



The influence of leverage on accrual-based and real earnings management: Evidence from the UK

Bassem Al-Shattarat^a

a) Department of Accounting, College of Business and Administration, Prince Sultan University, Riyadh-SAUDI ARABIA.

^aCorresponding author.

E-mail address: bshattarat@psu.edu.sa

ARTICLE INFO

Article history:
Received 10 November 2021
Accepted 15 November 2022
Available online 01 July 2024

JEL classification:
M41

Keywords:
Real earnings management
Accrual-based earnings management
Leverage
Agency theory

ABSTRACT

The crucial aim of this study is to observe the association between leverage and earnings management using accrual-based earnings management (AEM) and real earnings management (REM) practices among the firms listed on the London Stock Exchange. To keep unobservable elements under control, this study employs a Two-Stage Least Squares approach to analyse data from UK-listed firms for the years 2009-2020. The findings reveal that there is a significant negative association between leverage and earnings management through REM but not through AEM. The results are aligned with the premise that leverage works towards limiting REM activities, which eventually influences the accounting earnings quality. Therefore, high leverage calls for debt repayment to minimise the available cash for managements non-optimal spending, depending on the lender-induced spending limitations. Further, this is predicted to minimise managers opportunistic behaviours and encourage their conservativeness. The study findings have implications for the regulatory and stock market players as it provides in-depth information concerning current practices in accounting and reporting.

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La influencia del apalancamiento en la gestión de los beneficios reales y basados en el devengo: Datos del Reino Unido

RESUMEN

El objetivo crucial de este estudio es observar la asociación entre el apalancamiento y la gestión de beneficios mediante prácticas de gestión de beneficios basadas en el devengo (AEM) y gestión de beneficios reales (REM) entre las empresas que cotizan en la Bolsa de Londres. Para mantener bajo control los elementos no observables, este estudio emplea un enfoque de mínimos cuadrados en dos etapas para analizar los datos de las empresas que cotizan en el Reino Unido durante los años 2009-2020. Los resultados revelan que existe una asociación negativa significativa entre el apalancamiento y la gestión de beneficios a través de REM, pero no a través de AEM. Los resultados concuerdan con la premisa de que el apalancamiento contribuye a limitar las actividades de REM, lo que a la larga influye en la calidad de los beneficios contables. Por lo tanto, un apalancamiento elevado exige el reembolso de la deuda para minimizar el efectivo disponible para gastos no óptimos de la dirección, en función de las limitaciones de gasto inducidas por el prestamista. Además, se predice que esto minimiza los comportamientos oportunistas de los directivos y fomenta su conservadurismo. Las conclusiones del estudio tienen implicaciones para los agentes reguladores y bursátiles, ya que proporciona información en profundidad sobre las prácticas actuales en materia de contabilidad y presentación de informes.

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Códigos JEL:
M41

Palabras clave:
Gestión de beneficios reales
Gestión de beneficios basada en el devengo
Apalancamiento
Teoría de la agencia

1. Introduction

There are various motives behind earnings management (EM), including the struggle of managers to maximise firms' profits and stock value; generally referred to as the prevention of debt covenant breach that could adversely impact the firm's reputation in the market and weaken the credibility and borrowing terms (Hirshleifer et al., 2004); the sought of managers to enhance their compensation arrangements and meet financial analysts' earnings forecasts (Iatridis & Kadorinis, 2009); avoiding reporting losses (Peasnell et al., 2005); achieving favourable contract terms (Rodríguez-Pérez & van Hemmen, 2010); maintaining relationships for additional debts (Ronen & Yaari, 2008); and reducing the possibility of contractual violations (Kim et al., 2012). However, limited research examines EM concerning leverage (Anagnostopoulou & Tsekrekos, 2017). This study examines whether firms with high financial leverage engage in apparent EM practices, contributing to other studies that seek to understand the motives for earnings management.

The literature notes two perspectives behind EM: the debt and control perspectives. According to the debt perspective, managers are expected to manage earnings to avoid debt covenant violations and high costs (Watts & Zimmerman, 1986). Debt covenant violations incur high costs. Thus, contracts defining a default in light of accounting numbers may incentivise managers to reach accounting decisions that could minimise the default potential (Watts & Zimmerman, 1986, p. 215). Literature shows that firms are incentivised to manage earnings so that they can steer clear of stumbling into technical default, while at the same time, this eradicates the related costs, with such incentives increasing the probability of violating covenants (Defond & Jiambalvo, 1994; Sweeney, 1994; Dichev & Skinner, 2002). Those managers will also seek to maintain favourable contractual terms (Rodríguez-Pérez & van Hemmen, 2010) or long-term relationships for additional debts (Ronen & Yaari, 2008; see also Lazzem & Jilani, 2018). The control perspective opines that debt financing plays a role as an effective oversight tool for reducing the opportunistic behaviour of management, leaving a low level of free cash flow to minimise managers' discretions in following behaviours because of the monitoring of creditors and investors (Jensen, 1986). Also, managers are often incentivised to continue borrowing at lower optimal levels as this minimises the bankruptcy probability, providing them with higher discretion in excess cash usage (Jensen, 1986).

