

The impact of financial leverage on accrual-based and real earnings management considering the role of growth opportunities

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Abstract

Research hypotheses that focus on financial leverage, earnings management, and sustainability factors which include growth potential will be highlighted in this study. Data collection includes all establishments that are trading on the Iraq Stock Exchange which is the sample population. Data comprised 31 issuers; selection was done systematically by eliminating companies from fiscal years 2009 through the year 2021. Estimation of the multivariate regression model used panel data actually to test hypotheses of this study. In relation to hypotheses, findings show that real EMS is not affected by financial leverage while accrual EMS is negatively affected. Furthermore, the research finds that a pertinent issue in this regard is the fact that the negative influence of monetary leverage on accrual-based earnings administration increases when growth opportunities are present. In another case, the relationship between monetary leverage and real earnings management does not depend on growth opportunity. Hence, this study shows the need to factor in sustainability elements like readiness for growth when examining the relation between financial leverage, earning management, and company performance.

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1. Introduction

Each business entity sets specific goals for its activities and strives to achieve them over time. One of these goals is to earn a sustainable profit. Profit is a key factor in determining returns on shareholders' equity and is regarded by analysts, investors, and the board of directors as one of the most significant items in financial statements [1], [2]. Financial statements indicate core data used by both internal and external stakeholders. Their job is to give an accurate and impartial assessment of the performance and financial standing of a business unit. However, in practice, there may be opportunities to influence accounting information using various methods and techniques, resulting in manipulated financial statements and inaccurate accounting data, which could lead to sustainable earnings management. In the financial decision-making process, managers often choose options that maximize the expected profit of the business unit. Consequently, this behavior leads to earnings management. Due to its detrimental effects on the accuracy of monetary reporting, earnings management has emerged as a major concern for professionals and regulators [3]. The importance of profit management must be

understood by both internal and external users. Earnings management is the deliberate manipulation of the external financial reporting process for one's own advantage, according to [4], [5].

Earnings management, a pervasive issue in the realm of accounting, involves the strategic use of financial reporting discretion to manipulate earnings in order to achieve specific goals [6], [7], [8]. This practice, often employed by managers, can have far-reaching consequences on the reliability of financial statements and the decision-making process of stakeholders. In the context of agency theory, which focuses on the relationship between principals (shareholders) and agents (managers), the potential for earnings manipulation arises when managers prioritize their own interests over those of shareholders or deceive creditors in credit-related decisions [9], [10]. The increasing number of shareholders in corporations, driven by the growth of joint-stock companies and financial markets, has created a complex landscape where managerial oversight has diminished. With a larger shareholder base, individual shareholders have less influence over managerial decisions, leading to a widening gap in information asymmetry between owners and managers [11], [12]. This knowledge disparity provides managers with the opportunity to manipulate financial records, potentially misleading shareholders and altering the organization's capital structure by seeking financial resources from creditors in capital markets [13], [14].

While previous research has delved into various aspects of earnings management and its influencing factors, there remains a notable gap in exploring the relationship between growth prospects and financial leverage. Understanding how growth prospects moderate the impact of financial leverage on earnings management is crucial for gaining insights into the dynamics of financial decision-making within organizations. By addressing this gap, the current study aims to shed light on the intricate interplay between financial leverage and earnings management in the context of evolving business landscapes.

2. Theoretical framework

In the realm of accounting literature, sustainable earnings management has been a longstanding topic that revolves around the manipulation of accounting profits. This subject has been extensively explored by accounting researchers since the early 20th century, with each researcher approaching it from specific angles and under different titles, such as profit manipulation, income smoothing, and ultimately earnings management. In the current state of accounting research, the concept of earnings management is defined as the altered or manipulated reporting of a company's economic behavior by insiders, especially managers, with the aim of misleading stakeholders and participants in the capital markets [15], [16].

Today, earnings management is considered a classic research topic in accounting, and numerous studies on corporate earnings management have been conducted in recent years [17]. Financial statements serve as the most essential source of information that corporate managers and other organizational leaders use to manage and maximize profits and income [18]. These statements encapsulate a company's financial behavior, financial position, and financial flexibility. Among the various figures presented in financial statements, profit holds significant importance for many managers, researchers, and readers alike [19], [20].

