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Full Length Research Paper

The impact of leverage on earnings management and the trade-off between discretionary accruals and real earnings management

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This research studies the impact of leverage on the earnings management levels of firms and investigates the role it plays in determining the choice of earnings management methods utilized by managers. This study is conducted within the context of European countries. Multiple panel regressions are run with leverage against various measures of earnings management. The results indicate that leverage curtails earnings management but this is only limited to discretionary accruals. Firms make a switch to real earnings management in cases of high leverage. The results indicate a positive impact of leverage on total earnings management and leverage moderates the choice between the two forms of earnings management. In the face of high leverage, managers make more use of real earnings management. This study broadens the scope of literature on leverage and earnings management by being the first study to investigate the impact of leverage on the total earnings management of firms and how leverage moderates the choice between the two forms of earnings management.

Key words: Earnings management, leverage, discretionary accruals, real earnings management, trade-off.

INTRODUCTION

The earnings reported by the managers of companies have always been of great importance to stakeholders. However, over the years major scandals that have led companies to bankruptcy have reduced the level of confidence stakeholders have in the quality of reported financial information (García-Meca and Sánchez-Ballesta, 2019). These scandals highlighted the need for quality financial information and effective control mechanisms in financial reporting to secure the trust that should exist between managers and stakeholders of

companies (Dilger and Graschitz, 2015). This research assesses the quality of financial reporting from the perspective of earnings management through real activities and discretionary accruals. Managers have the motivation to take opportunistic advantage of the level of discretion available to them to massage earnings or to draw a wrong picture of the organization's future and this is what is known as earnings management (Christie and Zimmerman, 1994). The occurrence of this act is further corroborated by Aini et al. (2006) where evidence is

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found that managers have incentives to manipulate financial statements to paint a financial image that aligns with their interests. This reduces the quality of financial statements being published. Besides the usage of discretionary accruals where managers make use of accounting methods to manipulate earnings, Graham et al. (2005) explain that firms make use of actual financial and production decisions to yield preferred results. They detail that about 80% of their survey respondents stated that they make certain economic decisions such as minimizing certain expenses to meet their companies' profit objectives. This is what Roychowdhury (2006) describes as 'real activity manipulation' which is popularly termed as real earnings management (REM). In the view of Roychowdhury (2006), even though this style of managing earnings is detrimental to the growth of the firm in its entirety, managers are motivated to adopt this tactic because it is more difficult to trace.

One notable incentive for earnings management prevalent in the literature is the need to avoid the violation of debt covenants (Healy and Wahlen, 1999). The association between the manipulation of financial information and lending contracts as established by various scholars makes it necessary to investigate the sort of relationship that may exist between earnings management and the leverage of companies. Various researchers who have worked on this link have observed contradictory results. Some studies that have found a positive relationship between leverage and earnings management have supported their argument by explaining that firms increase their levels of earnings management to put companies in better positions to obtain debt financing and also to avoid the violation of debt terms and conditions thereafter (Chamberlain et al., 2014; Iatridis and Kadorinis, 2009; Rodríguez-Pérez and Van Hemmen, 2010; Lazzem and Jilani, 2018). Conversely, another theory suggests that financial institutions and creditors serve as an external monitoring mechanism in a bid to protect their interests. Studies that have made this conclusion observed negative associations between leverage and earnings management (Alsharairi and Salama, 2012; Kutha and Susan, 2021 Rodríguez-Pérez and van Hemmen, 2010; Vakilifard and Mortazavi, 2016; Zamri et al., 2013).

Other spectrums of literature concerning earnings management also establish the existence of schemes where there is a trade-off between accruals earnings management (AEM) and real earnings management (REM). These studies suggest that firms sometimes alternate between AEM and REM depending on the specific circumstance the firms find themselves in (Cohen et al., 2008; Zang, 2012). In this light, Ewert and Wagenhofer (2005) document how managers prefer the use of REM in the event of regulators being stricter on accounting standards. This is a critical position for companies to be in because REM does not only affect the financial books but poses a real-time danger to the

existence of the firms. This is because most company managers are ready to misuse resources and forego viable projects to meet certain aims that may not be in the best interest of stakeholders (Graham et al., 2005).

In this research, the aim is to establish what sort of relationship exists between the leverage of firms and their levels of earnings management. This is done by first observing the impact of leverage separately on the two forms of earnings management and then observes this impact on the overall level of earnings management. The study also tries to observe the nature of trade-offs between AEM and REM. This research contributes to the existing literature by building on the established frameworks to explore how leverage impacts total earnings management and how it influences the choice of earnings management between AEM and REM. Some studies have just discussed the impact of leverage on AEM or REM but this research goes a step further to analyze and understand what role leverage plays when companies alternate between the two methods of earnings management. The study is also conducted on a European sample where there is the mandatory adoption of the IFRS which is a principle-based accounting system as compared to the other prominent studies conducted in the US where there is the use of the US GAAP which is a law-based accounting system. The results acquired from this analysis serve as a guide for creditors and debt holders who rely on the quality of financial information. It will generate a sense of cautiousness about the ability of managers to manipulate earnings given specific circumstances.