The present study contributes to the literature by addressing the relationship between leverage and EM in the UK context. Although several accounting studies have focused on earnings management over the last two decades (Roychowdhury, 2006; Gunny, 2010; Zang, 2012), the studies that examine the effect of leverage have mostly concentrated on the US market (Merchant & Rockness, 1994; Karamanou & Vafeas, 2005). However, relatively few studies have focused on the impact of financial leverage on real earnings management (REM) in other markets, especially the UK stock market. In the UK, the existing research highlighted that accrual-based earnings management (AEM) and REM are widely practised, for example, during initial public offerings (Teoh et al., 1998), to avoid debt covenant violation (Iatridis & Kadorinis, 2009) and to avoid reporting losses (Al-Shattarat et al., 2022; Peasnell et al., 2005). However, the reported evidence on the leverage effect is sparse and mixed (Chelley-Steeley & Steeley, 2005).

The UK market has some essential characteristics that have implications for the capital structure decisions of UK compan-

ies. These characteristics include lower political involvement in accounting, lower litigation costs, and lower public debt issuance (Ball et al., 2000). Further, UK companies are reported to be one of the major users of credit ratings: they are the third largest users of Standard and Poor's credit ratings after the US and Canada (Standard & Poors, 2010). Historically, deregulation in the UK in the mid-1980s led to changes in the sources of financing choices where bonded debt was increasingly used as the primary financing source as opposed to the traditional reliance on bank loans and equity (Rudin, 1991). In the post-2008 financial crisis era, UK firms switched back their financing practices to depend more on short-term debt. In this regard, Custódio et al. (2013) found that firms in the UK rely more on short-term debt than their US counterparts.

In the UK market, there are requirements and characteristics distinct from those of other developed markets (e.g., the US market) - and this holds particularly in light of the practices of corporate governance mechanisms utilised and the requirements of disclosure system listing (e.g., auditor liability, kinds of prohibited services in auditing) (Gerakos et al., 2013). Such distinct characteristics are predicted to bring about the direct impact of the UK capital market's regulatory environment on earnings management, and according to Brown & Higgins (2005), UK firms possess varying characteristics from their US counterparts, particularly when it comes to their willingness to meet earnings targets of otherwise. Aside from this, UK companies are not as aggressive as their US counterparts in the earnings targets pursuant (Sit-anggang et al., 2019).

Additionally, this study contributes to the literature by measuring both AEM and REM. However, in studying the effect of leverage on EM, most prior research focused on AEM (Jha, 2013; Anagnostopoulou & Tsekrekos, 2017; Lazzem & Jilani, 2018). However, as the manager can use AEM and REM as substitutes (Cohen et al., 2008; Zang, 2012), the effect of leverage should be considered in a comprehensive view of both AEM and REM. Hence, measuring both accrual and real EM is essential due to the reported differences between the two perspectives (Enomoto et al., 2015); and capturing a more comprehensive impact of financial leverage.

Based on Jensens (1986) control hypothesis, the expectation in leverage is such that it could bring about heightened monitoring and oversight of external creditors and external parties which have invested interests in the firm (e.g., equity investors who are desirous of assessing the risk profile of the firm). Hence, this study clarifies the effect of the leverage of firms on REM and AEM and finds such leverage has an adverse effect on REM but not on AEM. This could lead to curtailing management's opportunistic behaviours and heightening their conservativeness. The study's empirical results have implications for the investment field players in light of decision-making and analysis processes. They provide information to shareholders and investors as to the earnings figure's reliability, when coupled with robust EM incentives, with the hope that they consider REM during their investment-making.

The structure of the study is as follows. Section 2 presents the theory and literature review. Section 3 describes the data and methods. Section 4 introduces the empirical findings. Section 5 presents the robustness test. Finally, section 6 presents the conclusions of the study.

2. Theoretical Framework, Literature Review and Hypotheses Development

According to the agency perspective, there are many reasons behind the manager's autonomous control over the firm's operations to obtain personal advantages instead of increasing shareholders' value. Initially, the manager's shareholder conflict may be caused by the manager's ineffective running of the firm. The tendency is such that complete control is sought to safeguard position and keep working for the firm. Literature enumerates management incentives towards EM engagement; to begin with, [Graham et al. \(2005\)](#) related that EM motivation lies in three main reasons: minimising political cost, minimising financing cost, and maximising the wealth of managers. Similarly, [Beneish \(2001\)](#) related details in the literature about increasing income through compensation agreements, security equity offerings, insider trading and debt covenants, and reducing income through regulation and cookie-jar reserves.