In previous decades, due to the high importance of profit figures in investors' economic decisions and the potential for manipulation by managers for personal or imposed purposes, auditors and regulators have placed a strong focus on these figures [21], [22]. The scrutiny surrounding profit figures stems from the critical role they play in shaping investors' perceptions of a company's performance and financial health. As such, ensuring the accuracy and reliability of profit figures in financial statements is crucial for maintaining transparency and trust in financial reporting practices [23], [24].

Real earnings and accrual-based earnings managing stand for dual foremost classifications into which earnings managing is characteristically divided in accounting literature. Accrual-based earnings management permits income to be reported in a particular direction without affecting cash flows by modifying accounting policies or estimates when recognizing particular activities or transactions in financial statements. Real earnings

management involves changing actual operations, such as offering additional cash discounts, and reducing research and development expenses, which affects cash flows [11], [25]. It is unclear whether managers should use accruals or real activities to smooth earnings; however, managers are more likely to employ real activities to manipulate earnings since accrual manipulation is less likely to draw notice and scrutiny of regulators and auditors than real decisions about product production and pricing [13].

Sustainable leverage plays a critical role in minimizing agency costs resulting from information asymmetry and conflicts of interest by helping managers align their interests with shareholders, as demonstrated by extensive empirical research in finance literature. Financial leverage imposes constraints through limited access to business cash flows, hence serving as a disciplinary tool in observing managerial discretionary activities, as per the agency philosophy of [19]. In other words, agency theory views leverage as a mechanism that disciplines managing, thereby curbing opportunistic behavior. This mechanism limits the opportunity for self-serving behaviors, causing managers to lose tools for earnings manipulation. For instance, Jelinek determined that higher leverage lowers earnings management by reducing opportunistic behavior [18]. By taking on leverage, the business agrees to utilize its free cash flow to settle debt principal and interest rather than funding endeavors that do not maximize value. Leverage lowers agency expenses related to free cash flow and limits the amount of free cash flow accessible to management. Leverage generates conflicts of interest between bondholders and shareholders as well as between shareholders and managers, even while it can help to lessen agency problems between stakeholders and directors and lower costs associated with information asymmetry. More free cash flows in a company increase opportunistic behaviors and managerial freedom in high-risk, low-return investments, leading to earnings volatility and increasing earnings management. Thus, higher financial leverage in a company, which gradually reduces free cash flow, negatively impacts earnings management and makes managers more cautious [16].

A large body of research on sustainable earnings management shows that debt and motivation to control profits because of contractual obligations are positively correlated. High leverage is also linked to financial trouble, as companies that are unable to fulfill their obligations are inclined to manipulate earnings in order to improve their condition and secure better terms on their debt. Watts and Zimmerman contended, however, that managing heavily leveraged corporations can inflate reported results artificially in order to strengthen a company's position in credit talks and obtain more cash at a reduced cost [26]. As leverage rises, highly indebted companies are more likely to take part in earnings management practices. Financial leverage indicator has varying impacts on corporate earnings management. On one hand, increased financial leverage, coupled with rising company debt, motivates managers to manipulate earnings through accruals and other accounting choices to improve financial statement figures, thus positively impacting earnings management [26]. Conversely, previous research indicates that company characteristics, such as corporate governance and growth opportunities, affect the relationship between managing and financial leverage. Factors influencing managerial opportunistic behavior include growth opportunities for the company.

Generally, there is an inverse association between corporate growth opportunities and earnings management [14]. As growth and profitability of companies increase, along with higher free cash flow, managers have more low-risk, high-return investment opportunities, minimizing earnings volatility and providing greater assurance to managers and investors, thereby reducing earnings manipulation incentives [18]. On the other hand, when growth and investment opportunities are limited, managers may engage in riskier investments with returns different from the company's current operations, causing profit fluctuations and leading managers to manage earnings to control these fluctuations [11].

