

# Accrual-based and cash-based earnings management in Algeria: substitution or complementary

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## Abstract

Managers are often employed many alternatives for earnings management following their objectives or the financial reporting objectives; the commonly used are the accrual-based and cash-based earnings management. The literature reveals that managers adopt the two strategies in different ways, suggesting a mixed relationship between them. Hence, this study investigates the relationship between the two strategies of earnings management in Algeria, whether it is a substitute or complementary. The study included 30 Algerian companies during 2011-2019, so a total of 270 firm-year observations were employed. Accrual-based earnings management was measured through the modified-Jones model, while cash-based earnings management was measured through the abnormal cash flows model. According to the results, Algerian companies engage more in accrual-based earnings management and employ the two strategies as substitutes, which explains the strong and negative effect of accrual-based on cash-based earnings management. We argue that companies engage first in accrual-based earnings management, and then they shift towards cash-based earnings management due to auditors' scrutiny. Furthermore, we found a positive and a medium effect of return on equity on cash-based earnings management, which reflects the managers' desire to adjust operating cash flows consistent with the reported earnings. Finally, the results indicated that company ownership, company listing, and the nature of financial statements do not affect cash-based earnings management.

**Keywords:** Algerian companies, accounting accruals, accrual-based earnings management, cash flows from operations, cash-based earnings management, return on equity.

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## Introduction

Earnings management describes the practices used to alter the perception of financial information (Kimouche, Cherroun, 2020). It contains all managers'

accounting decisions related to the selection and application of accounting policies (accounting earnings management) and their real decisions related to the allocation of economic resources (real earnings management), including that linked to operating, financing, or investment activities (Kimouche, Charchafa, 2021). Whether managers adopt an informational or opportunistic view, they need to make accounting or real decisions consistent with those objectives; this is the substance of earnings management.

Literature shows that managers have different tendencies towards accounting and real earnings management, which leads to a disparity between companies in terms of their levels. The explanations revealed that managers widely use the two strategies to manipulate financial statements following the intended objectives (Badertscher, 2011; Shahzad, 2016; Oz, Yelkenci, 2018). However, the level of each strategy is affected by many factors, especially those that relate to the companies, and management characteristics (Shen, Chih, 2005; Alhadab, Clacher, 2018).

Another approach has been followed through exploring the relationship between the two strategies and determining if there is a trade-off between them and whether they employed as substitutes (Cohen, Zarowin, 2010; Badertscher, 2011; Zang, 2012; Braam et al., 2015, Zhu et al., 2015; Li, 2019) or complementary (Chen, Huang, Fan, 2012; Sellami, 2016; Anagnostopoulou, Tsekrekos, 2017). The purpose of that approach is to explain the behaviours of managers towards real and accounting decisions and determine the role of accounting policies as compared to operating, investment, and financing policies and the interaction between them.

Most previous studies have provided evidence from developed, and emerging countries (Cohen, Dey, Lys, 2008; Cohen, Zarowin, 2010; Badertscher, 2011; Yuan et al., 2020). However, managers' incentives in developing countries to trade-off between the two strategies could be different due to divergences in institutional characteristics, such as investor protection, supervision, and accounting practices. Companies in developing countries are often under the control of governments, facing different levels of legal environment stringency, and exposed to governmental interventions. Therefore, managers' incentives to engage in a strategy of earnings management can be affected. In addition, firm-specific factors including corporate governance, audit quality, ownership structure, and double-listing status can also affect managers' incentives towards accounting choices through affecting the relative cost of each strategy.

This study can be included in that debate by exploring the impact of accrual-based earnings management on cash-based earnings management in Algerian companies. The study starts from the conclusions of previous studies that have revealed a negative relationship between accounting and real earnings management. It carries out in Algeria as a transition economy knowing since the early of the 90s deep reforms to shift from socialism to capitalism and integrating into the international economy. These reforms have imposed accounting reforms to satisfy the needs of users in the new environment, which can change the managers' incentives towards the two strategies of earnings management and limit their accounting choices.

This paper is expected to make some contributions. Unlike most previous studies, our paper aims to explore the direct relationship between accrual-based and cash-based earnings management without any noise of other factors. In the limits of our review, we found the study of Kimouche, Charchafa (2021) in Algeria, so the carrying out of this study in a transition economy like Algeria is expected to provide new empirical evidence about the accounting choices of managers in different

economic environments. Finally, due to the different features between the two strategies, it is relevant to analyze the direct relationship between them.

The remainder of this paper is structured as follows: Section 2 contains the literature review and hypothesis development; Section 3 describes the method and materials; Section 4 presents and discusses the results; and finally, Section 5 summarizes the conclusions.