According to the contract between the owners and the management, management is morally responsible for optimising the owners' profits, and, in return, it receives compensation from the owners ([Jensen & Meckling, 1976](#)). However, this separation may lead to agency problems and conflicts of interest between owners and managers who may not act to the best of the owner's interests ([Fama & Jensen, 1983](#)). Moreover, the agency theory posits that management has a distinct interest from the principals of the firm owing to their differing aims. Principals work to prosper their companies with ever-increasing profitability. In contrast, agents (managers) are also motivated to maximise their economic needs ([Jensen & Meckling, 1976](#)). Thus, there needs to be an agreement detailing each party's rights and obligations to steer clear of agency conflicts. These agency conflicts can trigger the occurrence of EM practices to reach the desired objectives. Such imbalance could result in the negative selection and moral hazard behaviour of management in the hopes of keeping EM under the radar, as mentioned in [Rauchhauss \(2005\)](#) study. The agency theory suggests that these conflicts between agents and principals can be reduced by oversight and supervision mechanisms, including debt covenant rules, which allow scrutiny to be present, representing constraints over management actions. This can reduce the costs or losses resulting from management actions.

Thus, debt financing might reduce agency problems and can be done by reducing cash flows under management's control ([Bhaduri, 2002](#)). Besides, this can signal investors who may lack information to interpret the company situation better, preventing management's adverse actions. In that sense, debt financing can give investors positive indications regarding management intentions and expected behaviours ([Koch & Shenoy, 1999](#)).

Accounting practices usage towards achieving the optimum outcome is encapsulated in EM definition ([Callao & Jarne, 2010](#)) - in other words, EM arises when management uses their judgment in financial reporting and structure transactions ([Healy & Wahlen, 1999](#)). EM can thus be referred to as a process of management intervention directed towards the preparation of external financial reporting and can be carried out using accrual policies and real activities ([Cohen et al., 2008](#)). More specifically, accrual income management is the accrual component used by management in determining the number of earnings. This happens when management opts for accounting policies from a group of accepted policies for earnings objectives achievement. Contrary to accrual-based EM, real EM stems from practices of normal

business to control reported earnings ([Roychowdhury, 2006](#)), including management actions to tweak operational timings and structuring, which are not according to business practices (e.g., sales manipulation, discretionary expenditures reduction and inventory over-production) to minimise costs of goods sold and achieve specific threshold of earnings ([Roychowdhury, 2006](#)).

One of the variables that have an important relation with EM and can help stakeholders identify EM is financial leverage. A review of the literature revealed that leverage could have different influences on EM. However, most studies in the literature show a positive association between leverage and EM ([Iatridis & Kadorinis, 2009](#); [Lazzem & Jilani, 2018](#)). There is a tendency among managers toward EM engagement to reduce the probability of debt covenant violations ([Fields et al., 2001](#)).

The level of high debt use can negatively affect the firms and decrease such negative effects and steer clear of breach of debt covenants. This is because high leverage could lead to under-investment issues that could be fatal for the firm's growth opportunities, making it undesirable in the eyes of shareholders ([Cohen & Lys, 2006](#); [Dimitrov & Jain, 2008](#); [Cai & Zhang, 2011](#)). Besides, there is a higher probability that companies with high debts would breach debt agreements than those with lower debts.

In previous research, EM is mostly measured by accruals ([Kothari et al., 2005](#); [Jelinek, 2007](#); [Sayidah et al., 2020](#)). However, this can underestimate firms' total EM activities (see [Braam et al., 2015](#)). This study investigates the impact of leverage on both accrual and real EM. This is important due to the reported differences between the two perspectives and to capture a more comprehensive impact of financial leverage in the UK market ([Braam et al., 2015](#)). Moreover, external parties like auditors/regulators find it more difficult to keep track of and oversee REM compared to AEM ([Cohen et al., 2008](#); [Cohen & Zarowin, 2010](#); [Gunny, 2010](#); [Zang, 2012](#)) because the former can be transformed into something that mimics a normal daily transaction, while the latter entails accounting methods and are assessed and overseen more easily ([Roychowdhury, 2006](#)). Also, there are direct cash flow consequences in REM, which may negatively impact the firm's economic and long-term value ([Gunny, 2010](#)). Besides, manipulating real activities is generally not under the auditing system's jurisdiction. It is less controlled by extensive processes and external oversight by the society at large (e.g., media and political parties) ([Kim & Sohn, 2013](#)). In support of this statement, equity investors were found to display a robust penalising response to AEM in comparison to REM, indicating that management may have a higher tendency to use earnings management via the manipulation of real activities as opposed to accruals ([Graham et al., 2005](#)).

Aligned with such a difference between real and accrual EM, prior authors indicated varying outcomes concerning the leverage impact on AEM and REM. For example, [Roychowdhury \(2006\)](#) finds a positive relationship between the presence of debt on a company's balance sheet and higher REM. Firms sell fixed assets to avoid covenant violations, according to [Bartov \(1993\)](#), while managers employ REM to smooth reported income to lower the cost of debt, according to [Trueman & Titman \(1988\)](#). Moreover, increasing leverage was found by [Zagers-Mamedova \(2009\)](#) to incentivise the shift from AEM to REM, and [Kim et al. \(2010\)](#) revealed that REM-using firms often refrain from violating debt covenants.