3. Research background

The authors [7] examined the relationship between managing skill and earnings quality in Iraqi businesses, as well as how the formation of ISIS has affected this relationship. Findings imply that managers' skill improves the quality of earnings, but this relationship is weakened by ISIS's presence. Real activity earnings managing

risers in businesses with low levels of government intervention, subpar corporate governance, and significant financial leverage, according to [11]. On the other hand, in organizations that operate in less strict regulatory settings and have rapid growth rates, there is an increase in the practice of managing earnings through accruals. In [21], the authors examined the moderating role of managerial abilities on the relationship between real earnings management and the future performance of Tehran Stock Exchange companies. Findings revealed a detrimental correlation between actual earnings manipulation and forthcoming corporate performance, with managerial competence failing to alleviate this adverse correlation. In [22], significant relationships between institutional, family, and internal managerial ownership were found in the data.

Nonetheless, no statistically significant association was observed between ownership of earnings by large shareholders and external managers. In [23], the authors investigated the impact of managing processes and characteristics on earnings management and aggressive financial reporting. An examination of data from 100 organizations during the period of 2008 to 2012 revealed a notable inverse correlation between managerial attributes and both earnings manipulation and assertive financial reporting. In [24], the authors demonstrated that there was no meaningful relationship between accrual or actual earnings manipulation and accounting comparability. In [25], the authors indicated that in organizations with substantial financial leverage, financial leverage had a significant inverse effect on all indicators of actual earnings management. Companies with low financial leverage experienced a strong inverse impact of financial leverage on both aggregate measures of real earnings managing and individual measures (excluding anomalous operational cash flows). In [27], the authors found a significant unfavorable relationship between earnings management and institutional ownership stability. They did not, however, discover a statistically significant combined effect of financial leverage and institutional ownership stability on earnings management. The influence of financial leverage on real earnings management in non-financial enterprises in Korea from 2010 to 2018 was investigated in [28]. The findings demonstrate a substantial and favorable correlation between financial leverage and earnings management.

Based on theoretical foundations, research hypotheses are formulated as follows:

1. **Hypothesis 1:** Financial leverage has a negative impact on accrual-based earnings management.
2. **Hypothesis 2:** Financial leverage has a positive impact on real earnings management.
3. **Hypothesis 3:** Growth opportunities positively moderate the impact of financial leverage on accrual-based earnings management.
4. **Hypothesis 4:** Growth opportunities negatively moderate the impact of financial leverage on real earnings management.

4. Research methodology

The population of this research includes all accepted companies in the Iraqi Stock Exchange between the years 2009 to 2021. Additionally, since information from the previous year is needed to calculate research variables, data from 2008 has also been collected. In this research, a systematic elimination method has been used for sample selection, and companies included in the sample must meet the following conditions:

1. To ensure comparability of information, the company's fiscal year should end in December.
2. The company has not changed its fiscal year during the research period.
3. All necessary data for examined companies must be available and accessible.
4. The company is not a financial intermediary (such as banks, investment, and leasing companies).

Considering the above conditions and limitations, 31 companies accepted in the Iraqi Stock Exchange were selected. Microsoft Excel was used for data collection and preparation, and EVIEWS software was utilized for model estimation. Variables of this research include dependent, independent, moderating, and control variables, each of which is explained below [29]. According to this research, discretionary accruals are a measure of

sustainable earnings managing; that is, larger discretionary accruals correspond to higher earnings managing, and vice versa. Furthermore, discretionary accruals were calculated using a modified Jones model and the following formula [9] based on:

$$\left(\frac{TA_{it}}{A_{it-1}}\right) = \alpha_1 \left(\frac{1}{A_{it-1}}\right) + \alpha_2 \left(\frac{(\Delta REV - \Delta REC)}{A_{it-1}}\right) + \alpha_3 \left(\frac{PPE_{it}}{A_{it-1}}\right) + \alpha_4 ROA_{it} + \epsilon_{it} \dots \dots (1)$$

Where:

TA_{it} represents the total liabilities of the company i in year t . To calculate this variable, net income minus operating cash flows is used.