LITERATURE REVIEW

Earnings management and leverage

Earnings management has been documented to be an inevitable part of companies. From a practical point of view, several executives who participated in a survey conducted by Graham et al. (2005) admit that earnings management activities are present in every company. In circumstances where these activities are pervasive, Leuz et al. (2003) state that it limits the ability of primary external stakeholders to effectively oversee the company. Previous studies have documented that firms perpetuate two forms of earnings management. They either decide to focus on AEM and/or REM. In the case of AEM, managers use the judgment accorded them to find loopholes within the accounting system and tweak accounting policies and estimates to align with their goals (Christie and Zimmerman, 1994). On the other hand, real earnings management entails firms deviating from their usual operations and affecting real-time cash flows to lure interested parties into thinking that financial objectives have been accomplished (Roychowdhury, 2006).

According to the free cash flow theory by Jensen

(1986), leverage plays the role of a control mechanism by imposing limitations on managers' access to cash flows and also regulating the discretionary accruals of the firm. This is what is known as the Jensen control hypothesis. By so doing, leverage alleviates the occurrences of agency conflicts between managers and shareholders. Despite leverage having the ability to reduce agency problems and information asymmetry, it also poses a problem of diverging interest between shareholders and debt holders (Lazzem and Jilani, 2018). In the light of this conflict of interest, debt holders initially negotiate their debt contract to include conditions that stipulate profitability thresholds of the companies. When companies fall below these thresholds, debt holders have the right to renegotiate the terms of the original contract to include terms that are less favourable to the companies. Indeed, accounting figures and results form the basis of these terms and conditions and firms will be penalized in the event of breaching any of them. The cost of breaching these covenants may be too hefty for the organization. From this perspective, managers have a major incentive to manage earnings. This perspective is contrary to the control hypothesis as leverage is rather providing incentives for managers to manipulate earnings.

Many studies have concluded on a mix of results that define the relationship between leverage and earnings management. Studies that have discovered a negative relationship between the two concepts have used the control hypothesis as the reason for their result. In the study of Ahn and Choi (2009) where they observed the role of banks in monitoring the corporate governance practices of their clients, it was concluded that the earnings management of firms' decreases as the strength of the bank monitoring increases. This conclusion was attained after observing that the reputation of the bank giving out the loan as an 'institutional investor' of a sort plus the magnitude of the loan are sufficient factors to limit the earnings management activity of a firm.

Alsharairi and Salama (2012) found a negative association between earnings management and leverage. In their case of studying non-cash mergers and acquisitions, only the low-level leverage group of non-cash acquirers showed significant signs of earnings management. They are of the view that debtors play a vital monitoring role in firms which further increases the credibility of financial reporting and limit the use of management discretion to manipulate accounting figures before business projects like mergers and acquisitions. Zamri et al. (2013) provide evidence to support the view that leverage reduces REM. By following Roychowdhury's (2006) approach to estimating REM, they arrive at results that suggest that leverage limits the occurrence of REM and improves the quality of financial reporting. Contrary to the negative relationship between leverage and earnings management established by the mentioned studies, some other studies have found a

positive association. Iatridis and Kadorinis (2009) study the motivating factors that encourage UK listed firms to engage in earnings management and conclude that leverage has a positive impact on earnings management. This result was attained through an analysis of the earnings management inclination of firms that try to match or beat the forecasts made by financial analysts and the results attained indicate that firms that are highly leveraged are more likely to engage in earnings management. A similar result is obtained by Lazzem and Jilani (2018) who studied the impact of leverage on accruals based earnings management within the context of French listed companies. Their results are consistent with the debt covenant hypothesis with leverage having a positive impact on earnings management. This result is also consistent with that of Khanh and Thu (2019) and Obeidat (2016). Tulcanaza-Prieto et al. (2020) also attained a positive association between leverage and REM in the context of Korean firms. In their study, they divided firms into classes of "suspicious" and "non-suspicious" firms. Firms that had a scaled net income of 0.005 or below were considered suspicious and otherwise, non-suspicious. They found a positive and significant impact of leverage on REM among suspicious firms and an insignificant result for non-suspicious firms.

Another interesting study on the subject was done by Rodríguez-Pérez and Van Hemmen (2010) where they studied the impact of debt on earnings management within the context of more and less diversified firms. They postulate that diversity increases the complexity of a firm and this leads to firms becoming less transparent. Their results show that in less diversified firms which are more transparent, debt reduces earnings management and in more diversified firms that are less transparent, debt has a positive impact on earnings management. For them, an increase in debt provides an incentive to manage earnings and diversification provides the needed context to achieve it.

The trade-off between AEM and REM

Studies have provided evidence that firms make strategic decisions between the two methods of earnings management. One prominent work in this field is by Cohen et al. (2008) where they analysed both AEM and REM before and after the passage of the Sarbanes Oxley Act (SOX). Their study observed the increasing nature of AEM before the SOX and its decrease after the SOX was passed as opposed to the decreasing nature of REM before the SOX and its increase after the SOX had been passed. Their study suggests that firms can choose which model of earnings management to enforce to suit their need. In circumstances where one form of earnings management become too costly to perform, managers engage more in the other form. In the study of Elkalla (2020), the findings buttress this point and indicate that

managers make use of these two methods of earnings management to complement each other. In studying the case of reverse mergers in the context of Chinese and non-Chinese firms Zhu et al. (2015) also provide results that support the idea that managers use the two forms of earnings management as substitutes. It is unclear as to whether highly leveraged firms are likely to switch from AEM to REM or vice versa. Company executives in the US have admitted that they would prefer the usage of REM over the usage of AEM to achieve desired earnings (Graham et al., 2005). This idea is confirmed by the results obtained by Anagnostopoulou and Tsekrekos (2017) and Gao et al. (2017). This is rather a more grievous choice since REM actually affects business activities and would decrease the future financial performance of the firm or even threaten its going concern (Cohen and Zarowin, 2010). Due to the mixed result already discussed where leverage has the capacity of both limiting and encouraging both AEM and REM, it is necessary to investigate the trade-off between the two methods of earnings management. This investigation is currently lacking in the literature.

