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The association between real activities and accruals earnings management in Malaysian listed companies

La asociación entre las actividades reales y la gestión de ganancias acumuladas en las sociedades cotizadas de Malasia

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Abstract

This study examines the association between real activities earnings management (REM) and accruals earnings management (AEM) of listed companies in the main market of Malaysia. The study sample consists of 300 companies with the lowest positive earnings measured by the ratio of return on assets from 2013 to 2015. It uses three proxies for AEM, namely, the Jones Model, Modified Jones Model (MJM) by Dechow, Sloan, and Sweeney (1995) and MJM by Kasznik (1999). For REM, the study uses the aggregate value of Roychowdhury (2006). Random effect panel data regression was run to test whether AEM and REM are used as complementary or substituted techniques in manipulating earnings reporting. The results of the study provide evidence of a significant positive relationship between REM and AEM, which supports the complement hypothesis. The same results are found in both the model of AEM, where REM is included as an independent variable, and in the model of REM, where AEM is included as an independent variable. These results indicate that managers jointly use these two techniques of earnings management when they prepare financial reports. The findings could be of importance to

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policy-makers, regulators, investors and practitioners in all countries, but particularly in Malaysia, by indicating the extent of and relationship between AEM and REM practices in Malaysian firms.

JEL Code: M41, M40, M48
Keywords: Corporate governance; Accrual earnings management; Real earnings management; Malaysia

Resumen

Este estudio examina la asociación entre la gestión de ganancias de actividades reales (REM) y la gestión de ganancias devengadas (AEM) de las empresas que cotizan en bolsa en el principal mercado de Malasia. La muestra del estudio consta de 300 empresas con las ganancias positivas más bajas medidas por el índice de rendimiento de los activos de 2013 a 2015. Utiliza tres proxies para AEM, a saber, el modelo de Jones, el modelo de Jones modificado (MJM) por Dechow, Sloan y Sweeney (1995) y MJM de Kasznik (1999). Para la REM, el estudio utiliza el valor agregado de Roychowdhury (2006). Se ejecutó una regresión de datos de panel de efectos aleatorios para probar si tanto la AEM como la REM se utilizan como técnicas complementarias o sustituidas en la manipulación de informes de ganancias. Los resultados del estudio proporcionan evidencia de una relación positiva significativa entre la REM y la AEM, lo que apoya la hipótesis del complemento. Los mismos resultados se encuentran tanto en el modelo de AEM, donde REM se incluye como variable independiente, como en el modelo de REM, donde AEM se incluye como variable independiente. Estos resultados indican que los gerentes utilizan conjuntamente estas dos técnicas de gestión de ganancias cuando preparan informes financieros. Los resultados podrían ser de importancia para los responsables de la formulación de políticas, reguladores, inversores y profesionales en todos los países, pero especialmente en Malasia, al indicar el alcance y la relación entre las prácticas de la AEM y la REM en las empresas malayas.

Código JEL: G10, G18, G14, O40, E44
Palabras clave: Regulación del mercado financiero; Eficiencia del mercado de capitals; Crecimiento económico y equilibrio macroeconómico

Introduction

The literature confirms the existence of earnings management (EM) practices resulting from different incentives that encourage managers to engage in them. For instance, the capital market expectations and valuation, contracts between managers and shareholders in terms of accounting numbers and, lastly, the antitrust or other government regulations. The issue of EM became important after the many severe accounting scandals witnessed globally. However, researchers have argued that the primary reason for these scandals is EM practices (Kazemian & Sanusi, 2015; Rahman, Sulaiman, Fadel, & Kazemian, 2016; Rezaee, 2005). This supports the argument of Perols and Lougee (2011) that firms which previously used

EM are most likely to commit fraud. Likewise, listed firms in Malaysia alleged to be guilty of fraud aggressively used EM before the year of the alleged fraud (Hasnan, Abdul-Rahman, & Mahenthiran, 2013; Rahman *et al*., 2016; Sulaiman, Danbatta, & Rahman, 2014).

The practices of EM can be grouped into two categories. First, accrual earnings management (hereafter AEM) is earnings manipulation by managers via accounting estimations and methods. Healy and Wahlen (1999) stated that managers can exercise judgment in many ways when they prepare financial reports; they must estimate many upcoming economic events; select among acceptable approaches for depreciation; choose an acceptable method for inventory valuation; and choose whether to defer expenditure or spend. Secondly, real earnings management (hereafter REM) is the manipulation of earnings by management through daily operational activities. Managers can manipulate real activities, for example by reducing research and development expenditure (R&D) to boost earnings (Bushee, 1998), timing asset sales (Bartov, 1993), overproducing, giving large discounts in order to increase the volume of sales, and reducing discretionary expenditure (Roychowdhury, 2006).