A_{it-1} represents total assets of the company i in the year $(t-1)$

ΔREV represents a change in revenue of the company i between year $(t-1)$ and t .

ΔREC represents a change in receivables of the company i between year $(t-1)$ and t .

PPE_{it} represents gross property, plant, and equipment of the company i in year t .

ROA_{it} represents the ratio of net income to total assets of the company i in year t .

ϵ represents discretionary liabilities of company i in year t .

It should be noted that in this model, discretionary accruals are the same as the error term (ϵ). In this research, three signs of anomalous operational cash flow, abnormal production costs, and abnormal discretionary expenses are utilized to compute actual earnings management. Companies that use some or all of these criteria to raise their reported earnings through actual earnings management are likely to use these three indicators at a given level of sales [8]. To calculate real earnings management, add these three factors together. Each of these is measured as follows:

A) Abnormal operating cash flow measurement method for abnormal operating cash flows is described by Equation 2.

$$\frac{CFO_{it}}{TA_{it-1}} = \alpha_0 \frac{1}{TA_{it-1}} + \alpha_1 \frac{Sales_{it}}{TA_{it-1}} + \alpha_2 \frac{\Delta Sales_{it}}{TA_{it-1}} + \epsilon_{it} \dots \dots (2)$$

Where:

CFO_{it} represents the operating cash flows of the company i at the end of year t .

TA_{it-1} represents the total assets of the company i at the end of year $(t-1)$.

$Sales_{it}$ represents sales of the company i at end of year t .

$\Delta Sales_{it}$ represents changes in sales of the company i at end of year t .

ϵ_{it} represents the abnormal operating cash flow of company i in year t .

The modified Jones model is considered a measure of abnormal operating cash flow.

B) Abnormal production costs

Measurement of abnormal production costs represented by Equation 3:

$$\frac{PROD_{it}}{TA_{it-1}} = \alpha_0 \frac{1}{TA_{it-1}} + \alpha_1 \frac{Sales_{it}}{TA_{it-1}} + \alpha_2 \frac{\Delta Sales_{it}}{TA_{it-1}} + \alpha_3 \frac{\Delta Sales_{it}}{TA_{it-1}} + \epsilon_{it} \dots \dots (3)$$

Where:

$PROD_{it}$ represents the production costs of the company, which is equal to the cost of goods sold plus changes in inventory of company i at the end of year t .

ε_{it} represents a measure of abnormal production costs of the company i in year t .

In this research, in accordance with [8], Equation 3 is used to estimate abnormal production costs, where the residual model is considered as a measure of abnormal production costs.

C) Abnormal discretionary expenses

Equation 4 provides measurement methodology for an indicator of abnormal discretionary expenditures based on:

$$\frac{DISEXP_{it}}{TA_{it-1}} = \alpha_0 \frac{1}{TA_{it-1}} + \alpha_1 \frac{Sales_{it}}{TA_{it-1}} + \varepsilon_{it} \dots \dots (4)$$

Where:

$DISEXP_{it}$ represents discretionary expenses of the company, which includes administrative, general, and selling expenses of the company i at the end of year t .

ε_{it} represents a measure of abnormal discretionary expenses of the company i in year t .

In this study, abnormal discretionary expenses are estimated using Equation 4 in accordance with [8], where the residual model is taken into consideration as a measure of abnormal discretionary expenses.

Financial leverage is the study's independent variable. The ratio of the book value of all debt to the book value of all assets is known as financial leverage [11]. The moderating variable in this research is growth opportunity, which is calculated as a division of the market value of equity by the book value of equity [11].

In this research, the following control variables are used based on [11]:

1. **Size:** Natural logarithm of the book value of total assets of the company.
2. **Profitability (RoA):** ratio of net income to book value of total assets.
3. **Institutional Ownership (Iow):** Percentage of institutional shareholders. Institutional shareholders include the total percentage of shares held by institutional investors such as banks, insurance companies, holding companies, financial institutions, organizations, and government entities.