HYPOTHESES DEVELOPMENT

Despite the mixed theories of how leverage impacts earnings management, it is expedient to assume the validity of one of the theories to serve as the base for the multivariate analyses. Several studies are in favour of the debt covenant violation hypothesis. Stemming from the fact that accounting figures are used as the basis for most parts of debt covenants, managers are motivated to manipulate these figures to avoid the cost of violation. Given this:

H1: Leverage has a positive impact on AEM.

A similar case can be argued for REM. As documented by Ewert and Wagenhofer (2005), even though REM has more damaging impacts on the firm, managers do prefer the usage of REM to achieve earnings goals because they are relatively more difficult to trace. Given that this mode of earnings management is more elusive to regulators and auditors, it will be logical to expect that most managers will make use of it to avoid the violation of debt covenants. Given this:

H2: Leverage has a positive impact on REM.

A major gap in this stream of literature is ascertaining the impact of leverage on the overall earnings management of a company. The few studies that have analysed both forms of earnings management only did so independently and not jointly. By still leaning on the debt covenant violation theory we test the effect leverage has jointly on AEM and REM. Given that firms will use any means of earnings management to avoid the violation of debt

covenants, we expect a positive relationship between leverage and the overall earnings management of a firm. Given this:

H3: Leverage has a positive impact on the overall earnings management of firms.

Instead of just increasing or decreasing AEM and REM, leverage may also shape their trade-off. Cohen et al. (2008) document that manager's use AEM and REM as substitutes but there is no clear evidence of which form of earnings management firms use within the context of leverage. However, Graham et al. (2005) do confirm that managers generally prefer to use REM. Given this:

H4: Highly leveraged firms are more likely to engage in REM than in AEM.

SAMPLE AND METHODOLOGY

Sample

This work focuses on European listed firms. The sample is made up of firms from 8 European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, and the United Kingdom*). Table 1 shows the country distribution where it can be noted that the highest representation is from the UK making up 38.85% of the sample. Spain on the other hand has the lowest representation, making up 3.28% of the sample. Firms from 17 sectors using the FactSet Level 1 Sector Code as a base of classification and for a period from 2009 to 2016 are studied. The sector distribution is reported in Table 2. The producer manufacturing sector has the highest representation making up 13.72% of the sample while the health service sector has the lowest representation, making up 1.16% of the sample. After eliminating firms in the finance and utility sectors because of the specific regulations that govern these sectors and firms with missing data there is a total of 9045 firm-year observations. All estimates and actual firm data collected for this research are sourced from the FactSet Database with all monetary values quoted in US dollars.

Variable measurement

Accruals earnings management (AEM)

Total accruals are split into two: discretionary accruals which are influenced by the discretion of managers and non-discretionary accruals, which arise as a result of the nature of the company (Mangala and Isha, 2017). AEM estimation generally focuses on discretionary accrual. To estimate AEM as a proxy for earnings management, the study makes use of a version of the performance matched discretionary accruals developed by Kothari et al. (2005). The model is defined as:

$$\frac{TAC_{it}}{A_{it-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{it-1}} + \alpha_2 \frac{\Delta REV_{it} - \Delta AR_{it}}{A_{it-1}} + \alpha_3 \frac{PPE_{it}}{A_{it-1}} + \alpha_4 ROA_{it} + \varepsilon_{it} \quad (1)$$

Where TAC is the total accruals $TAC_{it} = \frac{NIB_{it} - OCF_{it}}{A_{it-1}}$ where NIB_{it} is net income before extraordinary items for firm i in the year t , OCF_{it} is operating cash flow for firm i in the year t . (Hribar and Collins, 2002)), ΔREV is a change in revenue from time $t-1$ to t , ΔAR is the is a change in account receivable from time $t-1$ to t , PPE is the gross property plant and equipment, A is the total assets, ε is

Table 1. Country and Sector Distribution.

Country	Count	Percentage
Belgium	335	3.70
France	1,682	18.60
Germany	1,747	19.31
Italy	680	7.52
Netherlands	299	3.31
Spain	297	3.28
Sweden	943	10.43
United Kingdom	3,062	33.85
Total	9045	100.00

Table 2. Sector distribution.

Fact set level 1 sector	Count	Percentage
Commercial Services	472	5.22
Communications	223	2.47
Consumer Durables	488	5.40
Consumer Non-Durables	675	7.46
Consumer Services	600	6.63
Distribution Services	337	3.73
Electronic Technology	924	10.22
Energy Minerals	226	2.50
Health Services	105	1.16
Health Technology	705	7.79
Industrial Services	477	5.27
Non-Energy Minerals	492	5.44
Process Industries	657	7.26
Producer Manufacturing	1,241	13.72
Retail Trade	497	5.49
Technology Services	606	6.70
Transportation	320	3.54
Total	9045	100.00

the residual, and the subscripts i and t denote firm and year respectively. The residual (ε) represents discretionary accruals (DAC) for firm i in year t . The estimation is conducted with a cross-sectional regression by industry and by year to partially control for industry and year specificities that affect the economic condition and total accruals.