Arguments on which type of EM is preferred by managers are still ongoing. Manipulations using AEM may be the preferred instrument for managing opportunistic profits since it has no general direct cash flow outcomes, and can be difficult to unravel (Peasnell, Pope, & Young, 2005), with lesser long-term costs on a firm than REM (Peasnell *et al*., 2005; Roychowdhury, 2006). Further, accrual principles alone create an opportunity to manipulate earnings since they require managers to forecast, estimate and make judgments, thus increasing the level of discretion that will increase the opportunity for EM (Dechow & Schrand, 2004). However, it is argued that firms face higher costs in implementing AEM than REM (Francis, Hasan, & Li, 2016), and that regulatory scrutiny and auditors will be more likely to discover AEM (Roychowdhury, 2006). Finally, application of the International Financial Reporting Standards (IFRSs) has significantly reduced the practice of AEM (Khoo & Ahmad-Zaluki, 2015; Wan Ismail, Kamarudin, Zijl, & Dunstan, 2013).

Therefore, some studies have argued that managers no longer use AEM; instead, they use REM (Nia, Sinnadurai, Sanusi, & Hermawan, 2017). Graham, Harvey, and Rajgopal (2005) earlier found that most EM is achieved via REM activities as opposed to AEM, while Cohen, Dey, and Lys (2008) found that the level of REM increased significantly after the passage of SOX, suggesting that firms switched from AEM to REM. However, it is also argued that managing earnings through REM activities is costly and can decrease the value of the firm because these actions are performed in the present period to boost profits, which will result in a negative effect on cash flow in future periods (Peasnell *et al*., 2005; Roychowdhury, 2006). In particular, insiders with concentrated ownership are more likely to have a long time horizon in the firm; thus, they are less likely to manage earnings using REM due to the negative effect of this costly technique on future performance (Francis *et al*., 2016).

In the context of Malaysia, previous studies have confirmed that firms have engaged in both AEM and REM. Based on 70,955 firm-year observations from 31 countries for the period 1990 to 1999, Leuz, Nanda, and Wysocki (2003) found that Malaysia was ranked 20th highest in terms of the aggregate AEM score (14.8). Likewise, Enomoto, Kimura, and Yamaguchi (2015) covered the period 1991 to 2010 for 222,513 firm-year observations from 38 countries and found that the aggregate AEM score in Malaysia was the 13th highest (23.3). Francis *et al*. (2016) found that the mean of AEM in Malaysian firms was 0.044, ranked 16th among 38 countries with 245,180 firm-year observations taken over 1994 to 2009. Similarly, a recent study by Lemma, Negash, Mlilo, and Lulseged (2018) based on 139,906 firm-year observations of 41 countries for the period 1995 to 2016, found that the mean of aggregate AEM in Malaysia was 0.507, the 14th highest.

Besides AEM, previous studies have also confirmed that firms engaged in REM. Enomoto *et al*. (2015) found that Malaysia's aggregate REM score is the 6th highest among 38 countries (33.5). Francis *et al*. (2016) reported that the mean values of the two proxies of REM, namely the Malaysian firms' abnormal production costs and abnormal discretionary expenses, were 0.048 and 0.024, ranked respectively 29th and 28th among 38 countries. Recently, Lemma *et al*. (2018) showed that Malaysian firms' average REM score is 0.502, the 30th highest among 41 countries.

As managers are encouraged to participate in different types of EM, the question remains, of course, whether they use AEM and REM as complementary or substitute tools in manipulating earnings reporting (Chen, Huang, & Fan, 2012). Thus, this study attempts to answer this question by examining the association between AEM and REM in Malaysia. Indeed, it is imperative to conduct this study to discover whether the full adoption of International Financial Reporting Standards (IFRSs) in Malaysia on 1 January 2012 terminated the practice of AEM, whether managers then shifted to REM or whether they are still using both types of EM as complementary tools. It is important to use several mechanisms of corporate governance (CG) to control the regression model investigating the association between REM activities and AEM; this has never used by previous studies. Including the CG mechanisms in the model could reduce the issue of endogeneity, called "omitted variable bias". Hence, CG mechanisms are considered as essential variables that affect the practices of EM and are included in the model.

This study contributes to existing knowledge from several perspectives. It contributes to the growing literature on examining the association between REM activities and AEM practices. However, in contrast to previous studies, this is the first to use several mechanisms of CG to control the regression model investigating the association between REM activities and AEM. Some of these mechanisms are related to the board of directors (BOD), i.e., size, meetings and independence, while others are related to the audit committee (AC), i.e., size,

meetings, independence and members with accounting expertise. Several regulators have frequently reformed their CG codes to strengthen the role of governance in mitigating EM. In the Malaysian context, several revisions have been made to the CG code (2007, 2012 and 2017), in an attempt to strengthen the governance practices. Therefore, integrating CG mechanisms into the model investigating the relationship between AEM and REM could enrich the existing literature in the field of EM.