## **Literature review and hypothesis development**

### **Concepts of earnings management**

Since the middle of the 80s, studies about accounts manipulation have primarily been based on accounting earnings management that was defined by Schipper (1989) as the "purposeful intervention in the external financial reporting process with the intent to obtain some private gains". Accounting (accrual-based) earnings management is the result of Generally Accepted Accounting Principles (GAAP) through the selection of accounting policies and the estimations required to apply them. Therefore, accounting earnings management is easy to execute, but easy to discover by auditors and observed by users.

Several studies have traced a change in earnings management practices with the passage towards the Sarbanes-Oxley Act (SOX) due to the new corporate governance principles and international standardization. Therefore, real earnings management has become an alternative to accrual-based earnings management (Cohen et al., 2008; Liu, Dong, Lian, 2011) because it is difficult to discover by auditors since it appears as legal in response to the normal economic conditions of a company (Cohen et al., 2008). Healy, Wahlen (1999) stated that earnings management appears when managers use their estimates and judgments in financial statements and their economic decisions to change the structure of transactions, in order to alter financial reporting to either mislead some stakeholders about the performance of a company or to concord with contractual clauses.

Real earnings management is purposeful action to alter disclosed earnings in a particular direction by making decisions that change the timing or structure of transactions (Zang, 2012). Unlike accrual-based earnings management, real earnings management contains all actions leading to the deviation from the ordinary practices of the company. Consequently, real earnings management involves real business activities that have direct influences on cash flows. Thus the effects on earnings are driven from cash flows, not from accounting accruals (Janin, 2000), and therefore it is known also as "cash-based earnings management".

The existence of accrual-based earnings management generally relates to the adoption of accounting policies and estimates. However, cash-based earnings management relates to a wide range of operating, financing, and investment decisions (Healy, Wahlen, 1999; Graham, Harvey, Rajgopal, 2005). Investment decisions for cash-based earnings management can be limited to the sale and purchase of noncurrent assets, while the financing decisions contain the financial engineering operations, like stock options, hedges, and securitization. At the operating level, the existence of cash-based earnings management often relates to inventories sale transactions, production costs, and discretionary expenses.

### **The relationship between accrual-based and cash-based earnings management**

According to Zhu et al. (2015), the two strategies differ in terms of several aspects, so managers may prefer a strategy depending on the circumstances. Cash-based

earnings management requires the departure from ordinary business practices, so the final effect on earnings may not be controlled. On the contrary, accrual-based earnings management affects earnings directly and more immediately, since the company can still adjust the accruals after the reporting period until the date of authorization of financial statements for issue (Chang, Chen, 2018).

From a practical perspective, managers prefer accrual-based earnings management, as it is easy to execute since it does not require affecting the cash flows. However, that strategy is ineffective under an efficient market, where users are conscious, auditors and regulators are vigilant (Kabir, 2010). Managers will not be able to benefit from accrual-based earnings management when a number of efficient and perfect market conditions are held (Walker, 2013). Accordingly, managers often shift to using cash-based earnings management.

Cohen, Zarowin (2010) suggested that if companies used high levels of accrual-based earnings management in the past, they are likely to switch towards cash-based earnings management in the present and future. Banimahd, Aliabadi (2013) concluded that accrual-based earnings management creates and shapes cash-based earnings management. However, Zang (2012) and Comporek (2021) suggested that managers prefer to engage in cash-based earnings management, rather than accrual-based earnings management for two reasons. First, cash-based earnings management cannot be easily discovered by auditors and regulators, and second accounting earnings management occurs only at the end of the period, while cash-based earnings management occurs throughout the period.

There are three streams of studies regarding the relationship between accrual-based and cash-based earnings management. The first concluded that managers use the two strategies as substitutes (Cohen, Zarowin, 2010; Badertscher, 2011), and that there is no simultaneous use of them. Braam et al. (2015) suggested that cost, secrecy, and masking political favours motivate politically connected companies to engage in cash-based earnings management as a substitute for accrual-based earnings management. Zhu et al. (2015) revealed that Chinese reverse merger companies engage in both accrual-based and cash-based earnings management at higher levels, which are used as substitutes.

Another stream suggested a complementary relationship, like Anagnostopoulou, Tsekrekos (2017) who indicated a complementarity between cash-based and accrual-based earnings management for highly leveraged companies, suggesting that the use of both strategies is necessary under the heavy outsider scrutiny. Chen et al. (2012) revealed a positive association of cash-based with accrual-based earnings management supporting a complementary relationship. Sellami (2016) suggested that French companies use the two strategies as complementary tools to smooth earnings. Wafaretta, Restuningdiah (2020) proved that managers adjust accounting earnings management levels based on the results of real earnings management in the Indonesian Banks.

The third stream revealed a mixed relationship, like Ismail (2017) who indicated that accrual-based and cash-based earnings management are used simultaneously in Egypt, with no complete substitution. Li (2019) showed that the relationship between the two strategies for US companies is complementary rather than a substitute. Hamza, Kortas (2019) provided evidence that accounting earnings management can be served as a substitute for some real earnings management alternatives and in a complementary way for others at the same time. They showed a substitute relationship between accrual-based earnings management and discretionary expenditures in Tunisia, and a complementary interaction between accounting earnings management and sales manipulation.