Real earnings management (REM)

REM is estimated per Roychowdhury (2006). The study measures total REM by using an aggregate model that combines different proxies of REM. The proxies of REM as postulated by Roychowdhury are the abnormal cash flow from operations (Abn_CFO), the abnormal discretionary expenditure (Abn_DisExp) and the abnormal production cost (Abn_Prod). The author argues that firms may try to augment sales figures upwards by providing more sales discounts and more lenient credit terms. This would increase sales but will have an adverse effect on the cash flow from

operations. This abnormal cash flow from operations is estimated in Equation 2. Also, the reduction of discretionary expenses is another way through which firms boost their earnings. Research and Development costs (R&D), selling, general and administrative expenses (SGA) and advertising expenses (ADVT) are reduced in an attempt to increase earnings. The estimation of the abnormal discretionary expense is defined in Equation 3. Finally, companies also take advantage of the principle of economies of scale to manage earnings through overproduction. The fixed costs per unit are reduced through this means and earnings increased. The abnormal production is estimated in Equation 4.

$$\frac{CFO_{it}}{A_{it-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{it-1}} + \alpha_2 \frac{SALES_{it}}{A_{it-1}} + \alpha_3 \frac{\Delta SALES_{it}}{A_{it-1}} + \varepsilon_{it} \quad (2)$$

$$\frac{DISEXP_{it}}{A_{it-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{it-1}} + \alpha_2 \frac{SALES_{it-1}}{A_{it-1}} + \varepsilon_{it} \quad (3)$$

Table 3. Variable definition.

Variable	Definition
$ DAC $	Absolute value of discretionary accruals
Abn_CFO	Abnormal cash flow from operations
Abn_PROD	Abnormal cost of production
Abn_DisExp	Abnormal discretionary expense
Ag_REM	Total Real earnings management
EM_ALL	Total earnings management
REM_vs_AEM	Use of REM in proportion to AEM
LEV	Leverage
LA	Log of total assets
INT	Interest expense
$LOSS_D$	Loss dummy variable coded as 1 if firm makes a loss and 0 if firm makes a profit
$ANALYST$	The number of financial analysts following a firm
$Big4$	Audit quality coded as 1 if firm is audited by Big4 and 0 if otherwise.

BIG4 audit firms are KPMG, PWC, EY and DELOITTE.

$$\frac{PROD_{it}}{A_{it-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{it-1}} + \alpha_2 \frac{SALES_{it}}{A_{it-1}} + \alpha_3 \frac{\Delta SALES_{it}}{A_{it-1}} + \alpha_4 \frac{\Delta SALES_{it-1}}{A_{it-1}} + \varepsilon_{it} \quad (4)$$

Where i and t represent firm and year respectively, CFO = cash flow from operations, DISEXP = discretionary expense which is estimated by summing R&D, SGA and ADVT, PROD = production cost estimated by summing the cost of goods sold and the change in inventory, A = total assets, SALES = total sales, Δ SALES = the change in total sales, ε = the residuals, which is the estimation of Abn_CFO , Abn_DisExp and Abn_Prod .

These proxies of REM are then aggregated into one proxy representing the total REM engaged in by firms. To generate total REM (Ag_REM) the methods of Bozzolan et al. (2015) and Zang (2012) are followed. Ag_REM is estimated by summing abnormal production costs and the inverse of abnormal discretionary expenses which is defined as follows

$$Ag_REM_{it} = Abn_PROD_{it} + (-1 * Abn_DisExp_{it}) \quad (5)$$

The greater the value the more total REM has been employed by firms. The abnormal cash flow from operations is excluded from the aggregate REM because of some insignificant results obtained in further tests (more details of this in the empirical analyses section).

Total earnings management and the trade-off between AEM and REM

To analyse the impact of leverage on total earnings management and the role it plays in shaping the trade-off between AEM and REM, the metrics developed by Bozzolan et al. (2015) are used. To estimate these metrics, all values of AEM and REM are classified into deciles. The metrics are defined as:

$$EM_{ALL} = DECILE DAC + DECILE Abn_Ag_REM \quad (6)$$

$$REM_vs_AEM = \frac{DECILE Abn_Ag_REM}{DECILE DAC + DECILE Abn_Ag_REM} \quad (7)$$

EM_{ALL} is a measurement of total earnings management activity engaged in by a firm whether it is AEM or REM. On the other hand,

REM_vs_AEM estimates the firm's usage of REM in proportion to the total earnings management engaged in by the firm. To interpret this, the greater the value of REM_vs_AEM the greater use of REM in proportion to AEM.