According to the best knowledge of the researchers, this study is the first to investigate the association between AEM and REM using data from listed companies in Malaysia (non-alleged fraud). It is different from a related study conducted by Rahman *et al*. (2016) in Malaysia which used only one proxy of REM, namely, abnormal levels of cash flow from operations; it also selected allegedly fraudulent firms in Malaysia to investigate the relationship between AEM and REM. However, the current study uses the aggregate value of the three proxies of REM introduced by Roychowdhury (2006), integrating the possible tools for REM activities, instead of only using a single tool. Furthermore, the current study selects the listed firms in the main market of Bursa Malaysia with the lowest positive earnings, instead of allegedly fraudulent firms, providing further confirmation of the association between REM and AEM.

Generally, the results of the study provide evidence of a significant positive relationship between REM and AEM, supporting the complement hypothesis. This finding indicates that managers engage in both REM and AEM practices to achieve the desired earnings reporting. This empirical evidence is robust as the study implements several robustness tests and finds the same results.

Literature review and hypothesis development

Under agency theory, the word, "agency" means "contract" where a principal appoints and delegates some decision-making authority to an agent to perform certain services on behalf of the shareholders (Jensen & Meckling, 1976; Shleifer & Vishny, 1997). Therefore, the agent must work in the interests of the principal, while the principal must reward the agent; this is the "agency relationship" (Jensen & Meckling, 1976). Usually, managers are paid directly (bonus and salaries) and indirectly (job security and future promotions) based on the firm's earnings performance (Xie, Davidson, & DaDalt, 2003), which may motivate them to manipulate earnings.

The most critical factors for the existence of EM are: first, "information asymmetry"; managers may act only for their own benefit at the expense of the owner, as they have information about the firm that is not necessarily available to the owner (Riwayati & Siladjaja, 2015). Thus, in order for EM to be successful, most of the accounting information users could be either unwilling or unable to completely unravel the influences of EM (Fields, Lys, & Vin-

cent, 2001). Second is "opportunism", when managers employ their judgment in restructuring transactions and in financial reporting to amend annual reports for the purpose of misguiding some stakeholders regarding firm performance or to have an impact on contractual outcomes, which in many firms, are dependent on accounting figures (Healy & Wahlen, 1999, p. 368).

Engaging in EM could occur when managers exploit the flexibility of accounting principles (AEM) or change the timing or structure of operation, investment, or financing transactions (REM) to alter their companies' performance outcomes (Li, 2019). To reduce the managers' self-interest, the principal may limit the differences of interest through the creation of appropriate rewards for managers and the costs of monitoring incurred to reduce their abnormal activities; these costs are together known as agency costs (Jensen & Meckling, 1976). Agency costs include the costs of implementing control devices (e.g., BOD, AC, and external auditors), which could significantly reduce EM (Jiraporn, Miller, Yoon, & Kim, 2008). Accordingly, earlier studies have extensively investigated the influence of the CG mechanisms, among others, on mitigating the practice of AEM, while few studies have focused on the REM activities. Importantly, whether managers need to use one EM tool or both together to achieve their goals is not fully clarified.

The literature shows two opposing views in describing the relationship between AEM and REM, i.e., the substitute and complement hypotheses. Although few previous studies have examined the association between the AEM and REM, they have conflicting results regarding the relationship between REM activities and AEM (Chen *et al*., 2012), some consistent with the substitute hypothesis while others are consistent with the complement hypothesis. According to the former, AEM and REM could achieve the same goal. This means that managers could choose a single EM tool in order to gain their desired earnings reporting (Chen *et al*., 2012).

Some previous empirical studies support the substitute hypothesis. Barton (2001) provided evidence that managers use derivatives, one type of REM, and discretionary accruals (a proxy of AEM) as partial substitutes for smoothing earnings. Zang (2007) investigated the trade-offs between AEM and REM and found that both practices are used by managers, as substitutes for each other, during the preparation of financial reports. Equally, a study using 139,906 firm-year observations (non-financial firms) from 41 countries for the period 1995–2016 revealed a significant negative relationship between AEM and REM; firms appear to use AEM and REM as substitute mechanisms to mask economic performance (Lemma *et al*., 2018). This result was found to be consistent in both regression models of that study, the AEM and REM models. The authors included AEM as an additional explanatory variable in the REM model and vice versa, and produced the same results. Similarly, Laksmana and Yang (2014) found that REM is mostly negatively related to AEM, suggesting that firms seemed to engage in one tool of EM over the other.

