assets.

V. Growth: Revenue growth, computed as measured as current revenue minus the previous year's revenue divided by the previous year's revenue

VI. OCF: OCF divided by total assets.

VII. Distress: Dummy variable equal to 1 if a firm reported negative net income for the year; 0 otherwise.

VIII. PPE: Tangibility, measured as PPE divided by total assets.

IX. Year: Dummy variables to control for year, country, and industry-specific effects.

X. ε: Error term.

These variables are included to capture firm-specific characteristics, economic conditions, and sectoral differences influencing the relationship between oil price volatility and DAs.

To test H2, two separated models are estimated, using the firm-year observations with positive (DApostv) and negative (DANegv) values for DAs:

$$\begin{aligned} DApostv_{it}/DANegv_{it} &= B_0 + B_1 Vol_{it} + B_2 Size_{it} + B_3 ROA_{it} + B_4 Leverage_{it} + B_5 Growh_{it} \\ &+ B_6 OCF_{it} + B_7 PPE_{it} + B_8 Year_{it} + \varepsilon_{it} \end{aligned} \quad (5)$$

where DApostv is the positive accruals generated from the modified Jones model; DANegv is the negative accruals generated from the modified Jones model.

4 | Empirical Results

4.1 | Empirical Models

The descriptive statistics for the variables are presented as follows:

Table 1. Descriptive statistics of key variables.

	DA	VOL	SIZE	ROA	PPE	OCF	LAVREGE	GROW
Mean	0.201618	0.408823	7.479981	0.320395	0.494268	0.267714	0.500136	0.389224
Median	0.158930	0.357898	7.446799	0.294638	0.300625	0.228743	0.459288	0.329234
Maximum	0.933682	1.020897	8.760374	0.837502	7.410654	0.844207	1.016771	1.781123
Minimum	0.006716	0.191228	6.451737	-0.043908	0.015485	-0.127339	0.080428	-0.446796
Std. Dev.	0.180578	0.224944	0.409294	0.195157	0.793456	0.177731	0.222415	0.445409
Observations	134	150	150	146	148	148	142	150

The descriptive statistics reveal important insights into the characteristics of the firms in the sample. On average, the firms in the study have a moderate size (mean SIZE = 7.479), with profitability ROA averaging 0.321. The average leverage ratio is 0.50, indicating that firms rely significantly on debt financing. The firms exhibit a relatively high revenue growth (mean GROW = 0.389) and positive operating cash flow (mean OCF = 0.267), suggesting relatively stable financial performance. DAs, as a proxy for earnings management, have a mean value of 0.201, highlighting varying levels of earnings manipulation. The average oil price volatility (mean VOL = 0.408) demonstrates substantial fluctuations, which is an important factor in assessing the relationship between oil price volatility and earnings management. These descriptive statistics serve as a foundation for further analysis in the study, highlighting the heterogeneity of firm characteristics and external factors in the context of oil price volatility.

4.2 | Empirical Models

4.2.1 | Oil price volatility and earnings management

The results of the panel least squares regression model for the dependent variable DA (which is considered as a proxy for earnings management) are as follows:

Table 4. **Results of panel EGLS regression for dependent variable (DANEGV).**

Variable	Coefficient	Std. Error	T-Statistic	Prob.
VOL	0.116004	0.069173	1.677015	0.0962
Size	-0.014748	0.046539	-0.316897	0.7519
ROA	0.383917	0.163745	2.344604	0.0207
PPE	0.113538	0.028315	4.009851	0.0001
OCF	-0.130177	0.120744	-1.078122	0.2832
Lavrege	0.244979	0.119279	2.053839	0.0422
GROW	0.065481	0.039896	1.641296	0.1034
C	-0.024925	0.349890	-0.071237	0.9433
R-squared	0.245149			
Durbin-Watson stat	1.905716			
F-statistic	5.474602			
Prob(F-statistic)	0.000018			

The regression results, as shown in the model, reveal important insights into the relationship between oil price volatility and earnings management. The dependent variable, DA, represents earnings management, with higher values of DA indicating more earnings manipulation. In line with the hypothesis, the coefficient for oil price volatility (VOL) was found to be positive, though not statistically significant at the conventional 5% level, with a p-value of 0.0962. This suggests a weak positive relationship between oil price volatility and earnings management, implying that increased volatility in oil prices could potentially influence managers to engage in earnings management, although this effect is not strong enough to reach statistical significance.