Other research (e.g., [DeFond & Park, 1997](#); [Becker et al., 1998](#); [Chung et al., 2005](#); [Jelinek, 2007](#); [Lee, Lev, & Yeo, 2007](#); [Zhong, Gribbin, & Zheng, 2007](#); [Rodríguez-Pérez &](#)

van Hemmen, 2010) observes a negative association between leverage and signed AEM. This negative association between leverage and upward AEM has been attributed to the fact that it may be efficient for creditors to incur the monitoring costs necessary to assess the real quality of debtors, so debt should be expected to limit opportunistic behaviour (Jensen (1986) control hypothesis; Rodríguez-Pérez & van Hemmen, 2010), and in UK firms, the cost of AEM engagement was noted to increase for achieving earnings benchmarks after FRS3, and the Cadbury report was introduced, coupled with the higher transparent financial reporting demand (Peasnell et al., 2000). Moreover, Anagnostopoulou & Tsekrekos (2017) found no significant effect of AEM.

In prior studies (DeFond & Jiambalvo, 1994; Sweeney, 1994; Jaggi & Lee, 2002; Beatty & Webber, 2003; Iatridis & Kadorinis, 2009; Lazzem & Jilani, 2018), violation of debt covenants volatility in major accounting measures relationship was found to be significant, particularly when it comes to earnings and liquidity. There is a tendency among managers toward EM engagement to reduce the probability of debt covenant violations (Fields et al., 2001). This type of behaviour has been attributed to the 'debt hypothesis', which is based on positive accounting theory and predicts that managers will choose to avoid covenant violations (Fields et al., 2001).

Based on the assumption that leverage is likely to be accompanied by heavier scrutiny by outside parties (auditors, regulators, and also debt and equity investors), combined with the assumption that REM is less easily detectable than AEM following extensive respective arguments and/or evidence provided by past research, and therefore, in the present study, the impact of leverage on REM and AEM is examined to determine the relationship of leverage with both in the context of UK firms. This study proposes the following hypothesis for testing;

H1: *There is a relationship between financial leverage and REM, whereas there is no relationship with AEM, in UK companies that manage earnings upward.*

3. Research Design

3.1. Data and Sample

The study sample covered the period from 2009 to 2020 of FTSE All-Share index firms listed on the London Stock Exchange (LSE). All accounting data are obtained from the *Datastream* database. Firms in regulated industries with SIC code greater than or equal to 4900 and less than or equal to 4999 and firms with SIC code greater than or equal to 6000 and less than or equal to 6999 are eliminated. This is because they operate in highly regulated industries with accounting rules that differ from those in other industries (Cohen et al., 2008; Zang, 2012). Lastly, the study determined the presence of missing values and outliers in the sample firms were excluded, and the final sample of 4,448 firm-year observations, which is used to test the formulated hypothesis¹.

¹All continuous variables are winsorized at the 1st and 99th percentiles.

3.2. Measure of Variables

3.2.1. Leverage

The financial leverage was examined by measuring leverage as the total debt over total assets (book leverage)². According to Graham & Harvey (2001), managers focus more on book values when establishing financial policies, owing to their lower volatility compared to market equity values - making the former a better guide to the financial structure. Nevertheless, some studies are in favour of market leverage more than book leverage - as exemplified by Welch (2004), who contended that the book value of equity can be negative and is mainly a plug number used to balance the left-hand side and the right-hand-side of the balance sheet. He also contended that literature highlights significant effects of profitability and fixed assets in the determination of leverage, and this may stem from the accounting rules - indicating that the increase of book value of equity owes itself to historical cash flows and the decrease of the same stems from the depreciation of assets. This study also examines another measure of leverage called market leverage in the robustness section as a book value of debt scaled by the market value of assets.

3.2.2. Real Earnings Management

Moving on to the REM tests - the study made use of three REM measures, namely overproduction, discretionary expenditure, and cash flows from operations, similar to the use in prior studies (e.g., Zang, 2012; Badertscher, 2011; Cohen & Zarowin, 2010; Gunny, 2010; Cohen et al., 2008; Roychowdhury, 2006). The normal production cost level is estimated using the following equation;

$$\frac{PROD_{i,t}}{TA_{i,t-1}} = \alpha_0 + \beta_1 * \left(\frac{1}{TA_{i,t-1}} \right) + \beta_2 * \left(\frac{SR_{i,t}}{TA_{i,t-1}} \right) + \beta_3 * \left(\frac{\Delta SR_{i,t}}{TA_{i,t-1}} \right) + \beta_4 * \left(\frac{\Delta SR_{i,t-1}}{TA_{i,t-1}} \right) + \varepsilon_{i,t}, \quad (1)$$

where:

PROD_{i,t} = The production costs defined as the sum of the cost of goods sold (COGS) and the change in inventories for firm *i* in year *t*.

TA_{i,t} = Total assets for firm *i* in year *t*,

SR_{i,t} = Sales revenue for firm *i* in year *t*,

ΔSR_{i,t} = Change in sales revenue for firm *i* in year *t*, and

ΔSR_{i,t-1} = Change in sales revenue at the beginning for firm *i* in year *t*.