Zang (2012) argued that REM and AEM are used by managers as substitute tools in

managing earnings, providing evidence that the level of REM activities is significantly and positively related to the costs associated with AEM; conversely, the level of AEM is significantly and positively related to the costs associated with REM activities. These findings support the substitute hypothesis in which managers trade off the two tools based on their relative cost. In the context of Malaysia, the study of Rahman *et al*. (2016), which consisted of 342 firm-observations of firms with alleged fraud for the period 2001 to 2013, revealed a significant negative relationship between AEM and REM which supported the substitute hypothesis. The authors argued that firms who commit fraud reduced their use of AEM, therefore increasing their use of abnormal cash flow from operations (one proxy of REM).

In contrast, the complement hypothesis supports the argument that managers use both forms of EM, real activities and discretionary accruals (Chen et al., 2012). This means that AEM and REM have a coordinated role in maximizing the desired earnings reporting. Mizik and Jacobson (2007) provided evidence that managers use both AEM and REM to inflate the firms' earnings, suggesting that the greatest effect on inflating the firms' earnings could be achieved through a coordinated approach. Lemma et al. (2018) also provided evidence supporting the complement hypothesis. They separately re-estimated their models for only US firms and reported a positive association between AEM and REM. Likewise, Chen et al. (2012) revealed that REM activities are positively associated with AEM, supporting the complement hypothesis. The authors suggested that managers used the two tools jointly and simultaneously to manipulate the earnings report.

Li (2019) also found that firms simultaneously used both tools of earnings manipulation, rather than a trade-off between them; using both AEM and REM together is also significantly associated with a higher return on the stock. Chen et al. (2012) argued that averaging the EM from using multiple tools is unlikely to be as obvious as using just one tool, as using a single tool is more likely to attract the attention of several parties such as auditors, regulators and market participants. Based on the complement hypothesis and the above discussion, the study suggests the following hypothesis:

H_1. There is a positive association between accrual earnings management and real earnings management.

Research methodology

Sample selection

The sample selection depended on the lowest positive firms' performance based on the ROA ratio (Burgstahler & Dichev, 1997; Roychowdhury, 2006; Ugrin, Mason, & Emley, 2017; Yuliana, Anshori, & Alim, 2015), as the ROA figure gives investors an idea of how efficiently

a company's management is generating earnings from its assets. Therefore, it is argued that managers are motivated to avoid reporting annual loss (Burgstahler & Dichev, 1997; Campa, 2015; Huynh & Nguyen, 2019; Roychowdhury, 2006). Hence, following the previous studies in EM which selected suspect firms whose ROA was between zero and 0.005 or 0.01 (Roychowdhury, 2006; Ugrin et al., 2017; Yuliana et al., 2015), 300 firms with the lowest positive earnings were selected for this study by following two steps (Al-Absy, Ku Ismail, & Chandren, 2017, 2018a, 2018b, 2019a, 2019b, 2019c). First, in one year or more, any firm with a negative ROA was excluded. Second, the average ROA for each firm was calculated (the sum of the ROA for all years / number of years). Then, the ascending averages were arranged to select the 300 firms with the lowest average. However, during data collection, 12 more firms were excluded. Thus, the final sample comprised 288 firms (864 firm-year observations for the three years). The selection of 2013 as a base year is based on the fact that it was the first financial year after the implementation of the MCCG 2012. Further, it was the following year of the full convergence with International Financial Reporting Standards (IFRS). Moreover, the data was collected until 2015. The reason is that the study includes several variables of CG were it is hand collected from firms' annual reports; as such, extending the period of study would be a challenge.

Measurement of earnings management

This study uses three measurements for AEM to provide extensive and robust results: the Jones Model (hereafter AEM-J), Modified Jones Model (MJM) by Dechow *et al*. (1995) (hereafter AEM-D) and MJM by Kasznik (1999) (hereafter AEM-K). It uses the Ordinary Least Squares (OLS) method to estimate the coefficients of α_1, α_2, α_3, α_4 and ε_{it} from the following equations for AEM-J, AEM-D and AEM-K, respectively.

$$\frac{TA_{it}}{A_{it-1}} = \alpha_1 \left(\frac{1}{A_{it-1}}\right) + \alpha_2 \left[\frac{(\Delta REV_{it})}{A_{it-1}}\right] + \alpha_3 \left(\frac{PPE_{it}}{A_{it-1}}\right) + \varepsilon_{it} \quad (1)$$

$$\frac{TA_{it}}{A_{it-1}} = \alpha_1 \left(\frac{1}{A_{it-1}}\right) + \alpha_2 \left[\frac{(\Delta REV_{it} - \Delta REC_{it})}{A_{it-1}}\right] + \alpha_3 \left(\frac{PPE_{it}}{A_{it-1}}\right) + \varepsilon_{it} \quad (2)$$

$$\frac{TA_{it}}{A_{it-1}} = \alpha_1 \left(\frac{1}{A_{it-1}}\right) + \alpha_2 \left[\frac{(\Delta REV_{it} - \Delta REC_{it})}{A_{it-1}}\right] + \alpha_3 \left(\frac{PPE_{it}}{A_{it-1}}\right) + \alpha_4 \left(\frac{\Delta CF_{it}}{A_{it-1}}\right) + \varepsilon_{it} \quad (3)$$