Among the control variables, the results show that profitability ROA has a positive and statistically significant relationship with earnings management (p-value = 0.0207), indicating that more profitable firms are more likely to engage in earnings management. Additionally, the coefficient for leverage (LAVREGE) is also positive and significant (p-value = 0.0422), suggesting that firms with higher levels of debt tend to engage more in earnings management, consistent with previous research. On the other hand, the firm size (SIZE), OCF, and growth (GROW) variables do not show statistically significant relationships with DAs, indicating that these factors might not have a direct impact on earnings management in this sample. The findings also suggest that firms with greater tangibility (PPE) tend to engage in more earnings management, with a positive and significant coefficient (p-value = 0.0001).

These results highlight the nuanced relationship between oil price volatility and earnings management. While the relationship is positive, it is not robust enough to be considered significant at the 5% level. However, the significant associations between earnings management and profitability, leverage, and tangibility suggest that these factors play a more crucial role in determining earnings management practices than oil price volatility in this dataset.

4.2.2|Oil price volatility and upward accruals

The results of the panel least squares regression model for the dependent variable DApostv (representing positive DAs indicate the following key findings:

Table 3. Results of panel least squares regression for dependent variable (DApostv).

Variable	Coefficient	Std. Error	T-Statistic	Prob.
VOL	0.108349	0.087815	1.233839	0.2223
SIZE	-0.160326	0.070331	-2.279606	0.0264
ROA	1.109404	0.234020	4.740637	0.0000
PPE	0.144845	0.032422	4.467495	0.0000
OCF	-0.931157	0.207816	-4.480686	0.0000
LAVREGE	0.237759	0.180309	1.318623	0.1926
GROW	0.044903	0.052707	0.851926	0.3978
C	0.977302	0.528958	1.847599	0.0699
R-squared	0.490531			
Durbin-Watson stat	1.684636			
F-statistic	7.840166			
Prob(F-statistic)	0.000001			

The regression model examining the relationship between oil price volatility (VOL) and positive discretionary accruals (DAPOSTV) yielded several insights. The coefficient of VOL is positive but statistically insignificant ($p = 0.2223$), indicating that oil price volatility does not significantly influence income-increasing earnings management.

Among the control variables:

Firm size (Size)

Demonstrates a negative and significant association with DAPOSTV ($p = 0.0264$), suggesting that smaller firms are more likely to engage in income-increasing earnings management, possibly due to greater information asymmetry.

Profitability (ROA)

Shows a strong positive and significant relationship ($p < 0.0001$), indicating that firms with higher profitability are more inclined to manage earnings upward.

PPE

Is also positively and significantly associated with DAPOSTV ($p < 0.0001$), reflecting the potential use of fixed assets in earnings management strategies.

OCF

has a negative and significant relationship ($p < 0.0001$), highlighting that firms with lower cash flows may engage in income-increasing earnings management to present a more favorable financial outlook.

Other variables, such as leverage (LAVREGE) and growth (GROW), do not show significant associations with DAPOSTV.

4.2.3|Oil price volatility and earnings management

The regression model, estimated using the Panel EGLS method with cross-section random effects, examines the relationship between oil price volatility (VOL) and negative Discretionary Accruals (DANEGV). The findings are as follows:

Table 4. Results of panel EGLS Regression for dependent variable (DANEGV).