## **The effect of investor's protection**

The explanations for the relationship between the two strategies tend to agree that accrual-based earnings management declines in countries with strong investor protection and more transparent reporting, where managers prefer to perform cash-based earnings management (Shen, Chih, 2005; Rennekamp, Rupar, Seybert, 2020). Accrual-based earnings management incurs more litigation risk than cash-based earnings management, especially after the accounting scandals around 2001 and the certification requirements imposed by the regulators with the adoption of the SOX Act. Therefore, companies have shifted from accrual-based to cash-based earnings management in the post-SOX period (Cohen et al., 2008; Järvinen, Myllymäki, 2016; Chang, Chen, 2018) as a result of managers' desire to avoid the high possibility of detecting accrual-based earnings management due to the increasing scrutiny of regulators.

## **The effect of control level**

Fang, Jin (2011) found that levels of cash-based and accrual-based earnings management are negatively associated with internal control quality. Nevertheless, Alhadab, Clacher (2018) found that high audit quality is insufficient to constrain all earnings management practices. Generally, studies have shown that enhanced audit quality is associated with a high level of cash-based earnings management because the ability to practice accrual-based earnings management is constrained (Chi, Lisic, Pevzner, 2011; Owusu et al., 2020). Garg (2018) suggested that companies rely more on cash-based earnings management when having to comply with internal control requirements, since cash-based earnings management is less susceptible to detection. In addition, cash-based earnings management is higher for companies under higher government intervention or higher corporate governance (Vakilifard, Mortazavi, 2016; Gao, Gao, Wang, 2017); whereas accrual-based earnings management is higher for companies in a less stringent legal environment.

## **The effect of earnings management costs**

The trade-off between the two strategies depends on their relative costs (Zang, 2012; Chen et al., 2015). The cost of accrual-based earnings management includes stakeholder scrutiny, audit quality, and accounting flexibility. However, the cost of cash-based earnings management contains many items, such as financial health, institutional ownership, and tax consequences (Zang, 2012). Accrual-based earnings management is more costly in the short term and limited by the accounting equilibrium presumed in financial statements (Zhu et al., 2015). On the contrary, cash-based earnings management is less subjected to scrutiny and control, but it is likely to have a higher negative impact on the company's performance in the long term (Graham et al., 2005; Järvinen, Myllymäki, 2016). Nevertheless, the effect of cash-based earnings management on future performance is not necessarily negative (Vorst, 2016). Consistent with that view, Choi et al. (2021) found that auditors, on average, charge a higher premium for cash-based earnings management than accrual-based earnings management.

## **The effect of IFRS adoption**

Ewert, Wagenhofer (2005) stated that companies resort to cash-based earnings management when accounting flexibility is reduced. He concluded that tighter accounting standards can reduce accrual-based earnings management, but they

may increase cash-based earnings management. Ipino, Parbonetti (2017) showed that IFRS adoption has led companies to substitute accrual-based earnings management with cash-based earnings management, especially in countries with strict enforcement regimes. Ferentinou, Anagnostopoulou (2016) indicated a significant shift from accounting earnings management to real earnings management by Greek companies after the IFRS adoption in 2005. Consequently, efforts to increase earnings quality might increase real earnings management.

## Hypotheses development

Algeria as a transition economy has known several reforms in different areas since the 90s to shift from socialism to capitalism and integrate into the international economy. The big workshops of reforms are the economic and institutional aspects, which they accompanied by an accounting reform to respond to the users' needs under the new environment. Since 2010, Algerian companies have adopted the Financial Accounting System (SCF), which was abstracted from the international reference providing many opportunities for managers to engage in accrual-based earnings management. Nevertheless, institutional reforms can limit those opportunities leading managers to rely on cash-based earnings management.

In the limits of our review, we found only the study of Kimouche, Charchafa (2021) in Algeria that directly relates with this study, which explored the effect of total accounting accruals on real earnings management in 20 Algerian companies from 2015 to 2019. The results indicated a negative and significant effect of total accounting accruals on real earnings management in Algerian companies. Consistent with the literature and considering those institutional and accounting reforms in Algeria, this study attempts to test the following hypothesis:

Hypothesis: the relationship between accrual-based and cash-based earnings management in Algeria is a substitute.

## Method and materials

### Data collection

This study included 270 firm-year observations related to 30 non-financial Algerian companies during the period 2011-2019. Financial companies have been excluded due to the specificities of accounting for financial operations in Algeria, where the determination of cash flows and accruals differs substantially from other industries. The only criterion used to select the companies is the accessibility to their financial statements, due to the difficulty of obtaining financial statements of Algerian companies, since the majority of them are family or public and not listed on the stock exchange. Thus, they do not have many reporting requirements. In addition, corporate governance in Algerian companies is characterized by secrecy and caution regarding the disclosure. The financial statements have been collected directly through contacting the chief financial officers of companies.