For testing the first hypothesis of research, following [11], a combined regression is used as described in Equation 5:

$$AEM_{i,t} = \beta_0 + \beta_1 Lev_{i,t} + \beta_2 Size_{i,t} + \beta_4 Roa_{i,t} + \beta_5 Iow_{i,t} + \varepsilon_{i,t} \dots \dots \dots (5)$$

Where:

- $AEM_{i,t}$: Accrual-based earnings managing of company i in year t .
- $Lev_{i,t}$: Financial leverage of company i in year t .
- $Size_{i,t}$: Size of company i in year t .
- $Roa_{i,t}$: Profitability of company i in year t .
- $Iow_{i,t}$: Institutional ownership of company i in year t .

In Equation 5, it is expected that the sign of β_1 is negative to reject the first hypothesis.

For testing the third hypothesis of research, following [11], a combined regression is used as described in Equation 6:

$$AEM_{i,t} = \beta_0 + \beta_1 Lev_{i,t} + \beta_2 MtB_{i,t} + \beta_3 Lev_{i,t} * MtB_{i,t} + \beta_4 Size_{i,t} + \beta_5 Roa_{i,t} + \beta_6 Iow_{i,t} + \varepsilon_{i,t} \dots \dots \dots (6)$$

Where:

- $MtB_{i,t}$: Growth opportunity of company i in year t .

The rest of the variables follow the description in Equation 5.

In Equation 6, it is expected that the sign of β_3 is negative to reject the third hypothesis.

For testing the fourth hypothesis of the research, following [11], a combined regression is used as described in Equation 7:

$$REM_{i,t} = \beta_0 + \beta_1 Lev_{i,t} + \beta_2 MtB_{i,t} + \beta_3 Lev_{i,t} * MtB_{i,t} + \beta_4 Size_{i,t} + \beta_5 Roa_{i,t} + \beta_6 Iow_{i,t} + \varepsilon_{i,t} \dots\dots(7)$$

In Equation 7, it is expected that the sign of β_3 is negative to reject the fourth hypothesis.

5. Results and discussion

Table 1 provides descriptive data for research variables. For every variable in this table, there are 1018 observations.

Table 1. Study variables' descriptive data

Variable	Mean	Median	Maximum	Minimum	Standard Deviation
AEM	0.174	0.120	0.945	-0.937	2.274
REM	0.240	0.440	0.998	-0.962	0.283
Lev	4.530	3.050	8.332	0.001	5.430
MtB	7.294	3.142	18.156	5.415	9.678
Size	441.22	443.22	49.27	245.19	39.01
Roa	-0.060	0.160	2.970	-0.830	1.630
low	4.050	4.400	7.900	0.000	2.260

The average (median) company valuation, according to data, is 443.22, with a maximum value of 49.27 and a minimum value of 245.19. In accrual-based earnings management, the average and median are 174.0 and 120.0, respectively. Based on average institutional ownership, sample companies appear to have 40% institutional ownership. The standard deviation of profitability is 163.0, and the standard deviation of growth opportunity is 967.8, indicating that profitability has been the least and growth opportunity has been the highest variability.

Table 2 presents findings from the initial hypothesis test. Hausman test was used to assess the fit between the fixed-effects model and the random-effects model, and Leamer F-test was used to assess the fit between the combined model and the fixed-effects model. Panel data model fit with fixed effects is determined using the Leamer F-test and Hausman test. The first theory predicts that financial leverage will lessen accrual-based earnings management.