Variable	Coefficient	Std. Error	T-Statistic	Prob.
VOL	-0.156358	0.070788	-2.208831	0.0315
SIZE	-0.052328	0.048395	-1.081278	0.2845
ROA	0.625615	0.166641	3.754270	0.0004
PPE	-0.131422	0.055356	-2.374146	0.0212
OCF	-0.609637	0.102215	-5.964266	0.0000
LAVREGE	-0.048857	0.109330	-0.446880	0.6568
GROW	-0.061723	0.038419	-1.606569	0.1141
C	0.377442	0.366317	1.030371	0.3075
R-squared	0.479445			
Breusch-godfrey	F-statistic=1.698141 Prob=0.1932			
F-statistic	6.973491			
Prob(F-statistic)	0.000007			

Oil price volatility (VOL)

Has a negative and statistically significant coefficient (-0.1564, p = 0.0315). This indicates that higher oil price volatility leads to an increase in income-decreasing earnings management, consistent with the "big bath" hypothesis, where firms strategically reduce reported earnings during periods of economic uncertainty to create a buffer for future periods.

Among the control variables:

Profitability (ROA)

Exhibits a positive and highly significant relationship with DANEGV (0.6256, p = 0.0004), suggesting that more profitable firms engage in income-decreasing accruals to manage their earnings across periods.

PPE

Shows a negative and significant coefficient (-0.1314, p = 0.0212), implying that firms with higher fixed asset investments are less likely to engage in income-decreasing DAs.

OCF

Has a negative and highly significant relationship with DANEGV (-0.6096, p < 0.0001), indicating that firms with lower cash flows are more likely to use income-decreasing strategies.

Other variables, including firm size (SIZE), leverage (LAVREGE), and growth opportunities (GROW), are not statistically significant in this model.

The adjusted R-squared value of 0.4107 indicates that the model explains approximately 41% of the variation in negative DAs. The statistically significant relationship between oil price volatility and DANEGV highlights the role of macroeconomic factors in shaping firms' earnings management behaviors, supporting the hypothesis that volatility prompts firms to adopt income-decreasing strategies.

5 | Conclusion

The relationship between oil price volatility and earnings management has been a subject of extensive analysis, particularly in economies reliant on oil exports. This study focuses on refining and petrochemical firms listed on the Tehran stock exchange, exploring the impact of oil price volatility on earnings management decisions. Iran's dependence on oil revenues and its susceptibility to fluctuations in global oil prices make it an intriguing context for examining this relationship.

The results of this study indicate a significant relationship between oil price volatility and earnings management. While oil price volatility does not appear to significantly influence income-increasing earnings management (as shown in the DAPOSTV model), it demonstrates a negative and significant impact on income-decreasing earnings management (DANEGV model). This suggests that managers in oil-dependent

economies may reduce reported earnings during periods of heightened volatility to establish future buffers, aligning with the "big bath" hypothesis. These findings highlight the role of economic uncertainty in creating opportunities for managerial discretion in financial reporting.

These results carry critical implications for investors, regulators, and policymakers in oil-exporting countries like Iran. They underline the importance of understanding the effects of oil price volatility on financial reporting quality. Regulatory bodies may consider these findings while designing policies to enhance transparency and reduce the likelihood of financial misrepresentation. Moreover, as Iran continues to reform its economic and market structures to attract foreign investment, the findings can inform strategies to improve financial transparency and investor confidence.

Despite some limitations, such as the exclusion of governance-related variables and the use of proxy measures for earnings management, the findings offer valuable insights. Future research could expand on this study by examining similar relationships in other oil-exporting countries or exploring the link between oil price volatility and real earnings management.

Funding

The authors declare that noexternal funding or technical and administrative support was received for this research.

Data Availability

All data supporting the reported findings in this research are provided in the paper. All authors have read and agreed to the publication of this research work.

Conflicts of Interest

The authors declare no conflict of interest with the findings and publication of this research work.