Next, the normal discretionary expenses level was estimated using the following equation;

$$\frac{DISEX_{i,t}}{TA_{i,t-1}} = \alpha_0 + \beta_1 * \left(\frac{1}{TA_{i,t-1}} \right) + \beta_2 * \left(\frac{SR_{i,t}}{TA_{i,t-1}} \right) + \varepsilon_{i,t}, \quad (2)$$

where:

DISEX_{i,t} = The discretionary expenditures are the sum of advertising expenses, research and development (R&D) expenses and selling, general and administrative (SG&A) expenses.

²The financial ratios (debt-to-asset and debt-to-equity ratios) were cast under doubt in Fields et al.s (2001) study particularly when used as a proxy for covenant violation. The present study refrained from using the firm's actual debt contract details which may not be available or may incur significant costs to obtain. Instead, the study uses a debt-to-asset ratio to proxy firms' proximity to violate debt covenants. Added to this, the leverage choice as a proxy for debt covenant tightness has been mentioned in Duke & Hunts (1990) study that investigated the leverage-presence of actual debt covenant restrictions tightness relationship and found leverage to be an effective proxy for closeness to some violations of debt covenants, such as retained earnings, net tangible assets as well as working capital.

Finally, we estimate the normal level of cash flow from operations (CFO) as:

$$\frac{CFO_{i,t}}{TA_{i,t-1}} = \alpha_0 + \beta_1 * \left(\frac{1}{TA_{i,t-1}} \right) + \beta_2 * \left(\frac{SR_{i,t}}{TA_{i,t-1}} \right) + \beta_3 * \left(\frac{\Delta SR_{i,t}}{TA_{i,t-1}} \right) + \varepsilon_{i,t}, \quad (3)$$

I estimate these regressions for each two-digit SIC code and year with at least eight observations (Cohen et al., 2008). The regression residuals were used as abnormal production cost, abnormal discretionary expenses and abnormal cash flow from operations. The total REM effects were encapsulated using abnormal discretionary expenses multiplied by a negative one and added to abnormal production costs, after which it was aggregated as a single measure (REM_1) following Cohen & Zarowin (2010) and Zang (2012). Abnormal cash flows from operations, and abnormal discretionary expenses were also multiplied by a negative one, after which they were aggregated into a single measure (REM_2) (Cohen & Zarowin, 2010; Zang, 2012). This indicates that higher REM represents one that is income-increasing.

3.2.3. Accrual-based Earnings Management

The level of EM is generally measured by accounting accruals, and based on Hribar & Collins (2002), cash flow statement data is used in this study to obtain the total accruals³ and to define total accruals (TACC) in the form of earnings before extraordinary items, less cash flow from operations⁴. Following the prior earnings management research (e.g., Kim et al., 2012; Liu et al., 2017), this study employs Kothari et al.s (2005) adjusted-performance modified Jones' model, which includes the return-on-assets (ROA), as a regressor in the estimation model. This affects the assessed discretionary accruals by controlling for performance. As a result, the inferences drawn from the discretionary accruals estimates are more reliable⁵. Kothari et al.s (2005) model was estimated as follows:

$$\frac{TACC_{i,t}}{TA_{i,t-1}} = \alpha_0 + \beta_1 * \left(\frac{1}{TA_{i,t-1}} \right) + \beta_2 * \left(\frac{\Delta SR_{i,t} - \Delta AR_{i,t}}{TA_{i,t-1}} \right) + \beta_3 * \left(\frac{PPE_{i,t}}{TA_{i,t-1}} \right) + \beta_4 * (ROA_{i,t}) + \varepsilon_{i,t}, \quad (4)$$

where:

$\Delta AR_{i,t}$ = Change in receivables firm *i* in year *t*,

$PPE_{i,t}$ = Gross property, plant and equipment for firm *i* in year *t*, and

$ROA_{i,t}$ = The return-on-assets calculated as the net income before extraordinary items divided by lagged total assets for firm *i* in year *t*.

The regression residual was then used as the discretionary accruals measure (denoted by Ab_ACC).

3.2.4. Other Variables

The reviewed literature indicated the need to include control variables of market-to-book (MTB), Return on Assets (ROA), firm size (SIZE), net interest expense (INT_EXP), and

big four audit firms (BIG 4) in the present study. More specifically, market-to-book was used as firm growth opportunities proxy, obtained as the market value of equity over book value⁶. The justification for the growth control imposition lies in the observation that high-growth firms may be more inclined to hide their losses and have higher accruals compared to those with lower growth (McNichols, 2000). The study included ROA as a firm profitability proxy based on the negative relationship between EM and ROA (Kothari et al., 2005; Jiraporn et al., 2008). This evidence that lower firm performance would lead to a higher probability of EM activity engagement. Moreover, ROA was obtained as income before extraordinary items over total assets. Firm size was also controlled in the study, obtained through the natural logarithm of total assets at year-end. According to Gu et al. (2005), firm size is affected by discretionary accruals and found a negative size-discretionary accruals association⁷. Leverage increase may lead to an interest payment (INT_EXP) increase and influence lower net income (Jelinek, 2007). In this regard, interest expense was obtained by calculating the ratio of interest expense to total debt. The argument is that the higher the interest expense, the lower the opportunistic behaviour (Jensen, 1986).