Where, TA_{it} is the total accruals (net income minus cash flows from operations), A_{it-1} is total assets of previous year, ΔREV_{it} is the change in revenues, ΔREC_{it} is the change in

accounts receivable, ΔCFO_{it} is the change in operating cash flows, PPE_{it} is gross property, plant and equipment, and ε_{it} is an error term. To calculate the discretionary accruals of the AEM-J, AEM-D and AEM-K, the study used the tool available in STATA software "statistics=>post-estimation=>predictions, residuals, etc.=> residuals (equation-level scores)" (Brennan, 2010, p. 621), after running the three equations. Lastly, the study uses the absolute values of AEM-J, AEM-D and AEM-K (ignoring the value sign), as in the previous studies.

For REM activities, the study uses the aggregate value of Roychowdhury (2006): the abnormal levels of cash flow from operations (ABCFO), the abnormal levels of production costs (ABPROD) and the abnormal levels of discretionary expenses (ABDISEXP). The following equations are used, respectively.

$$\frac{CFO_{it}}{A_{it-1}} = \beta_1\left(\frac{1}{A_{it-1}}\right) + \beta_2\left(\frac{S_{it}}{A_{it-1}}\right) + \beta_3\left(\frac{\Delta S_{it}}{A_{it-1}}\right) + \varepsilon_{it,} \quad (4)$$

$$\frac{PROD_{it}}{A_{it-1}} = \beta_1\left(\frac{1}{A_{it-1}}\right) + \beta_2\left(\frac{S_{it}}{A_{it-1}}\right) + \beta_3\left(\frac{\Delta S_{it}}{A_{it-1}}\right) + \beta_4\left(\frac{\Delta S_{it-1}}{A_{it-1}}\right) + \varepsilon_{it} \quad (5)$$

$$\frac{DISEXP_{it}}{A_{it-1}} = \beta_1\left(\frac{1}{A_{it-1}}\right) + \beta_2\left(\frac{S_{t-1}}{A_{t-1}}\right) + \varepsilon_t \quad (6)$$

Where, CFO_{it} is cash flow from operations, A_{it-1} is total assets of previous year, S_t is revenues while ΔS_{it} is the change in revenues. Further, $PROD_t$ reflects the cost of goods sold (COGS) plus the change in inventory (ΔINV), and lastly, ΔS_{it-1} is the one year lag of ΔS_{it}. For equation (6), $DISEXP_{it}$ is the sum of R&D, advertising, selling, general and administrative costs. Ordinary Least Squares (OLS) is used to estimate the coefficients of $\beta_1, \beta_2, \beta_3, \beta_4$ and ε_{it} for each equation. To calculate ABCFO, ABPROD and ABDISEXP, the study used the tool available in STATA software "statistics=>post-estimation=>predictions, residuals, etc.=> residuals (equation-level scores)" (Brennan, 2010, p. 621), after running equations 4, 5 and 6. Importantly, studies confirmed that firms involved in increase-earnings manipulation are likely to show low ABCFO, high ABPROD and/or low ABDISEXP, or vice versa. Therefore, the values of ABCFO and ABDISEXP are multiplied by –1 to achieve consistency among variables (Chen *et al*., 2012; Chi, Lisic, & Pevzner, 2011; Cohen & Zarowin, 2010; Haji-Abdullah & Wan-Hussin, 2015). The following equation was then used to combine the values of ABCFO, ABDISEXP and ABPROD to reflect the total value of the abnormal real earnings management (ABREM).

$$ABREM = ABCFO^{*-1} + ABPROD + ABDISEXP^{*-1} \quad (7)$$

Lastly, to be consistent with the proxies of DA and also based on recent ABREM studies (Chang, Wang, Chiu, & Huang, 2015; Francis *et al*., 2016; Kim & Sohn, 2013; Kwon, Na, & Park, 2017; Lisboa, 2016; Liu & Wang, 2017; Xu & Ji, 2016), this study used the absolute value of ABREM, meaning that the value sign was ignored.