Table 2. Results of the first hypothesis test, $AEM_{i,t} = \beta_0 + \beta_1 Lev_{i,t} + \beta_2 Size_{i,t} + \beta_4 Roa_{i,t} + \beta_5 Iow_{i,t} + \varepsilon_{i,t}$

Variable	Coefficient	Standard error	t-statistic	p-value	VIF
Constant	0.7127	0.5138	1.387	0.1663	-
Lev	-0.095	0.034	2.749	0.0063	1.18
Size	-0.0280	0.0230	-1.218	0.2237	1.03
Roa	0.0757	0.0522	1.448	0.1483	1.15
low	-0.0546	0.0747	-0.7320	0.4646	1.06
Fisher Statistic (Overall Model Significance)	-	-	10.99	0.000	
Leamer F-test	-	-	2.313	0.0002	

Variable	Coefficient	Standard error	t-statistic	p-value	VIF
Hausman Test	-	-	15.343	0.0040	
Durbin-Watson statistic	-	-		-	
Adjusted R-squared	-	-		0.2208	
Omnibus statistic	-	-	248.925	0.000	

The findings show that accrual-based earnings management and financial leverage have a negative association. In other words, accrual-based earnings management declines by 5.9% for every unit rise in financial leverage. Consequently, accrual-based earnings management decreases as a result of financial leverage, and the first hypothesis is accepted at a one percent significant level.

There is no multicollinearity among independent variables in Eq. 1, according to the results of the inflation variance statistic. The total significance of Equation 1 is indicated by Fisher statistic's significance (99.10). Additionally, the presence of variance heterogeneity amongst disturbances in Equation 1 is indicated by the significance of the heteroscedasticity ratio. The generalized least squares (GLS) approach has been utilized in this study to deal with variance heterogeneity.

Table 3 presents findings from the second hypothesis test. The Hausman test was used to evaluate the fit of fixed effects and random effects models, and the Limber F-test was utilized to assess the model's fit between the combined model and the fixed effects model. Panel data with fixed effects were used to fit the model, which was determined by the Limber F-test and Hausman test. The second hypothesis states that real earnings management should rise as a result of financial leverage.

The findings suggest that there is no statistically significant positive correlation between financial leverage and real earnings management. Stated otherwise, the second hypothesis is rejected at a one percent significance level, and it may be stated that financial leverage does not boost real earnings management as the financial leverage variable's significance level is bigger than five percent.

Table 3. Results of the second hypothesis test, $REM_{i,t} = \beta_0 + \beta_1 Lev_{i,t} + \beta_2 Size_{i,t} + \beta_4 Roa_{i,t} + \beta_5 low_{i,t} + \epsilon_{i,t}$

Variable	Coefficient	Standard error	t-statistic	p-value	VIF
Constant	2/331	0/5917	3/939	0/0001	-
Lev	0/0326	0/0400	0/8149	0/4156	1/18
Size	-0/1088	0/0265	-4/100	0/0001	1/03
Roa	0/2560	0/1068	2/396	0/0171	1/15
low	0/1842	0/1115	1/652	0/0993	1/06
Fisher Statistic (Overall Model Significance)	-	-	14/231	0/0000	
Leamer F-test	-	-	1/618	0/0232	
Hausman Test	-	-	25/532	0/0000	
Durbin-Watson statistic	-	-		1/753	
Adjusted R-squared	-	-		0/2152	
Omnibus statistic	-	-	206/199	0/0000	

According to values of variance inflation factor (VIF), there is no issue with multicollinearity among independent variables in Equation 2. Equation 2's overall importance is indicated by Fisher's F-statistic (14.231). Furthermore, the likelihood ratio statistic's importance suggests that there is heteroskedasticity in

residuals of Equation 2. In this work, heteroskedasticity has been addressed by application of the generalized least squares (GLS) method.

Table 4 presents findings from the third research hypothesis test. The Hausman test was used to select between fixed effects and random effects models, and the Limer F-test was utilized to assess model fit between fixed effects and pooling model. Model fit utilizing panel data with fixed effects was ascertained using the Limer F-test and Hausman test. The third hypothesis states that growth prospects should exacerbate the detrimental effects of financial leverage on accrual-based earnings management.