Leverage

Leverage is calculated using total debts scaled by total assets. The formula is defined as:

$$LEV_{it} = \frac{DEBT_{it}}{ASSET_{it}} \quad (8)$$

Control variables

Firm size is controlled using the log of total assets. There are conflicting theories to explain the impact firm size has on earnings management. Large firms have big reputations to protect so are willing to put in place strategies to avoid losses that will negatively affect stock prices (Bozzolan et al., 2015). However, other studies have observed a negative relationship between firm size and earnings management because small firms do not draw much attention to themselves and are free to manage earnings (Balsam et al., 2003). Also as a control variable is the interest expense. Jelinek (2007) argues that high interest payments would lead to low net income and to compensate for this, firms may actively manage earnings upwards and therefore a positive relationship between interest expense and earnings management is expected. The interest expense is scaled by the lagged total assets. To control for performance, a loss dummy is included because firms that incur losses have been found to manage earnings more (Francis et al., 2004). Financial analysts limit earnings management in firms because they act as external monitors (Aubert and Grudnitski, 2012; Dyck et al., 2010; Yu, 2008). Finally, the study includes audit quality using the $Big4$ dummy variable. While Alhadab and Clacher (2018) and Alzoubi (2018) argue that audit quality can restrain the activities of earnings management, Piot and Janin (2007) argue that audit quality makes no difference in levels of earnings management (Table 3).

Multivariate model

To test the various hypotheses of this, leverage as the independent variable is regressed against the varying measures of

$$|DAC|_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (9)$$

$$Ag_REM_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (10)$$

$$EM_ALL_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (11)$$

$$REM_vs_AEM_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (12)$$

The regressions are panel regressions with industry, year and country fixed effects with VCE industry clusters. The VCE industry clusters cater for the issues of heteroskedasticity and autocorrelation issues observed from untabulated tests. The absolute value of *DAC* is used because with discretionary accruals it is more relevant to focus on the magnitude of earnings management and not the direction.

RESULTS AND DISCUSSION

Descriptive statistics and correlation matrix

As shown in Table 4, the mean values of both discretionary accruals and real earnings management are close to zero, which is an indication of good model estimations. The estimations of *EM_ALL* and *REM_vs_AEM* do not share this characteristic because of the nature of the metrics used (deciles). The mean leverage of firms in the sample is 21.179 and that of the natural log of total assets is 6.460. It is also interesting to note that 21.7% of the samples are loss-making firms. Firms in the sample are averagely followed by 5.735 financial analysts and 78.4% of firms are audited by the Big4. This indicates the fairly large size of firms in the sample. Table 5 shows the correlation that exists between the variables in the analyses. The highest correlation coefficient estimated is 0.674 indicating that multicollinearity will not be a problem in the model. This is supported by the fact that the highest Variance Inflation Factor (VIF) estimated is 2.27.

Multivariate analyses

Results for the various main multivariate models are reported in Table 6. H1 is tested in the first multivariate model as defined by Equation 9 where the absolute value of discretionary accruals ($|DAC|$) is used as the dependent variable and results are reported in Column A of Table 6. The negative and significant leverage coefficient (significant at $p<0.1$) attained signifies that firms with high levels of leverage are less likely to engage in AEM. This is not consistent with H1 which states that leverage has a positive impact on AEM. The result goes contrary to the claim that firms with high leverage manage earnings for the fear of debt covenant violations. This is consistent with the results of Lazzem and Jilani

earnings management estimated as the dependent variable. The models are defined as:

(2018). Based on the results obtained for Equation 9 where the H1 of the study is rejected, there is an indication that the control hypothesis is effective to the extent of AEM. This may be as a result of the ease with which activities of AEM are noted as stated by Graham et al. (2005). Managers will have to find more elusive ways to manage earnings without leaving obvious trails. Even though this result is inconsistent with H1, it does not conclusively rule out the validity of debt covenant violation theory that states that managers engage in earnings management to avoid the violation of debt covenants. This is because of the other methods of managing earnings and this is investigated by H2.

H2 is tested in the second model which is defined by Equation 10 and results are reported in Column B of Table 6. Here, the measure of REM (*Ag_Rem*) is the dependent variable. Consistent with Tulcanaza-Prieto et al. (2020), the positive and significant leverage coefficient (significant at $p<0.01$) attained signifies that firms with high levels of leverage engage in high levels of REM. The H2 of the study which states that leverage has a positive impact on REM is validated. The result is consistent with H2 and the debt covenant violation theory which suggests that firms manage earnings to avoid violation. The opposing results of Equations 9 and 10 give meaning to the findings of other studies that suggest that firms use the two methods of earnings management as substitutes and pick whichever one fulfills their need. Especially in this case, firms prefer the usage of REM to AEM which may be due to the difficulty in tracing activities of REM. Managers can elude stakeholders more easily by using this form of earnings management. To fully understand this phenomenon, it is imperative to have a metric that estimates the overall earnings management activity of a firm.

Following the metric designed by Bozzolan et al (2015), the overall earnings management activity of firms is estimated to investigate the H3 of the study. The H3 of the study which states that leverage has a positive impact on the overall earnings management of firms is tested in the third multivariate model defined by Equation 11 where the variable *EM_ALL* is used as reported in Column C of Table 6. The positive and significant coefficient of leverage (significant at $p<0.05$) supports the hypothesis that firms with high leverage are likely to engage in more activities of earnings management. This is in support of

Table 4. Descriptive statistics.