### Model

The model is a multiple linear regression that measures the effect of accrual-based earnings management on cash-based earnings management. That effect has been controlled by the return on equity, company size, company ownership, company listing, and the nature of financial statements:

$$REM_{it} = \alpha_0 + \alpha_1 AEM_{it} + \alpha_2 ROE_{it} + \alpha_3 SIZE_{it} + \alpha_4 OWN_{it} + \alpha_5 LIST_{it} + \alpha_6 NFS_{it} + \xi_{it} \quad (1)$$

where:  $REM_{it}$  is the cash-based earnings management proxy for the period;  $AEM_{it}$  is the accrual-based earnings management proxy for the period;  $ROE_{it}$  is the return on equity for the period;  $SIZE_{it}$  is the company size at the end of the period, it calculated as the logarithm of total assets divided into ten;  $OWN_{it}$  is the company ownership, it takes 1 if the company is public, otherwise 0;  $LIST_{it}$  is the company listing, it takes 1 if the company is listed in the Algiers Stock Exchange, otherwise 0;  $NFS_{it}$  is the nature of financial statements, it takes 1 if the company presents consolidated financial statements for the period, otherwise 0;  $a_0$  is the intercept;  $a_1$ ,  $a_2$ ,  $a_3$ ,  $a_4$ ,  $a_5$  and  $a_6$  are the parameters;  $\xi_{it}$  is the error term.

The return on equity captures the profitability because the tendency of managers towards a strategy of earnings management can be affected by the profitability (Purnama, Nurdiniah, 2019). The company size, company ownership, company listing, and the nature of financial statements are used as control variables to capture the control level and investor's protection, since the governance system and control mechanisms differ according to these characteristics. Big companies are more subjected to internal and external control and more stakeholders view-oriented than small companies.

Regarding company ownership, two major categories of companies can be distinguished in Algeria, public and private. Public companies are under governmental control with more stakeholders' orientations than private companies that have shareholders' orientations. The listed companies are under a high level of control by the securities committee, investors and other market interveners, and also they have more reporting requirements than the non-listed companies. Finally, the consolidated financial statements present the whole financial position and comprehensive performance of the company and thus, they are more able to meet investors' expectations than separate financial statements.

## Measurement of accrual-based earnings management

This study has relied on the discretionary accounting accruals as a proxy of accrual-based earnings management starting from the Modified-Jones model, as shown in Equation (2):

$$TAC_{it}/A_{it-1} = \beta_0 + \beta_1 (1/A_{it-1}) + \beta_2 [(\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \beta_3 (PPE_{it}/A_{it-1}) + \zeta_{it} \quad (2)$$

where:  $TAC_{it}$  is the total accounting accruals at the end of the period;  $A_{it-1}$  is the total assets at the beginning of the period;  $REV_{it}$  is the sales of the period;  $REC_{it}$  is the customers at the end of the period;  $PPE_{it}$  is the property, plant and equipment at the end of the period;  $\beta_0$  is the intercept;  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are the parameters;  $\zeta_{it}$  is the error term, which measures the unpredictable accounting accruals or discretionary accruals. The model's variables were obtained from financial statements, whereas the total accruals were calculated depending on Equation (3):

$$TAC_{it} = \Delta WCN_{it} + CP_{it} - DOT_{it} \quad (3)$$

where:  $\Delta WCN_{it}$  is the variation in working capital needs;  $CP_{it}$  is the non-cash expenses;  $DOT_{it}$  is the amortization and impairment expenses for the period.

## Measurement of cash-based earnings management

This study has based on the abnormal cash flows from operations as a proxy of real earnings management, which estimated using the model that links the sales and change in sales as predictors of cash flows from operations, and therefore,

estimating the cash-based earnings management as the standardized residuals as shown in Equation (4):

$$CFO_{it}/A_{it-1} = \gamma_0 + \gamma_1 (1/A_{it-1}) + \gamma_2 (REV_{it}/A_{it-1}) + \gamma_3 (\Delta REV_{it}/A_{it-1}) + \varepsilon_{it} \quad (4)$$

where:  $CFO_{it}$  is the net cash flows from operations for the period;  $\gamma_0$  is the intercept;  $\gamma_1$ ,  $\gamma_2$ , and  $\gamma_3$  are the parameters;  $\varepsilon_{it}$  is the error term. Cash-based earnings management represents the standardized residuals of Model (4) since they are unexpected and inexplicable through the ordinary activity of the company.