Empirical Model

This study follows previous work in examining whether there is a relationship between AEM and REM. The previous studies used two empirical models, AEM and REM (Chen *et al*., 2012; Laksmana & Yang, 2014; Lemma *et al*., 2018). This study follows previous work first by including REM as an independent variable in the AEM models; and second by including AEM as an independent variable in the REM model. Furthermore, to minimize the probability of endogeneity and error in determining the models, this study included two groups of control variables related to CG mechanisms (Prencipe & Bar-Yosef, 2011). First are those related to the BOD, namely, board size (BSIZE), meetings (BMEET) and independence (BCIND); and to the AC, namely, AC size (ACSIZE), meetings (ACMEET), independence (ACIND) and accounting expertise (ACAE). Additional CG mechanisms namely, ownership concentration (Conc5) and Big4 audit firms (Big4) are also included. Secondly are the control variables related to firm-specific characteristics, namely, firm size (FSIZE), return on assets (ROA), leverage (LEV) and industry dummy (INDUS). These factors may influence managers' attitude towards engaging in earnings manipulations; they might also determine the use of AEM and REM as complementary or substitute tools. The definitions of the control variables are provided in Table 1. Thus, the empirical models used are:

$$AEM = \alpha + \beta_1 REM + \beta_2 BSIZE + \beta_3 BMEET + \beta_4 BCIND + \beta_5 ACSIZE + \beta_6 ACMEET + \beta_7 ACIND \beta_8 ACAE + \beta_9 Conc5 + \beta_{10} Big4 + \beta_{11} FSIZE + \beta_{12} LEV + \beta_{13} ROA + \beta_{14} INDUS + \varepsilon. \quad (1)$$

$$REM = \alpha + \beta_1 AEM + \beta_2 BSIZE + \beta_3 BMEET + \beta_4 BCIND + \beta_5 ACSIZE + \beta_6 ACMEET + \beta_7 ACIND \beta_8 ACAE + \beta_9 Conc5 + \beta_{10} Big4 + \beta_{11} FSIZE + \beta_{12} LEV + \beta_{13} ROA + \beta_{14} INDUS + \varepsilon. \quad (2)$$

Table 1

Variable definitions and measurements

Variables	Measurement
AEM	There are three measurements for AEM. AEM_J is the absolute value of discretionary accruals using the Jones Model, AEM_D is the absolute value of discretionary accruals using MJM by Dechow et al. (1995) and, AEM_K is the absolute value of discretionary accruals using MJM by Kasznik (1999).
REM	The absolute of the aggregate value of abnormal levels of real earnings management
BSIZE	Number of board directors
BMEET	Number of board meetings per year
BIND	The proportion of board independence
ACSIZE	Number of AC members
ACMEET	Number of AC meetings per year
ACIND	The proportion of AC independence
ACAE	The proportion of AC with accounting expertise
Conc5	The proportion of shares held by the five largest shareholders
Big4	"1" if the firm is audited by Big4, "0" otherwise
FSIZE	Natural log of total assets
LEV	Total debt to total assets
ROA	Net income/total assets
INDUS	"1" for observation in the manufacturing industry, and "0", otherwise

Results and discussion

Descriptive statistics

Table 2 shows the descriptive statistics of the variables. For AEM, the average AEM-J is 4.99, 4.84 and 4.45% for 2013, 2014 and 2015, respectively. The average AEM-D is 4.96, 4.87 and 4.52% and the average AEM-K is 3.69, 3.74 and 3.40%. It seems that there is no significant difference in the average AEM during these years. Taking all years together, the overall average value of AEM-J, AEM-D and AEM-K is 4.76, 4.79 and 3.61%, respectively. For REM, the average value is 13.24, 12.41 and 13.22% for 2013, 2014 and 2015, respectively. It seems that there is no significant difference in the average of REM over the years. Taking all the years together, the overall average value of REM is 12.96%.

Regarding the control variables, the average number of board directors and board meetings

is 7.42 and 5.46, respectively. Further, the average percentage of independent board directors is 47.45%, which indicates that Malaysian firms have implemented the recommendations of MCCG 2007 (one third) and almost fulfilled the recommendation of MCCG 2017 (50%). Concerning AC, the average number of AC directors and AC meetings is 3.24 and 5.04, respectively. Moreover, the average percentage of AC's independent directors is 89.97%, which is in line with the earlier MCCG requirement that the majority of AC directors should be independent, and almost meets the recommendation of MCCG 2017, that the AC should comprise solely independent directors. In respect of accounting expertise, the average percentage of AC directors who are qualified or experts in accounting is 42.89%.

The result in respect of ownership concentration suggests that the five largest shareholders have 54.60% of the ownership. 459 (53.13%) firm-year observations indicated auditing by Big4 audit firms. Regarding firm-specific characteristics, the average total assets (using the natural log value), leverage and ROA are 13.48, 20.78% and 4.41, respectively. 366 (42.36%) firm-year observations identified manufacturing firms.