Regarding the AEM-associated costs, auditor quality was used, which is represented by a dummy variable equal to 1 in case the auditor of firm *i* in year *t* is a Big 4, and zero in case it is not a Big 4. The variable proxied the auditor's and regulator's monitoring, where higher monitoring leads to higher engagement costs in AEM (Chung et al., 2005; Zang, 2012). Additionally, a dummy industry and year were used in the study to keep their effects under control.

3.3. Empirical Models

The study's formulated hypothesis addressing the leverage-EM relationship was tested using Equations 6 and 7. EM was used to represent accrual-based and real earnings management. The study did not include the details of the firm's actual debt contracts (due to their unavailability and costly-to-obtain nature). Rather, the debt-to-asset ratio was used as a proxy for the proximity of firms to debt covenant violation. The hypothesis was tested with the help of Two-Stage Least Squares (2SLS) to keep unobservable elements under control, and the following equation was used;⁸

$$REM_{i,t} = \alpha_0 + \alpha_1 * BLEV_{i,t} + \alpha_2 * BIG\ 4_{i,t} + \alpha_3 * MTB_{i,t} + \alpha_4 * ROA_{i,t} + \alpha_5 * SIZE_{i,t} + \beta_6 * INT_EXP_{i,t} + \varepsilon_{i,t}, \quad (5)$$

$$Ab_ACC_{i,t} = \beta_0 + \beta_1 * BLEV_{i,t} + \beta_2 * BIG\ 4_{i,t} + \beta_3 * MTB_{i,t} + \beta_4 * ROA_{i,t} + \beta_5 * SIZE_{i,t} + \beta_6 * INT_EXP_{i,t} + \varepsilon_{i,t}, \quad (6)$$

where:

$REM_{i,t}$ = is the proxies for real earnings management (REM_1; REM_2), which is mentioned above.

$Ab_ACC_{i,t}$ = is the proxy for accrual-based earnings management, which is mentioned above.

$BLEV_{i,t}$ = is a measure of leverage, which is calculated by the ratio of the book value of total debt to the book value of total assets (%). The control variables are defined in detail in the above.

⁶Market value is obtained by multiplying the closing price at fiscal year-end by the outstanding number of shares.

⁷The ROA and SIZE control variables may have a significant influence over EM, when it comes to real earnings management as evidenced by Roychowdhury (2006) and Cohen et al. (2008).

⁸This study replaces the book leverage (BLEV) of market leverage (MLEV) in equations 6 and 7 to evaluate the robustness of our results.

³See also Xie (2001).

⁴Balance sheet-based measurement of total accruals is adversely affected by measurement error (Hribar & Collins, 2002).

⁵Dechow et al. (1995) provide evidence on the importance of controlling for firms' performance, which is a problem that can bias accruals estimation.

4. Empirical Results and analysis

4.1. Descriptive Statistics

Table 1. Descriptive Statistics

Panel A: Accruals and real earnings management variables						
	Mean	Median	Std. Dev.	Max.	Min.	N
REM_1	0.0002	0.007	0.395	3.558	-3.729	2,486
REM_2	-0.0006	0.005	0.282	2.732	3.011	2,590
Ab_ACC	-0.0001	-0.002	0.124	0.693	-0.827	3,133
Panel B: Independent variables						
	Mean	Median	Std. Dev.	Max.	Min.	N
BLEV	0.169	0.122	0.207	0.781	0.000	4,448
MLEV	0.092	0.062	0.106	0.730	0.000	4,448
BIG 4	0.777	1.000	0.415	1.000	0.000	4,448
MTB	2.218	1.062	2.779	26.398	0.014	4,448
ROA	0.083	0.073	0.110	0.566	-0.244	4,448
SIZE	13.49	13.28	1.503	17.89	10.13	4,448
INT_EXP	0.028	0.0003	0.117	0.998	0.000	4,448

Table 1 reports the mean, median, standard deviation, the maximum and minimum of all variables over the period 2009 to 2020.

The descriptive statistics results, enumerating the mean, median, standard deviation, and the maximum and minimum values of the firms for the years from 2009 to 2020 are tabulated in Table 1. Prior sections definitions of the variables were followed, after which they were winsorized at 1% and 99% percentile to avoid the influence of extreme outliers (Gunny, 2010). In Panel A of the above table, the results of the descriptive statistics for discretionary accruals and real earnings management proxies are presented, and in Panel B, the results of the descriptive statistics for independent variables are listed. REM_1 and REM_2 measures and Ab_ACC differ from 0, indicating the presence of earnings management in the UK firms, which may have been used to hide failures and adverse financial situations (Cohen et al., 2008).

In addition to the above, the leverage median descriptive statistics are aligned with that of prior studies (Roychowdhury, 2006; Cohen et al., 2008), with a median leverage ratio of 12.20%, almost the same as the obtained values of the less limited sample used by Cohen et al. (2008). The mean (MTB) value is 1.062, where a majority of the firms (77.7 %) were audited by Big 4. Averagely, the sample is profitable, having a ROA mean of 8.30%, and based on the cost of debt, UK firms have 2.80% interest expenses out of the total debt.