References

[1] Bilgin, M. H., Gozgor, G., & Karabulut, G. (2015). The impact of world energy price volatility on aggregate economic activity in developing Asian economies. *The singapore economic review*, *60*(01), 1550009. https://doi.org/10.1142/S0217590815500095

[2] Lee, K., Ni, S., & Ratti, R. A. (1995). Oil shocks and the macroeconomy: the role of price variability. *The energy journal*, *16*(4), 39–56. https://doi.org/10.5547/ISSN0195-6574-EJ-Vol16-No4-2

[3] Tang, W., Wu, L., & Zhang, Z. (2010). Oil price shocks and their short-and long-term effects on the Chinese economy. *Energy economics*, *32*, S3--S14. https://doi.org/10.1016/j.eneco.2010.01.002

[4] Degiannakis, S., Filis, G., & Floros, C. (2013). Oil and stock returns: Evidence from European industrial sector indices in a time-varying environment. *Journal of international financial markets, institutions and money*, *26*, 175–191. https://doi.org/10.1016/j.intfin.2013.05.007

[5] Park, J., & Ratti, R. A. (2008). Oil price shocks and stock markets in the US and 13 European countries. *Energy economics*, *30*(5), 2587–2608. https://doi.org/10.1016/j.eneco.2008.04.003

[6] Alhassan, A. (2019). Oil price volatility and corporate decisions: Evidence from the GCC region. *Emerging markets finance and trade*, *55*(9), 2057–2071. https://doi.org/10.1080/1540496X.2018.1517330

[7] Wang, Y., Xiang, E., Ruan, W., Hu, W., & others. (2017). International oil price uncertainty and corporate investment: Evidence from China's emerging and transition economy. *Energy economics*, *61*, 330–339. https://doi.org/10.1016/j.eneco.2016.11.024

[8] Zhao, X., Li, T., & Zhai, D. (2016). Effects of oil price volatility on bilateral trade between China and the GCC. In *Energy relations and policy making in asia* (pp. 11–30). Springer. https://doi.org/10.1007/978-981-10-1094-1_2

[9] Healy, P. M., & Wahlen, J. M. (1999). A review of the earnings management literature and its implications for standard setting. *Accounting horizons*, *13*(4), 365–383. https://doi.org/10.2308/acch.1999.13.4.365

[10] Hirshleifer, D., Hou, K., Teoh, S. H., & Zhang, Y. (2004). Do investors overvalue firms with bloated balance sheets? *Journal of accounting and economics*, *38*, 297–331. https://doi.org/10.1016/j.jacceco.2004.10.002

[11] Bugshan, A., Alnahdi, S., Ananzeh, H., & Alnori, F. (2022). Does oil price uncertainty affect earnings management? Evidence from GCC markets. *International journal of energy sector management*, *16*(6), 1240–1258. https://doi.org/10.1108/IJESM-05-2021-0003

[12] Healy, P. M. (1985). The effect of bonus schemes on accounting decisions. *Journal of accounting and economics*, *7*(1–3), 85–107. https://doi.org/10.1016/0165-4101(85)90029-1

[13] Lee, H. A., & Choi, W. W. (2016). Allowance for uncollectible accounts as a tool for earnings management: Evidence from South Korea. *International journal of accounting & information management*, *24*(2), 162–184. https://doi.org/10.1108/IJAIM-06-2015-0040

[14] Agarwal, S., Chomsisengphet, S., Liu, C., & Rhee, S. G. (2007). Earnings management behaviors under different economic environments: Evidence from Japanese banks. *International review of economics & finance*, *16*(3), 429–443. https://doi.org/10.1016/j.iref.2005.08.003

[15] Jenkins, D. S., Kane, G. D., & Velury, U. (2009). Earnings conservatism and value relevance across the business cycle. *Journal of business finance & accounting*, *36*(9–10), 1041–1058. https://doi.org/10.1111/j.1468-5957.2009.02164.x