Variable	Mean	Std. Dev.	25 th Perc.	50 th Perc.	75 th Perc.	N
DAC	0.044	0.043	0.014	0.031	0.059	9045
Ag_Rem	0.001	0.367	-0.166	0.044	0.211	9045
EM_ALL	11.002	4.057	8.000	11.000	14.000	9045
REM_vs_AEM	0.501	0.207	0.357	0.500	0.667	9045
LEV	21.179	16.144	8.084	19.688	30.807	9045
INT	0.011	0.012	0.003	0.008	0.015	9045
LOSS_D	0.217	0.412	0.000	0.000	0.000	9045
LA	6.460	2.181	4.871	6.315	7.957	9045
ANALYST	5.735	6.956	1.000	2.000	8.000	9045
Big4	0.784	0.412	1.000	1.000	1.000	9045

The descriptive statistics (mean, standard deviation, quartile values and number of observations) for dependent and independent variables in the models, all variables defined. Outliers are winsorized at 1-99%.

Table 5. Correlation matrix.

Variable	DAC	Ag_Rem	EM_ALL	REM_vs_AEM	LEV	INT	LOSS_D	LA	ANALYSTS	Big4
DAC	1.000									
Ag_Rem	-0.017	1.000								
EM_ALL	0.610***	0.635***	1.000							
REM_vs_AEM	-0.540***	0.657***	-0.012	1.000						
LEV	-0.062***	0.057***	-0.014	0.091***	1.000					
INT	0.059***	-0.012	0.018*	-0.025**	0.637***	1.000				
LOSS_D	0.161***	0.024**	0.117***	-0.077***	0.104***	0.182***	1.000			
LA	-0.253***	0.097****	-0.114***	0.237***	0.276***	0.076***	-0.209***	1.000		
ANALYST	-0.155***	0.019*	-0.104***	0.130***	0.110***	0.023**	-0.182***	0.674***	1.000	
Big4	-0.082***	0.033***	-0.034***	0.076***	0.111***	0.057***	-0.039***	0.396***	0.253***	1.000

Table 6. Main regression - leverage and earnings management measures.

Variable	Expected sign	A: DAC	B: Ag_Rem	C: EM_ALL	D: REM_vs_AEM
CONSTANT		0.076***	-0.133***	4.709***	0.336***
LEV	+	-0.00015*	0.00213***	0.01450**	0.00128***
INT	+	0.315***	-2.755***	-17.482**	-1.667***
LOSS_D	+	0.009***	0.051**	0.440**	-0.007
LA	?	-0.005***	0.032***	0.196***	0.0278***
ANALYST	-	0.0002**	-0.004*	-0.035**	-0.002
Big4	?	0.002	-0.015	0.021	-0.015
F VALUE		38.89	21.31	19.35	37.99
R ²		8.68%	4.15%	3.79%	7.67%
N		9045	9045	9045	9045

The coefficients after running the main regression models, the dependent variable in column A is the absolute value of discretionary accruals (Kothari Model), in column B is the total real earnings management, in column C is the total earnings management and in Column D is the ratio of real earnings management to total earnings management, *, **, *** indicate statistical significance at 10, 5 and 1% level, respectively. P-values are two-tailed. Standard errors are clustered at industry level (applies to all regressions).

the debt covenant violation theory described by Healy and Wahlen (1999). Indeed, the findings until this point

indicate that AEM decreases with increases in leverage and REM increases with the increase in leverage but the

Table 7. Regression - leverage and individual REM proxies/|DAC_MJM.

Variable	Expected sign	A: Abn_CFO_1	B: Abn_PROD	C: Abn_DisExp_1	D: DAC_MJM
CONSTANT		0.044***	-0.099***	-0.035***	0.080***
LEV	+	0.000014	0.000518***	0.001614***	-0.000138***
INT	+	0.348***	-0.398*	-2.356***	0.528***
LOSS_D	+	0.071***	0.064***	-0.013**	0.020***
LA	?	0.003***	0.017***	0.015***	-0.006***
ANALYST	-	-0.001*	-0.002***	-0.002***	0.0002
BIG4	?	0.004	0.007	-0.023***	0.001
F VALUE		70.18	20.72	26.56	53.10
R ²		13.01%	4.09%	5.16%	11.39%
N		9045	9045	9045	9045

The coefficients after running additional regression models, the dependent variable in column A is the abnormal cash flow from operations, in column B is the abnormal production costs, in column C is the abnormal discretionary expense and in Column D is the absolute value of discretionary accruals (Modified Jones Model).

result after testing H3 indicates that firms' usage of REM outweighs their decrease in the usage of AEM. This result makes it interesting to explore the notion that, in the face of high leverage, firms prefer the usage of REM over the usage of AEM.

To investigate the trade-off between AEM and REM in the presence of leverage, the H4 of the study is tested by using the aggregate portion of REM in comparison to AEM as the dependent variable (*REM_vs_AEM*). This fourth model is defined by Equation 12, and results are reported in Column D of Table 6. The positive and significant coefficient of leverage (significant at p<0.01) is consistent with the H4 of the study and indicates that highly leveraged firms are more likely to make use of REM rather than AEM. This is in line with the assertions of managers in the study of Graham et al. (2005) where they indicated that they preferred the usage of REM to AEM. These results lead us to reject H1 and accept H2, H3 and H4.

$$Abn_CFO_1_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (13)$$

$$Abn_PROD_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (14)$$

$$Abn_DisExp_1_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (15)$$

$$|DAC_MJM|_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * Big4_{it} + \varepsilon_{it} \quad (16)$$

Where *Abn_CFO_1* and *Abn_DisExp_1* both stand for the inverses of abnormal cash flow from operations and abnormal discretionary expenses respectively (all other variables already defined). Panel A of Table 7 indicates an insignificant result for *Abn_CFO_1*. It is difficult to justify this result and this is the reason for its exclusion from the estimation of *Ag_REM*. Even though this is not enough justification for its exclusion, it is consistent with

Additional analyses and robustness check

Individual REM proxies and Modified Jones

The study of Roychowdhury (2006) proposed three proxies of REM and many studies following have made use of the aggregation of these proxies. Since REM is an aggregation of individual proxies, an investigation into these individual proxies may be relevant to ascertain which of them firms are more likely to engage in to protect their interests.