## Results and discussion

### The estimation results of earnings management models

Table 1 shows the estimation results of Model (2) used to measure accrual-based earnings management. The results indicate that the Fisher significance level is less than 1% and that the calculated F-statistic is more than the F-critical value from the Fisher table, which almost reached 3.85; hence the model is significant at 1% level. The regression coefficient of the property, plant and equipment and the intercept are also significant at 1% level, while the regression coefficient of  $(\Delta REV - \Delta REC)/A$  is not significant. The Variance Inflation Factor and Durbin-Watson suggest the validity of Model (2) in terms of multicollinearity and autocorrelation. The determination coefficient indicates that only 25.20% of the accruals are predictable (non-discretionary); the remainder of the accruals are discretionary and measure the accrual-based earnings management.

Table 1 The estimation results of accrual-based earnings management model

	Coefficient	t-statistic	VIF	F-statistic	R <sup>2</sup>	Durbin-Watson
$(\Delta REV - \Delta REC)/A$	0.110	0.988	1.000			
PPE /A	-0.166	(-5.165)**	1.037	(10.128)**	0.252	2.106
Intercept	0.040	(2.569)**				

Dependent Variable: TAC /A; VIF: Variance Inflation Factor; \*\*: Significant at 1% level

Source: Author calculation.

Table 2 The estimation results of cash-based earnings management model

	Coefficient	t-statistic	VIF	F-statistic	R <sup>2</sup>	Durbin-Watson
REV /A	-0.371	(-3.098)**	1.078			
$\Delta REV /A$	0.029	1.404	1.077	(3.807)**	0.293	1.853
Intercept	0.094	(6.863)**				

Dependent Variable: CFO /A; \*\*: Significant at 1% level

Source: Author calculation.

Table 2 shows the estimation results of Model (4) employed to measure cash-based earnings management. The results indicate that Model (4) is significant at 1% level, as the calculated F-statistic is more than the F-critical value that almost reached 3.85. The regression coefficient of sales and the intercept are also significant at 1% level, while the regression coefficient of change in sales is not significant. The model is valid in terms of multicollinearity and autocorrelation, as suggested by The Variance Inflation Factor and Durbin-Watson. The determination coefficient indicates that only 29.30% of cash flows are predictable; the remainder of cash flows are abnormal and measure the cash-based earnings management.



## Descriptive statistics

Table 3 presents the descriptive statistics for 270 observations of 30 Algerian companies during 2011-2019, showing that cash-based earnings management reached 3.44% of total assets, on average; while accrual-based earnings management reached 5.64% of total assets, on average. This means that Algerian companies tend to practice more accrual-based earnings management. According to the mean of the return on equity, the net income of Algerian companies represents 11.64% of total equity, on average. However, it is very dispersal compared to cash-based and accrual-based earnings management, respectively. The table shows that the data contain 175 observations for public companies versus 95 observations for private companies and 108 observations for listed companies against 162 observations for non-listed companies. Finally, 160 observations concern companies with separate financial statements versus 110 observations for companies with consolidated financial statements.

Table 3 The descriptive statistics of data

	REM	AEM	ROE	SIZE	OWN		LIST		NFS	
Observations	270	270	270	270	270		270		270	
Mean	-0.034	-0.056	0.116	0.755	0	1	0	1	0	1
Median	-0.016	-0.021	0.098	0.744	95	175	162	108	160	110
Std. Deviation	0.097	0.041	0.148	0.097	-	-	-	-	-	-
Minimum	-0.276	-0.299	-0.329	0.613	-	-	-	-	-	-
Maximum	0.254	0.048	0.609	0.996	-	-	-	-	-	-

Source: Author calculation.

## Correlation results

Table 4 summarizes the results of correlation between the variables of Model (1). According to the results, a strong, negative and statistically significant at 1% level relationship exists between cash-based earnings management and accrual-based earnings management. While a medium, positive and significant at 1% level relationship exists between cash-based earnings management and return on equity. The relationship between cash-based earnings management and company size is weak, negative and statistically significant at a 5% level. Contrarily, the relationships of cash-based earnings management with company ownership, company listing, and the nature of financial statements are not statistically significant. Lastly, the relationships between different independent variables are not statistically significant, except for the relationships of company listing with accrual-based earnings management and company ownership that are significant at 1% level, but they are weak, which excludes any effects of correlation between independent variables on the results of the study.

Table 4 The correlation matrix

	AEM	ROE	SIZE	OWN	LIST	NFS	VIF
REM	(-0.615)**	(0.526)**	(-0.232)*	-0.002	0.012	0.098	-
AEM		0.164	0.092	-0.100	(-0.300)**	-0.107	1.135
ROE			0.044	-0.111	-0.082	0.073	1.045
SIZE				-0.044	-0.158	-0.028	1.029
OWN					(0.295)**	-0.144	1.142
LIST						0.111	1.235
NFS						0.111	1.063

\*: Significant at 5% level; \*\*: Significant at 1% level

Source: Author calculation.