Table 2

Descriptive Statistics of variables per Year

Variables	Obs.	Mean			
		2013	2014	2015	All Years
AEM_J	288	0.049924	0.048407	0.044535	0.047622
AEM_D	288	0.049628	0.048742	0.045197	0.047856
AEM_K	288	0.036886	0.037444	0.033976	0.036102
REM	288	0.132426	0.124111	0.132243	0.129593
BSIZE	288	7.402778	7.427083	7.423611	7.417824
BMEET	288	5.388889	5.475694	5.513880	5.459491
BIND	288	0.470039	0.475627	0.477719	0.474462
ACSIZE	288	3.225694	3.246528	3.260417	3.244213
ACMEET	288	4.986111	5.027778	5.104167	5.039352
ACIND	288	0.902256	0.896238	0.900637	0.899711
ACEXP	288	0.428357	0.427488	0.430787	0.428877
FSIZE	288	13.38396	13.48168	13.58904	13.48489
LEV	288	20.65024	20.77688	20.89850	20.77522
ROA	288	4.739236	4.386042	4.110417	4.411898
Conc5	288	0.545489	0.546213	0.546445	0.546049
Big4	288	153 (53.13%)	153 (53.13%)	153 (53.13%)	459 (53.13%)
INDUS	288	122 (42.36%)	122 (42.36%)	122 (42.36%)	366 (42.36%)

Note: All variables are as defined in Table 1. Descriptive Statistics is based on original data except for AEM_J,

AEM_D, REM, BMEET and ACMEET, which they have winsorized to reduce the outlierproblem. Sample for the three years is 864 firm-year observations (288 firms per year).

Diagnosis tests

Before running the regression of the empirical models, the study conducted several diagnostic tests. For instance, the outlier test found problems in some variables, including AEM, REM, ACMEET and BMEET. The data of AEM, REM and ACMEET were winsorized using the minimum level of 1%, and the data of BMEET using 5%. The normality test suggests that the data of all variables are normal, as the kurtosis and skewness of each variable do not exceed ±3 and ±10, respectively. The variance inflation factor (VIF) test reveals no multicollinearity issue, and the Pearson correlation test reported in Table 3 concluded that there is no issue over the degree of correlation among variables.

The Wooldridge test indicated that the data has no autocorrelation problem. The Breusch-Pagan / Cook-Weisberg test, however, shows that heteroscedasticity is a problem, so the regression of the empirical models is run within the "robust" option to rectify this. Lastly, the Lagrange Multiplier (LM) test indicates that the random effect in panel data is appropriate, so the random effect of panel data regression is used as the main regression. However, given the different conclusions of some authors, the study also re-estimates the empirical models by using the OLS and feasible generalized least squares (FGLS) as robustness tests to provide fitness results.

Table 3

Pearson Correlation Test

N	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	AEM_J	1																
2	AEM_D	0.93***	1.00															
3	AEM_K	0.55***	0.59***	1.00														
4	REM	0.26***	0.27***	0.21***	1.00													
5	BSIZE	-0.08**	-0.08**	-0.08**	-0.09**	1.00												
6	BMEET	0.05	0.03	0.08**	-0.04	0.20***	1.00											
7	BIND	0.06	0.05	0.02	0.05	-0.32***	0.07*	1.00										
8	ACSIZE	-0.07**	-0.07**	-0.03	-0.09***	0.31***	0.27***	0.20***	1.00									
9	ACMEET	0.00	0.00	-0.03	-0.06*	0.14***	0.59***	0.04	0.14***	1.00								
10	ACIND	0.09***	0.12***	0.07**	0.01	0.10***	-0.08**	0.41***	-0.08**	0.00	1.00							
11	ACEXP	0.04	0.04	0.03	0.05	-0.03	-0.02	-0.04	-0.15***	0.02	0.07**	1.00						
12	FSIZE	-0.11***	-0.14***	-0.12***	-0.20***	0.36***	0.35***	-0.02	0.27***	0.30***	-0.13***	-0.02	1.00					
13	LEV	0.05	0.06*	0.06*	-0.05	0.14***	0.08**	-0.11***	-0.01	0.13***	0.03	0.00	0.34***	1.00				
14	ROA	0.05	0.07**	0.05	0.06	0.08**	0.00	-0.06*	0.00	-0.05	-0.06*	0.01	0.04	-0.10***	1.00			
15	Big4	-0.07**	-0.09***	-0.08**	-0.05	0.12***	0.16***	0.04	0.20***	0.11***	-0.08**	0.03	0.47***	0.13***	0.02	1.00		
16	Conc5	-0.05	-0.05	-0.04	0.07**	0.05	0.14***	-0.09***	0.09**	0.07**	-0.13***	-0.01	0.09***	-0.08**	0.00	0.09***	1.00	
17	INDUS	0.03	0.04	0.00	0.12***	-0.09**	-0.27***	-0.09***	-0.14***	-0.14***	0.06*	0.04	-0.30***	-0.02	0.03	-0.12***	0.00	1

Notes: *** p<0.01, ** p<0.05, * p<0.1. All variables are as defined in Table 1.