Table 4. Results of the third research hypothesis test, $AEM_{i,t} = \beta_0 + \beta_1 Lev_{i,t} + \beta_2 MtB_{i,t} + \beta_3 Lev_{i,t} * MtB_{i,t} + \beta_4 Size_{i,t} + \beta_5 Roa_{i,t} + \beta_6 Iow_{i,t} + \epsilon_{i,t}$

Variable	Coefficient	Standard error	t-statistic	p-value	VIF
Constant	1/494	0/5258	2/841	0/0047	-
Lev	-0/1177	0/0357	-3/295	0/0011	1/20
MtB	-0/0119	0/0021	-5/635	0/0000	6/49
MtB*Lev	-0/0111	0/0022	4/979	0/0000	6/18
Size	-0/0614	0/0231	-2/649	0/0084	1/07
Roa	0/1196	0/0605	-1/976	0/0000	1/18
Iow	-0/0142	0/0757	-0/1886	0/8505	1/19
Fisher Statistic (Overall Model Significance)	-	-	17/276	0/0000	
Limer's F-statistics	-	-	2/580	0/0000	
Hausman statistics	-	-	19/963	0/0028	
Durbin-Watson statistic	-	-		1/903	
Adjusted R-squared	-	-		0/2242	
Likelihood Ratio statistics	-	-	246/980	0/0000	

The p-value found for the interaction term between financial leverage and growth prospects is less than the 5% error threshold, according to the results shown in Table 4. Thus, it can be said that the relationship between financial leverage and accrual-based earnings management is significantly impacted by growth potential. Additionally, at a 5% error level, the estimated coefficient for the interaction term between financial leverage and growth opportunities is negative, suggesting that growth opportunities amplify the effect of financial leverage on accrual-based earnings management. To be more precise, accrual-based earnings management reduces by 0.1701 (or $-0.1177 - 4.729 \times 0.0111 = -0.1177 - 4.729 \times 0.0111$) for every unit rise in financial leverage as growth prospects expand. At a 5% error level, the third hypothesis is not rejected in light of justifications and determined significance level. The variance inflation factor (VIF) values indicate that there is no multicollinearity problem among independent variables in Equation 3. The significance of Fisher's F-statistic (17.276) indicates the overall significance of Equation 3. Furthermore, the significance of the likelihood ratio statistic indicates the presence of heteroskedasticity in residuals of Equation 3. In this study, the generalized least squares (GLS) method has been used to address the issue of heteroskedasticity.

Table 5 presents findings from the fourth research hypothesis test. The Hausman test was used to select between fixed effects and random effects models, and the Limer F-test was utilized to assess model fit between fixed effects and pooling model. Using Hausman and Limer F tests as a basis, model fit using panel data with fixed effects was determined. According to the fourth hypothesis, it is expected that growth opportunities will reduce the positive impact of financial leverage on real earnings management.

Table 5. Results of the fourth research hypothesis test, $REMi,t = \beta_0 + \beta_1Levi,t + \beta_2MtBi,t + \beta_3Levi,t * MtBi,t + \beta_4Sizei,t + \beta_5Roai,t + \beta_6Iowi,t + \epsilon_{i,t}$

Variable	Coefficient	Standard error	t-statistic	p-value	VIF
Constant	2/036	0/580	3/510	0/0005	-
Lev	0/0452	0/0462	0/9789	0/3282	1/20
MtB	0/0054	0/0046	1/1926	0/2338	6/49
MtB*Lev	-0/0058	0/0057	-1/0191	0/3088	6/18
Size	-0/0964	0/0258	-3/725	0/0002	1/07
Roa	0/1903	0/1185	1/605	0/1092	1/18
Iow	0/1646	0/1085	1/517	0/1301	1/19
Fisher Statistic (Overall Model Significance)	-	-	11/016	0/0000	
Limer's F-statistics	-	-	1/794	0/0074	
Hausman statistics	-	-	30/527	0/0000	
Durbin-Watson statistic	-	-		1/739	
Adjusted R-squared	-	-		0/2014	
Likelihood Ratio statistics	-	-	204/040	0/0000	