## Model estimation

Table 5 summarizes the results of model (1) when estimated using the three options of panel data. Concerning the overall significance of Model (1), Table 5 support the hypothesis of significance at 1% level under the three models since the Fisher test significance levels are less than 1% and the calculated F-statistics are more than the F-critical value from the Fisher table, which almost reached 2.36. The determination coefficients support these results, suggesting that independent variables together explain an important part of changes in cash-based earnings management. However, the explanatory power of the Fixed Effects Model is strong versus the medium explanatory power of the Random Effects Model, then Pooled Regression Model, respectively.

Regarding the partial significance of Model (1), it appears that the regression coefficients of accrual-based earnings management and return on equity are statistically significant at 1% level under the three models, as the significance levels of the Student test are less than 1%, and the calculated T-statistics are more than the T-critical value that almost reached 2.61 at the degree of freedom (df = 270) and the significance level (p = 0.01) for the two parameters. According to the three models, the values of the parameters suggest a strong negative effect of accrual-based earnings management on cash-based earnings management and a medium positive effect of return on equity on cash-based earnings management. For both variables, the parameters take similar values under the Pooled Regression and Random Effects, and they are close to those under the Fixed Effects.

Table 5 Model (1) estimation results

Independent variables		Dependent variable: REM		
		Estimation method		
		Pooled Regression Model	Fixed Effects Model	Random Effects Model
AEM	Coefficient	-0.939	-0.927	-0.936
	t-statistic	(-5.697)**	(-5.591)**	(-5.827)**
ROE	Coefficient	0.388	0.432	0.395
	t-statistic	(8.351)**	(8.356)**	(8.583)**
SIZE	Coefficient	-0.133	-0.159	-0.134
	t-statistic	(-2.015)*	(-2.027)*	(-2.031)*
OWN	Coefficient	0.010	0.015	0.011
	t-statistic	0.676	0.884	0.706
LIST	Coefficient	-0.021	-0.012	-0.019
	t-statistic	-1.354	-0.738	-1.273
NFS	Coefficient	0.005	0.012	0.005
	t-statistic	0.340	0.747	0.389
Intercept	Coefficient	0.036	0.042	0.035
	t-statistic	0.647	0.698	0.642
R <sup>2</sup>		0.437	0.607	0.471
F-statistic		(15.898)**	(4.584)**	(16.156)**
Durbin-Watson		2.169	2.092	2.155
Periods included		9	9	9
Cross-sections included		30	30	30
Observations		270	270	270

\*: Significant at 5% level; \*\*: Significant at 1% level

Source: Author calculation.

The regression coefficient related to company size was statistically significant at 5% under the three models, but the values of the parameter indicate a negative and

weak effect of company size on cash-based earnings management. The regression coefficients of the company ownership, company listing and the nature of financial statements are not significant since the significance levels of the Student test is very high, also the calculated T-statistics are less than the T-critical value that almost reached 2.61 at the degree of freedom (df = 270) and the significance level (p = 0.01). Thereby, the last three variables do not have any effect on cash-based earnings management. Finally, the intercept is not statistically significant under the three estimated models.

## Model selection

Table 6 summarizes the results of the restricted F-test used to select the valid model between Pooled Regression and Fixed Effects. The results show that the calculated F-value (F') is more than the F-critical value. Therefore, the Fixed Effects Model is more valid to estimate Model (1) than the Pooled Regression Model.

Table 6 The restricted F-test results

N	T	K	R <sup>2</sup> <sub>FEM</sub>	R <sup>2</sup> <sub>PM</sub>	F'	F-critical value
30	9	7	0.607	0.437	3.475	2.100

$$F' = \frac{(R^2_{FEM} - R^2_{PM}) / (N - 1)}{(1 - R^2_{FEM}) / (N \times T - N - K)}$$

where: N is the number of cross-sections; T is the number of periods; K is the number of estimated parameters including the intercept; R<sup>2</sup><sub>FEM</sub> is the determination coefficient from the Fixed Effects Model; R<sup>2</sup><sub>PM</sub> is the determination coefficient from the Pooled Regression Model; F' is the F-calculated value; F-critical value: is the F from F-distribution table at degrees of freedom (N - 1) and (NT - N - K); Null: Pooled Regression Model is valid.

Source: Author calculation.

Table 7 the Hausman test results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	8.038	6	0.235

Null: Random Effects Model is valid.

Source: Author calculation.

Table 7 presents the results of the Hausman test used to select the valid model between Fixed Effects and Random Effects. According to the results, the Hausman test is not significant, so the Random Effects Model is more valid to estimate Model (1) than the Fixed Effects Model.