Table 2

Panel A: Pairwise Pearson Correlation among all Dependent Variables						
	REM1	REM2	Ab_ACC			
REM1	1.000					
REM2	0.825*	1.000				
Ab_ACC	0.060*	0.144*	1.000			
Panel B: Pairwise Pearson Correlation among all Independent Variables						
	(1)	(2)	(3)	(4)	(5)	(6)
(1) BLEV	1.000					
(2) BIG 4	-0.007	1.000				
(3) MTB	0.276*	0.027*	1.000			
(4) ROA	-0.046*	0.010	0.240*	1.000		
(5) SIZE	0.179*	-0.060*	-0.154*	-0.154*	1.000	
(6) INT_EXP	0.217*	0.027*	0.299*	0.282*	-0.212*	1.000
VIF	1.15	1.11	1.79	1.29	1.19	1.53

Notes: *, **, *** Statistical significance at the 10%, 5%, 1% level, respectively.

Table 2 (Panel B) tabulates the correlation results that support the statistical analysis of prior studies - Cohen & Zarowin (2010) and Roychowdhury (2006). Specifically, the findings show that a low correlation exists between the model's explanatory variables, with all the correlation coefficients being lower than 30%. Higher values would indicate a multicollinearity issue. Added to this, the explanatory variables VIF tests were lower than 10 - Myers (1990) recommended limit - further highlighting the absence of multicollinearity. Aligned with other studies (Cohen & Zarowin, 2010), the present study findings supported a positive and significant correlation between REM_1 and REM_2 and Ab_ACC, which is an indication that the sample firms had REM coexisting with a specific AEM level.

4.2. Assessing the Influence of Leverage on AEM and REM

The econometric test results of the independent variables regression from the estimation of models 6 and 7 are presented in Table 3 - three measures of EM were considered as dependent variables (REM_1, REM_2 and Ab_ACC). There was a possibility that the results may have been reached through an unobservable variable (correlated excluded variable) because it is unclear whether the causality comes from earnings management to leverage or the other way around. As such, the approach of 2SLS regression was employed to decrease this concern. This method makes use of instrumental variables to keep unobservable elements under control so as not to influence the outcome. However, industry median leverage (InMd_LEV) is used as an instrumental variable (Leary & Roberts, 2014).

A public company that is listed on a stock market is obligated to prepare financial statements in accordance with International Financial Reporting Standards (IFRS) and has an unfettered right to offer shares or debentures to the public, whereas a private company is banned from doing so. Furthermore, non-listed companies (private companies) rely nearly entirely on debt financing, have larger leverage ratios, and avoid external capital markets, making their capital structures more sensitive to performance variations. (Brav, 2009; Goyal et al. 2011; López-Gracia & Sogorb-Mira, 2014). Based on the results, there are negative coefficients of BLEV in REM_1 (-1.822) and REM_2 (-0.590), which are statistically significant at the level of 1% (where REM_1 has $t = -3.25$ and REM_2 has $t = -3.18$). This result is in line with prior studies (e.g., Jelinek, 2007; Rodríguez-Pérez & van Hemmen, 2010), which reported a significant negative financial leverage-income smoothing relationship. Jelinek (2007) contended that debt repayment is generally required for high leverage, which lessens the available cash for management to use for non-optimal spending. Aside from this, firms using debt financing experience lenders' scrutiny and are under lender-induced spending limitations. This is expected to decrease their managers' opportunistic behaviours and encourage them to be more conservative (Jensen, 1986). Moreover, no significant effect was found on Ab_ACC and aligned with the formulated hypothesis. This result is in line with the previous study (Anagnostopoulou & Tsekrekos, 2017), which reported no significant effect of AEM.

Moving on to the study's control variables, ROA (profitability proxy) was found to have a negative relationship with REM_1, REM_2 and Ab_ACC, indicating that firms opt for EM when underperformance pressures. Such firms engage in EM practice to sustain stock market confidence. This result supports the prior study by Anagnostopoulou & Tsekrekos (2017) who reported that profitable companies often engage

Table 3. Leverage and Earnings Management Proxies: 2SLS Regression Analysis

	First Stage Model		Second Stage Model					
	BLEV		REM_1		REM_2		Ab_ACC	
	Coef.	t-Test	Coef.	t-Test	Coef.	t-Test	Coef.	t-Test
Instrument: InMd_LEV	0.524	10.64***						
BLEV			-1.822	-3.25***	-0.590	-3.18***	-0.043	-1.02
BIG 4	-0.006	-0.121	0.080	1.11	0.025	1.01	-0.009	-1.43
MTB	0.030	4.26***	-0.021	-2.98***	-0.003	-2.02**	-0.0004	-1.67*
ROA	-0.024	-1.04	-1.412	-4.81***	-1.610	-9.22***	-0.456	-11.26***
SIZE	0.017	3.79***	-0.002	-0.88	-0.001	-1.35	-0.001	-1.38
INT_EXP	0.161	2.99***	-1.259	-2.11**	-0.449	-3.25***	-0.084	-1.49
Constant	-0.123	-3.38***	0.480	2.99***	0.299	3.15***	0.057	2.11**