[16] Ahmad-Zaluki, N. A., Campbell, K., & Goodacre, A. (2011). Earnings management in Malaysian IPOs: The east Asian crisis, ownership control, and post-IPO performance. *The international journal of accounting*, *46*(2), 111–137. https://doi.org/10.1016/j.intacc.2011.04.001

[17] Saleh, N. M., & Ahmed, K. (2005). Earnings management of distressed firms during debt renegotiation. *Accounting and business research*, *35*(1), 69–86. https://doi.org/10.1080/00014788.2005.9729663

[18] Miranda-Lopez, J., & Valdovinos-Hernandez, I. (2019). The impact of the global economic crisis of 2008 on earnings quality in Mexico. *Journal of accounting in emerging economies*, *9*(3), 407–421. https://doi.org/10.1108/JAEE-08-2016-0071

[19] Persakis, A., & Iatridis, G. E. (2015). Earnings quality under financial crisis: A global empirical investigation. *Journal of multinational financial management*, *30*, 1–35. https://doi.org/10.1016/j.mulfin.2014.12.002

[20] Rusmin, R., Scully, G., & Tower, G. (2012). Income smoothing behaviour by Asian transportation firms. *Managerial auditing journal*, *28*(1), 23–44. https://doi.org/10.1108/02686901311282489

[21] Habib, A., Uddin Bhuiyan, B., & Islam, A. (2013). Financial distress, earnings management and market pricing of accruals during the global financial crisis. *Managerial finance*, *39*(2), 155–180. https://doi.org/10.1108/03074351311294007

[22] Filip, A., & Raffournier, B. (2014). Financial crisis and earnings management: The European evidence. *The international journal of accounting*, *49*(4), 455–478. https://doi.org/10.1016/j.intacc.2014.10.004

[23] Altarturi, B. H. M., Alshammri, A. A., Hussin, T. M. T. T., & Saiti, B. (2016). Oil price and exchange rates: A wavelet analysis for organisation of oil exporting countries members. *International journal of energy economics and policy*, *6*(3), 421–430. https://dergipark.org.tr/en/pub/ijeeep/issue/31918/351098

[24] Cimini, R. (2015). How has the financial crisis affected earnings management? A European study. *Applied economics*, *47*(3), 302–317. https://doi.org/10.1080/00036846.2014.969828

[25] Han, J. C. Y., & Wang, S. (1998). Political costs and earnings management of oil companies during the 1990 Persian Gulf crisis. *Accounting review*, *73*(1), 103–117. https://www.jstor.org/stable/248343

[26] Byard, D., Hossain, M., & Mitra, S. (2007). US oil companies' earnings management in response to hurricanes Katrina and Rita. *Journal of accounting and public policy*, *26*(6), 733–748. https://doi.org/10.1016/j.jaccpubpol.2007.10.006

[27] Hsiao, D. F., Hu, Y., & Lin, J. W. (2016). The earnings management opportunity for US oil and gas firms during the 2011 Arab Spring event. *Pacific accounting review*, *28*(1), 71–91. https://doi.org/10.1108/PAR-03-2014-0013

[28] Arouri, M. E. H., & Rault, C. (2012). Oil prices and stock markets in GCC countries: empirical evidence from panel analysis. *International journal of finance & economics*, *17*(3), 242–253. https://doi.org/10.1002/ijfe.443

[29] Liao, L., Kang, H., Morris, R. D., & Tang, Q. (2013). Information asymmetry of fair value accounting during the financial crisis. *Journal of contemporary accounting & economics*, *9*(2), 221–236. https://doi.org/10.1016/j.jcae.2013.10.001

[30] Bugshan, A., Alnori, F., & Bakry, W. (2021). Shariah compliance and corporate cash holdings. *Research in international business and finance*, *56*, 101383. https://doi.org/10.1016/j.ribaf.2021.101383