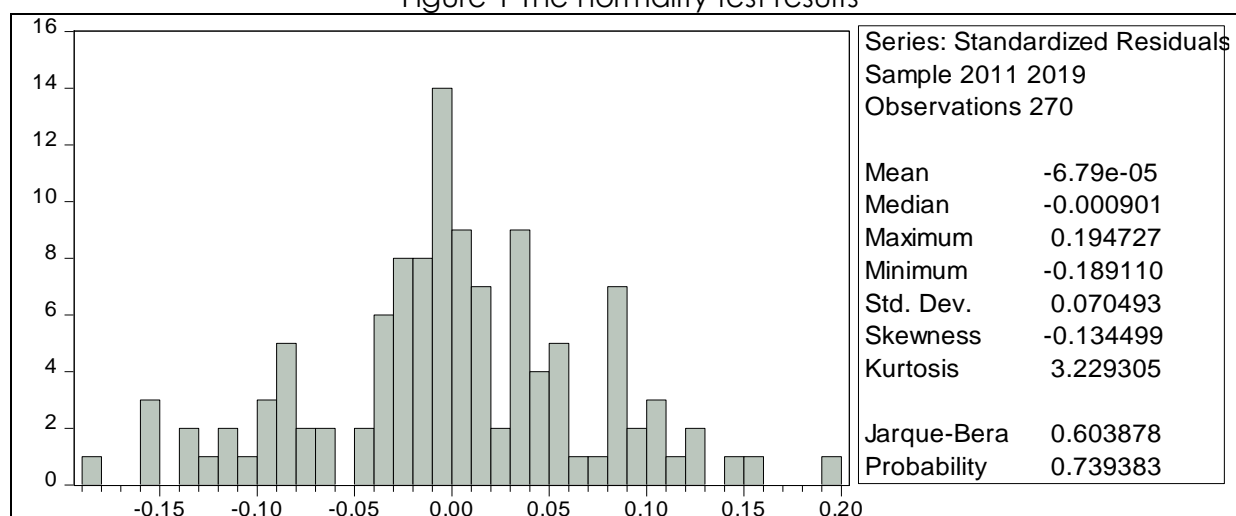
## Model validation

Figure 1 presents the results of the normality test for the standardized residuals obtained from the estimation of Model (1). The results indicate that the significance level of the Jarque-Bera statistic is more than 5%, so it is not statistically significant. Consequently, the standardized residuals are normally distributed.

Table 8 shows the results of the homoscedasticity test for the standardized residuals of Model (1). The results indicate that the significance levels of Breusch-Pagan and Koenker are more than 5%; hence the two tests are not statistically significant, which means that the standardized residuals are homoskedastic.

From Table 2, it appears that the Variance Inflation Factors (VIF) are very weak and they did not exceed 1.3; thus there is no sign of multicollinearity between independent variables that can affect their associations with the dependent variable, which confirm the values of the correlation.

Figure 1 The normality test results



Source: Author calculation.

Table 8 Homoskedasticity test results

	Lagrange multiplier (LM)	Prob.
Breusch-Pagan	5.286	0.259
Koenker	4.297	0.367

Source: Author calculation.

From Table 5, it seems that the Durbin-Watson statistic under the Random Effects Model reached 2.155, and it is situated between 2 and 2.265 ( $2.265 \approx 4 - dU$ ), knowing that  $dU$  is the upper critical value from the Durbin-Watson table at degrees of freedom  $k' = 6$  and  $n = 270$  and significance level 1%. For that reason, the standardized residuals obtained from the estimation of Model (1) are not auto-correlated. These results indicate that the Random Effects Model meets the OLS's criteria; hence it is valid for hypothesis testing.

## Discussion

According to the Random Effects Model, accrual-based earnings management and other independent variables together explain 47.10% of changes in cash-based earnings management. Most of the explanatory power of the model can be assigned to the accrual-based earnings management, then the return on equity and company size, respectively, as the findings indicate a strong negative effect of the accrual-based earnings management, a medium positive effect of the return on equity and a weak negative effect of the company size on cash-based earnings management.

This study provides empirical evidence that the relationship between the two known strategies of earnings management is negative starting from accrual-based earnings management towards cash-based earnings management. That relationship tends to be interchangeable, when accrual-based earnings management levels decrease, cash-based earnings management increases, and vice versa. Furthermore, managers of Algerian companies use firstly accrual-based earnings management because it is easy to execute, and then they shift towards cash-based earnings management to avoid the increase of the auditor's scrutiny and thus, avoid the increase of accrual-based earnings management cost.

The medium positive effect of return on equity on cash-based earnings management can be explained by the managers' need to adjust cash flows from

operations to reconcile with the level of earnings. However, the negative effect of the company size on cash-based earnings management means that the big companies are less practice of cash-based earnings management than small companies due to the high level of control in the big companies and the rigorous requirements of disclosures and transparency to protect investors and maintaining the interests of other stakeholders.