To ensure the robustness of results relating to AEM, the study also makes use of another model for its estimation. The Modified Jones Model (MJM) (1995) is used in the estimation of AEM and this is used as the dependent variable. (The MJM is defined as:

$$\frac{TAC_{it}}{A_{it-1}} = \alpha_0 + \alpha_1 \frac{1}{A_{it-1}} + \alpha_2 \frac{\Delta REV_{it} - \Delta AR_{it}}{A_{it-1}} + \alpha_3 \frac{PPE_{it}}{A_{it-1}} + \varepsilon_{it}$$

The individual proxies of REM and the discretionary accruals from MJM are used as dependent variables in the following models:

methods used by Bozzolan et al. (2015) and Zang (2012). These studies excluded the abnormal cash flow from operations while estimating total REM. Results for *Abn_PROD* are reported on Panel B of Table 7. The positive and significant leverage coefficient attained (p<0.01) in this model signifies that firms are likely to use overproduction as a form of REM to attain desired earnings in cases of high leverage. Panel C of Table 7

Table 8. Regression - leverage and ME Component.

Variable	Expected sign	ME
CONSTANT		-0.023***
LEV	+	0.000157*
LOSS_D	+	0.100***
LA	?	0.006***
ANALYST	-	-0.001***
BIG4	?	0.001
F VALUE		65.28
R ²		13.61%
N		8272

The coefficients after running an additional regression model, the dependent variable in this regression is total earnings management estimated using managed earnings component model.

indicates the results for *Abn_DisExp_1* where a positive and significant leverage coefficient is attained as well ($p<0.01$). This is also consistent with the H2 of the study and indicates that firms are likely to use the reduction of discretionary expenses to manage earnings in cases of high leverage. In Panel D of Table 7, results for $|DAC_{MJM}|$ are reported where the negative and significant leverage coefficient ($p<0.01$) obtained is consistent with the results of the main regression model. Leverage has a negative impact on AEM.

Earnings management from the perspective of financial analysts

For further analyses, earnings management is estimated from the perspective of financial analysts as defined in the model proposed by Aubert and Grudnitski (2012). This is defined as:

$$ME_{it} = \alpha_1 + \alpha_2 * LEV_{it} + \alpha_3 * LA_{it} + \alpha_4 * LOSS_D_{it} + \alpha_5 * ANALYST_{it} + \alpha_6 * BIG4_{it} + \varepsilon_{it} \quad (18)$$

The result of the model defined in Equation 18 reported in Table 8 corroborates the results of the main analyses and supports the H3 of the study. The positive and significant coefficient of leverage attained ($p<0.1$) indicates that firms with high leverage are more likely to manage their earnings.

Interest cover ratio

The results of the main models suggest that firms with high leverage are likely to engage in higher levels of earnings management and they do this preferring REM

$$ME_{it} = |Reported EPS_{it} - ex post convergent consensus EPS_{it}| \quad (17)$$

Where, *ME* represents the managed earnings component which is a measure for earnings management. *Reported EPS* is the Earnings Per Share published by companies. The *Ex post convergent consensus EPS* represents the recalculated EPS estimates made by financial analysts after firms have published their financial statements and more information is made available. The median of these *ex-post* estimates is used. To further corroborate the findings of the main analyses, the additional analysis makes use of the *ME* Component as a dependent variable. In this case, the *ME* Component is recognized as the total earnings management engaged in by firms. The *ME* is scaled by the prior year closing stock price as done by Aubert and Grudnitski, (2012). Also, the absolute values of the *ME* are used because the interest is in the degree of earnings management and not the direction of earnings management. This results in the following model:

over AEM; the supporting theory being that firms with high leverage manage earnings to prevent debt covenant violations. Interest coverage covenant is one of the widely used debt covenants by financial institutions when giving out loans. Dichev and Skinner (2002) documented that the median interest coverage ratio is lower for firms that fall within their threshold of firms classified as debt covenant violators. From this, it is logical to assume that firms with lower interest cover ratios are closer to debt covenant violations. Firms with a low interest coverage ratio are more likely to manage earnings to avoid violation. This leads to the following models:

$$|DAC|_{it} = \alpha_1 + \alpha_2 * INTCOV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * BIG4_{it} + \varepsilon_{it} \quad (19)$$

Table 9. Regression - interest cover ratio and earnings management.