Table 5 shows the mediating effects of growth opportunities on the relationship between financial leverage and real earnings management. These results indicate that growth opportunities do not significantly affect the positive relationship between financial leverage and real earnings management. Given the obtained significance level, the fourth hypothesis is rejected at a 5% error level. According to the values of variance inflation factor (VIF), there is no issue with multicollinearity among independent variables in Equation 4. Equation 4's overall importance is indicated by Fisher's F-statistic (11.016). Furthermore, the likelihood ratio statistic's importance suggests that there is heteroskedasticity in residuals of Equation 4. In this work, heteroskedasticity has been addressed by the application of the generalized least squares (GLS) method. One of the accounting figures that attracts the interest of many users of accounting information is accounting profit. This figure represents the outcome of a company's operating and non-operating activities, which are communicated to users through income statements. A feature of accounting profit that garners attention from users is its management. This study aims to examine the impact of financial leverage on real earnings managing and accrual-based earnings managing, considering the moderating role of growth opportunities. According to the first hypothesis test results, accrual-based earnings management is adversely affected by financial debt. Companies with high leverage experience reduced free cash flow since a significant portion of cash flow is lost as interest expenses.

Consequently, managers are forced to refrain from investing in projects that lack maximum value, adopting a cautious approach to avoid investments in non-maximal value projects, effectively controlling accruals. Additionally, companies with high leverage are likely subject to stricter controls by creditors, reducing managers' incentives for earnings management. Thus, increased leverage leads to decreased accrual-based earnings management. The second hypothesis test's findings demonstrated that financial leverage has little effect on real earnings management. This result runs counter to [12]. Higher leverage ratios should, in theory, raise the value of a company's debt and encourage managers to manipulate real results. This investigation did not discover any meaningful correlation, nevertheless. The third hypothesis test's findings showed that growth prospects exacerbate the detrimental effects of financial leverage by influencing the link between accrual-based earnings management and financial leverage. These results are consistent with [11]. The fourth hypothesis test's findings suggested that the relationship between financial leverage and actual earnings management is

unaffected by growth opportunities. This result is in opposition to the study conducted by [11]. Cloud, fog, and edge computing technologies [30] along with cybersecurity or optimization techniques [31], [32] and machine learning are important to enhance financial leverage on accrual-based and real earnings administration.

Cloud, fog, and edge computing technologies have revolutionized the way businesses operate and manage their data [30]. These technologies offer flexible, scalable, and cost-effective solutions for storing, processing, and analyzing vast amounts of data. By leveraging cloud computing, organizations can access computing resources on demand, enabling them to efficiently manage their financial data and streamline their operations. In the realm of financial leverage, these technologies play a crucial role in enhancing accrual-based and real earnings administration. Accrual-based earnings management involves manipulating accounting entries to artificially inflate or deflate reported earnings, while real earnings management involves making strategic business decisions to impact the underlying economic performance of a company. Cloud computing provides a secure and reliable platform for storing and processing financial data, allowing organizations to accurately track and report their earnings without the risk of manipulation.

Furthermore, cybersecurity and optimization techniques are essential components in safeguarding financial data and ensuring the integrity of financial reporting [31]. With the increasing frequency and sophistication of cyber threats, organizations must implement robust cybersecurity measures to protect sensitive financial information from unauthorized access or manipulation [32].

6. Conclusion and recommendations

Based on the findings of this study, the presence of debt contracts and increased external financing, or higher financial leverage, can act as a sustainable factor in limiting managers' opportunistic behaviors and reducing their adverse effects on financial reporting. Investors are advised to consider the level of financial leverage and debt contracts when evaluating companies and making investment decisions.

It is recommended that future studies look into how corporate governance practices, as a sustainable tool, affect the connection between financial leverage and earnings management. Furthermore, trade credit and conditions of information asymmetry should be taken into consideration when studying the relationship between financial leverage and earnings management.

Conflict of interest

The authors declare that they have no conflict of interest and all of the authors agree to publish this paper under academic ethics.

Author contributions

Akram Abbas Awad: Conceptualization, Methodology, Investigation, Writing - Original draft preparation.

Daruosh Foroghi: Data Curation, Formal Analysis, Visualization, Writing - Review & editing.

Alireza Rahrovi Dastjerdi: Supervision, Funding Acquisition, Writing - Review & editing.

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