The results are consistent with previous studies that found a substitution relationship between accrual-based and cash-based earnings management (Cohen, Zarowin, 2010; Badertscher, 2011; Braam et al., 2015; Zhu et al., 2015; Li, 2019; Ipino, Parbonetti, 2017). However, they differ from other studies that revealed a simultaneous use of two strategies and a complementary relationship between them (Chen et al., 2012; Sellami, 2016; Anagnostopoulou, Tsekrekos, 2017; Wafaretta, Restuningdiah, 2020). The results differ also from the previous studies that suggested a mixed relationship between the two strategies (Ismail, 2017; Li, 2019; Hamza, Kortas, 2019) arguing that accrual-based earnings management is used simultaneously with some practices of cash-based earnings management and interchangeably with others. Finally, the findings confirm our hypothesis that the relationship between accrual-based and cash-based earnings management in Algeria is a substitute. Concerning control variables, it appears that the highly profitable companies and smaller companies have higher levels of cash-based earnings management.

## Conclusion

Accrual-based and cash-based earnings management are two strategies of earnings management that are often used to manipulate financial statements by managers in response to their opportunistic objectives or informational objectives of financial reporting. Due to the differences between the two strategies, many previous studies have asked the question of how managers use the two strategies, and the nature of the relationship between them. The current study is a part of this trend by exploring whether accrual-based and cash-based earnings management are substitutes or complementary in Algerian companies.

The study included 270 observations for 30 Algerian companies selected based on the accessibility to their financial statements during 2011-2019. Accrual-based earnings management was measured by discretionary accruals, which have been estimated depending on the modified-Jones model. However, cash-based earnings management was measured through abnormal cash flows from operations. Additionally, the return on equity, company size, company ownership, company listing, and the nature of financial statements have been used as control variables in a linear regression model to test the relationship between the two strategies.

The results showed that managers of Algerian companies engage in the two strategies, while they tend to engage more in the accrual-based strategy. Regarding the relationship between the two strategies, the results indicated a very strong negative effect of accrual-based earnings management on cash-based earnings management. Concerning the control variables, the results indicated a medium and positive effect of return on equity on cash-based earnings management and a negative and weak effect of company size on cash-based earnings management. Contrarily, the results indicated that company ownership, company listing, and the nature of financial statements do not affect cash-based earnings management.

Considering these results, we argued that the relationship between the two strategies of earnings management in Algerian companies is interchangeable, the managers use accrual-based earnings management firstly, and then they shift towards cash-based earnings management to avoid the increase of accrual-based

earnings management cost due to the increase of the scrutiny of regulators and auditors. In addition, accrual-based earnings management is ineffective against some opportunistic objectives of managers, especially tax evasion, which cannot be achieved through accrual-based earnings management since it requires manipulating the cash flows.

The medium positive effect of return on equity on cash-based earnings management can be explained by the managers' need to adjust the cash flows from operations to reconcile with the level of reported earnings. While the negative effect of company size on cash-based earnings management might be due to the high level of control and the governance requirements in the big companies compared to smaller companies.

This study contributes in the literature by providing additional empirical evidence about the relationship between accrual-based and cash-based earnings management in a developing environment compared to the studies in developed or emerging environments, where the economic and institutional characteristics, accounting practices, and governance systems are very different. This study is very important for the accounting literature in Algeria as it is the only to date that explored that subject, so it is expected to be useful for auditors, users of financial statements, standards setters, managers, and researchers in Algeria.

The findings of this study have many empirical implications for different parties; auditors are invited to be more cautious when certifying financial statements and give more attention to the relationship between accrual-based earnings management and cash-based earnings management to understand the interaction between them and how managers combine the two strategies to achieve the intended objectives. The auditors must not focus only on verifying the regularity and reliability of financial statements; they must also evaluate the integrity and effectiveness of the internal control system.

As cash-based earnings management does not focus on accounting policies and estimates as is the case for accrual-based earnings management, the audit process should not be limited in the accounting documents; it must extend to include the administrative documents and the practices and working procedures, especially for the cash transactions. Auditors must extensively use internal confirmations and physical inventory to make sure the cash balances. They also must intensify external confirmations with customers, suppliers and banks to make certain of the cash inflows and outflows.

Users of financial statements must use carefully accounting information taking into account different manipulations by managers to alter the form and content of financial statements. Users should use earnings and cash flows together when making decisions based on financial statements to avoid any distortion in one of them. They should also consult financial analysts to discover if financial information is being manipulated and find other sources to reach private information. For their part, managers should take into account that earnings management practices can affect negatively the company value in the long term; hence the continuity of the company requires leaving those practices.

These results require regulators to strengthen the control procedures, encourage the commitment to transparency and compliance with laws, and support the governance systems, especially in small companies, to protect different stakeholders. On the other hand, future studies must explore the relationship between accrual-based and cash-based earnings management, employing other measures and taking into consideration the other techniques of earnings management through extending the number of observations and using other explanatory variables. Future

studies should also explore the available solutions that can limit the opportunistic behaviours of managers.

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