Variable	Expected sign	A: DAC	B: Abn_Ag_Rem	C: EM_All	D: REM_vs_AEM
CONSTANT		0.044***	-0.078***	12.399***	0.359***
INTCOV	-	0.00000063*	-0.000343***	-0.00142***	-0.00015***
INT	+	0.203***	-1.818***	-2.929	0.980***
LOSS_D	+	0.010***	0.032***	0.895***	-0.014**
LA	?	-0.005***	0.033***	-0.070**	0.029***
ANALYST	-	0.0002*	-0.005***	-0.035***	-0.002***
BIG4	?	0.002*	-0.020*	0.068	-0.016***
F VALUE		70.18	25.05	20.46	37.30
R ²		8.46%	5.13%	4.66%	7.84%
N		8752	8752	8752	8752

The coefficients after running additional regression models, interest cover ratio replaces leverage as the independent variable, the dependent variable in column A is the absolute value of discretionary accruals (Kothari Model), in column B is the total real earnings management, in column C is the total earnings management and in Column D is the ratio of real earnings management to total earnings management.

$$Ag_REM_{it} = \alpha_1 + \alpha_2 * INTCOV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * BIG4_{it} + \varepsilon_{it} \quad (20)$$

$$EM_ALL_{it} = \alpha_1 + \alpha_2 * INTCOV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * BIG4_{it} + \varepsilon_{it} \quad (21)$$

$$REM_vs_AEM_{it} = \alpha_1 + \alpha_2 * INTCOV_{it} + \alpha_3 * LA_{it} + \alpha_4 * INT_{it} + \alpha_5 * LOSS_D_{it} + \alpha_6 * ANALYST_{it} + \alpha_7 * BIG4_{it} + \varepsilon_{it} \quad (22)$$

Where, *INTCOV* represents the interest coverage of firms.

Results of these models defined in Equation 19 to 22 are reported in Table 9. The results indicate almost a neutral relationship between discretionary accruals and interest coverage ratio. Even though this does perfectly not match the expectation, the results is still positive and indicate that firms do not manage earnings through AEM as their interest coverage ratio decreases and they get closer to debt covenant violation. However, in the case of REM, a negative and significant coefficient signifies that firms that have low interest coverage ratios have higher levels of REM to manipulate their earnings. This result is consistent with the major theory of this study which is the debt covenant violation theory. With the case of the overall earnings management engaged in by firms, a negative and significant relationship with interest cover is found. Firms that are closer to violation of covenants (low interest cover ratio) have higher levels of total earnings management. Similarly, a negative relationship between the levels of REM used in proportion to AEM and interest cover is found. This indicates that the more firms are close to debt covenant violation, the more they make use of REM to manage earnings.

Conclusion

This study investigates the impact of leverage on the earnings management strategy of firms. This is done by: testing the impact of leverage on AEM; testing the impact

of leverage on REM; testing the impact of leverage on the total earnings management activity; investigating how leverage moderates the usage of REM and AEM. This study contributes to the current stream of literature by providing deeper insights into how leverage affects the quality of financial reporting. Analysing the impact of leverage on total earnings management and also studying how leverage moderates the trade-off between REM and AEM is a study that had not been conducted and this research makes this contribution to literature. Two major theories support results obtained in this stream of research. One is the control hypothesis by Jensen (1986) and the other is the debt covenant violation hypothesis also covered by Healy and Wahlen (1999) and many researchers thereafter. The results of this study provide insights into both theories. First, the tests on AEM indicate that the control hypothesis is in force. The results show that firms with high leverage are less likely to manage their earnings using AEM procedures. However, further tests on REM indicate that the fear of debt covenant violation urges firms to manage their earnings through REM. The second insight is that the role leverage plays in shaping firms' choices between AEM and REM has been established. AEM has been noted to be more easily traceable as compared to REM. Leverage can control the level of earnings management but this ability is only limited to AEM. Instead of firms succumbing to the monitoring mechanism of leverage, managers rather find other ways to manage earnings. The fear of violating debt covenants provides a much stronger incentive to manage earnings over the control

hypothesis. Firms, therefore, opt for REM which is much harder to trace because this mode of earnings management affects the day-to-day operations of the firm and not just directly cooking the books. A positive relationship between leverage and the total earnings management levels of firms is therefore found. This result is strengthened by the fact that regressions using the ratio of REM to total earnings management are run and this shows firms' preference for REM over AEM. Also, further analysis including the individual proxies of REM provides additional evidence. Two out of the three proxies indicate increases in REM as leverage increases.

These results may be of interest to a variety of stakeholders of firms. First, potential and current debt holders must pay close attention to the operations and decisions made by managers of firms with specific regard to production volumes and discretionary expenses. There should be an interest in ascertaining the regularity of these operations and decisions. Indeed, REM activities are more difficult to trace, but debt holders should not rely on their ability to limit AEM but also enquire further into REM activities which are better concealed to make sure that firms are not violating debt covenants. Secondly, shareholders must be concerned about the choice of managers to prefer the use of REM in high leverage situations. REM seems the worse option out of the two modes of managing earnings. This is because real-time operations of the firms are affected and in the long run this would threaten the going concern of firms. Managers' preference of REM in the face of high leverage despite the adverse effects on the continuity of firms indicates how strong the fear of debt covenant violation is.

This study does indeed have certain limitations that should not be overlooked. There are several measures of leverage but to simplify the analysis because of the multiple tests ran, this study only makes use of total debt. It may be interesting to compare the relationship that may exist between other forms of leverage and earnings management and also ascertain the key reasons for the differences that may be observed. Another avenue would be to study the impact of leverage changes in firms on the quality of financial reporting instead of using the raw leverage levels as done in this study.

CONFLICT OF INTEREST

The authors have not declared any conflict of interest.

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