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels. This table shows the Two-Stage Least Squares (2SLS) results. The dependent variables are EM proxies (REM_1, REM_2, Ab_ACC).

in earnings management. Moreover, size (SIZE) was found to have no significant statistical relationship with REM_1, REM_2 and Ab_ACC. In contrast, market-to-book (MTB) had a statistically negative relationship with all three EM proxies, indicating that EM should be opted for by firms displaying lower than promising growth (Roychowdhury, 2006). There is no significant association between BIG 4 and all three EM proxies, indicating that firms audited by Big 4 auditors don't engage in EM activities. As for the interest expense variable (INT_EXP), the cost of debt was found to have a negative and significant effect on EM of REM_1 at the level of 5% and REM_2 at the level of 1%. This means that interest expense negatively affects the EM practice, and as such, debt decrease may result in interest payments decrease, and ultimately EM increases. Lastly, no significant relationship was found in this study between INT_EXP and Ab_ACC.

4.3. Fixed Effects Model

The Chow test is the first test to see the best model between fixed effects and common effects. The untabulated results found in the Chow test are fixed effects as the best model. Then to determine the model between fixed and random effects, Hausman Test was used, and it proposed a fixed-effect model to run the analysis since I rejected the null hypothesis because the prob-value is statistically significant at the 5% level (Wooldridge, 2010). Thus, this study ran the main model to control the firm fixed effects and minimise the concern that persistent correlated excluded variables may influence the outcome. Notably, from Table 4, it is evident that even with the use of firm fixed effects, the BLEV coefficient still has a negative and statistical relation with REM_1 and REM_2, but not with Ab_ACC, which is aligned with the study's prediction. The result in Table 3 is also aligned with this finding.

Table 4. Leverage and Earnings Management Proxies: Fixed Effects Model

	REM_1		REM_2		Ab_ACC	
	Coef.	t-Test	Coef.	t-Test	Coef.	t-Test
BLEV	-0.078	-3.14***	-0.088	-2.09**	-0.020	-1.35
BIG 4	0.0003	0.24	0.019	0.64	-0.005	-1.36
MTB	-0.012	-3.01***	-0.002	-1.99**	-0.0006	-2.96***
ROA	-0.936	-4.27***	-1.314	-9.68***	-0.370	-10.54***
SIZE	-0.088	-1.35	-0.019	-1.11	-0.005	-1.44
INT_EXP	-0.503	-1.74*	-0.203	-2.45**	-0.109	-1.37
Constant	0.278	2.21**	0.364	3.66***	0.061	3.99***
Adj R ²	0.298		0.131		0.301	

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels. This table shows the firm fixed effect regression results. The dependent variables are EM proxies (REM_1, REM_2, and Ab_ACC).

5. Robustness Test

5.1. Other Measure of Leverage

In terms of evaluating the robustness of the results, another measure of leverage is used to re-run the analysis. This study identifies the market leverage (MLEV) as a book value of debt scaled by market value of assets. The untabulated results reveal that there are negative coefficients of MLEV in REM_1 (-1.822) and REM_2 (-0.911), which are statistically significant at the level of 1% (where REM_1 has $t = -4.11$ and REM_2 has $t = -3.36$). However, no significant effect was found on Ab_ACC. Therefore, the results remain unchanged, suggesting that the study findings are also robust to the alternate method of identifying the leverage.

5.2. Alternative Measure of ROA

The untabulated results reveal that, in general, are robust when using earnings before interest and taxes (EBIT) instead of ROA with net income before extraordinary items in Equations 6 and 7. However, the results remain unchanged.

6. Conclusion

This study conducted an empirical examination of the influence of leverage on accrual-based earnings management and real earnings management in the context of UK firms. The accounting data used in the study were obtained from the DataStream database for the years from 2009 to 2020. When it comes to leverage, Jensen (1986) stated that it should be heightened monitoring and scrutiny from external creditors and extended external parties with a vested firm interest, such as equity investors that are inclined to assess the risk profile of the firm. The empirical analysis of this study shows a significant negative effect of leverage on REM but not on AEM. The findings support the idea that leverage helps to restrict REM activities, which in turn affects the accounting earnings quality. This is expected to reduce managers' opportunistic behaviors and promote their conservatism. Moreover, the results are robust to different leverage measures.

This study is not without its limitations, the first of which is the absence of the direct measurement of management's opportunistic behaviour. Instead, it was estimated through the development of real and accruals-based earnings management. Another limitation lies in the inclusion of managerial discretion determinants, such as managerial ownership and audit committee structure. Future studies are thus recommended to analyse the specific characteristics of the firm on the leverage-earnings management relationship.

Acknowledgment

The author would like to thank Prince Sultan University for their support.

Funding

This research has not received any specific grants from public, commercial or non-profit funding bodies.

Conflicts of interest

The author declares that they has no conflicts of interest.

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