[31] Degeorge, F., Patel, J., & Zeckhauser, R. (1999). Earnings management to exceed thresholds. *The journal of business*, *72*(1), 1–33. https://doi.org/10.1086/209601

[32] DeFond, M. L., & Jiambalvo, J. (1994). Debt covenant violation and manipulation of accruals. *Journal of accounting and economics*, *17*(1–2), 145–176. https://doi.org/10.1016/0165-4101(94)90008-6

[33] Smith, M., Kestel, J., & Robinson, P. (2001). Economic recession, corporate distress and income increasing accounting policy choice. *Accounting forum*, *25*(4), 334-352. http://dx.doi.org/10.1111/1467-6303.00070

[34] Ghazali, A. W., Shafie, N. A., & Sanusi, Z. M. (2015). Earnings management: An analysis of opportunistic behaviour, monitoring mechanism and financial distress. *Procedia economics and finance*, *28*, 190–201. https://doi.org/10.1016/S2212-5671(15)01100-4

[35] Kjærland, F., Kosberg, F., & Misje, M. (2021). Accrual earnings management in response to an oil price shock. *Journal of commodity markets*, *22*, 100138. https://doi.org/10.1016/j.jcomm.2020.100138

[36] Hribar, P., & Collins, D. W. (2002). Errors in estimating accruals: Implications for empirical research. *Journal of accounting research*, *40*(1), 105–134. https://doi.org/10.1111/1475-679X.00041

[37] Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. *Accounting review*, *70*(2), 193–225. https://www.jstor.org/stable/248303

[38] Arthur, N., Tang, Q., & Lin, Z. S. (2015). Corporate accruals quality during the 2008-2010 global financial crisis. *Journal of international accounting, auditing and taxation*, *25*, 1–15. https://doi.org/10.1016/j.intaccaudtax.2015.10.004

[39] Cohen, D. A., Dey, A., & Lys, T. Z. (2008). Real and accrual-based earnings management in the pre-and post-Sarbanes-Oxley periods. *The accounting review*, *83*(3), 757–787. https://doi.org/10.2308/accr.2008.83.3.757

[40] Kang, S. H., & Sivaramakrishnan, K. (1995). Issues in testing earnings management and an instrumental variable approach. *Journal of accounting research*, *33*(2), 353–367. https://doi.org/10.2307/2491492

[41] Peasnell, K. V, Pope, P. F., & Young, S. (2000). Accrual management to meet earnings targets: UK evidence pre-and post-Cadbury. *The british accounting review*, *32*(4), 415–445. https://doi.org/10.1006/bare.2000.0134

[42] Dechow, P. M., Hutton, A. P., Kim, J. H., & Sloan, R. G. (2012). Detecting earnings management: A new approach. *Journal of accounting research*, *50*(2), 275–334. https://doi.org/10.1111/j.1475-679X.2012.00449.x

[43] Al-Khazali, O. M., & Mirzaei, A. (2017). The impact of oil price movements on bank non-performing loans: Global evidence from oil-exporting countries. *Emerging markets review*, *31*, 193–208. https://doi.org/10.1016/j.ememar.2017.05.006

[44] Aldahray, A., & Alnori, F. (2021). Impact of regulatory environment on accruals manipulation of bankrupt firms. *Spanish journal of finance and accounting/revista española de financiación y contabilidad*, *50*(1), 114–142. https://doi.org/10.1080/02102412.2020.1735209

[45] Skinner, D. J., & Sloan, R. G. (2002). Earnings surprises, growth expectations, and stock returns or don't let an earnings torpedo sink your portfolio. *Review of accounting studies*, *7*(2), 289–312. https://doi.org/10.1023/A:1020294523516

[46] Becker, C. L., DeFond, M. L., Jiambalvo, J., & Subramanyam, K. R. (1998). The effect of audit quality on earnings management. *Contemporary accounting research*, *15*(1), 1–24. https://doi.org/10.1111/j.1911-3846.1998.tb00547.x