Findings of the empirical model

The results using the random effect panel regression are presented in Table 4. In Model 1 (AEM Model), REM has been included as an independent variable to investigate the association between REM and AEM. To ensure robust results, the study has used three measurements of AEM, AEM-J, AEM-D and AEM-K. The study finds that REM is significantly and positively associated with all models of AEM, AEM-J, AEM-D and AEM-K, supporting the complement hypothesis. This finding suggests that managers used both types of earnings manipulation, REM and AEM, in reporting firms' earnings. For Model 2 (REM Model), the three measurements of AEM, AEM-J, AEM-D and AEM-K, have been separately included as independent variables to see whether there is a complementary association between AEM and REM. The results are consistent with the earlier results; all models of AEM, AEM-J, AEM-D and AEM-K, are significantly and positively associated with REM.

This means that firms who engaged in REM also joined in AEM at the same time. In these cases, both AEM and REM play essential roles in strategically boosting or undermining the firm's earnings. The result suggests that the full adoption of IFRSs in Malaysia where it is made on 1 January 2012 (one year's prior of collected the study data) may not entirely stop firms to engage in AEM practices. Further, insider directors, which in many cases, include family members, may easily participate in REM practices. Thus, in such fact of firms with the lowest positive firms' performance, managers are motivated to avoid reporting an annual loss by using both methods of EM, AEM and REM. Managers may engage in REM during the daily activities and also join in AEM at the end of the period (during the preparation of financial reporting) to control the situation. Overall, the results indicate that practicing both types of EM in firms are indispensable. This result is consistent with previous studies (Chen *et al.*, 2012; Lemma *et al.*, 2018; Li, 2019).

The empirical results for control variables in Model 1 (AEM) are as follows. The board size, board independence and AC meetings are not associated with AEM-J and AEM-D, while they are significantly and negatively associated with AEM-K. In addition, the board meetings and AC independence are significantly and positively associated with all measurements of AEM, AEM-J, AEM-D and AEM-K, which is inconsistent with agency and resource dependence theories. Further, the AC size, AC accounting expertise, big four audit firms and ownership concentrations are not associated with AEM-J, AEM-D and AEM-K. For the firm-specific characteristics, firm size is significantly negatively associated with AEM-D and AEM-K. The return on assets is positively associated with AEM-D. Firm's leverage is significantly positively associated with AEM-J, AEM-D and AEM-K. However, whether or not the firm is in the manufacturing sector is not associated with AEM.

The empirical results for control variables in Model 2 (REM) are as follows. The AC size is significantly and negatively associated with REM. However, independence of board directors and ownership concentration are significantly and positively associated with REM. Meanwhile, the board size, board meeting, AC independence, AC meetings and big four audit firms are found to be not associated with REM. For the firm-specific characteristics, size is significantly and negatively associated with REM. However, firms that belong to the manufacturing sector are significantly and positively associated with REM. Leverage and return on assets are not related to REM.

Table 4

Random effect regression of the main models

VARIABLES	Model 1 (AEM)			Model 2 (REM)		
	AEM_J	AEM_D	AEM_K	REM	REM	REM
REM	0.0969***	0.0949***	0.0512***			
	(0.0181)	(0.0183)	(0.0132)			
AEM_J				0.628***		
				(0.132)		
AEM_D					0.628***	
					(0.137)	
AEM_K						0.503***
						(0.157)
BSIZE	-0.00156	-0.00197	-0.00234***	0.00285	0.00311	0.00354
	(0.00134)	(0.00123)	(0.000849)	(0.00352)	(0.00357)	(0.00381)
BMEET	0.00334**	0.00282*	0.00391***	0.00254	0.00278	0.00260
	(0.00165)	(0.00152)	(0.00112)	(0.00404)	(0.00400)	(0.00414)
BIND	-0.00565	-0.0142	-0.0276*	0.108**	0.113**	0.126**
	(0.0211)	(0.0199)	(0.0141)	(0.0545)	(0.0544)	(0.0552)
ACSIZE	-0.000594	0.000954	0.00374	-0.0159	-0.0165*	-0.0191*
	(0.00405)	(0.00394)	(0.00348)	(0.00989)	(0.0100)	(0.00995)
ACMEET	-0.000755	-0.000126	-0.00255**	-0.000182	-0.000646	0.000847
	(0.00196)	(0.00186)	(0.00120)	(0.00444)	(0.00442)	(0.00452)
ACIND	0.0268*	0.0366***	0.0255**	-0.0603	-0.0649	-0.0592
	(0.0141)	(0.0131)	(0.0103)	(0.0466)	(0.0466)	(0.0475)
ACEXP	0.00453	0.00399	0.00234	0.0132	0.0132	0.0167
	(0.0103)	(0.00921)	(0.00672)	(0.0283)	(0.0280)	(0.0283)
FSIZE	-0.00238	-0.00289**	-0.00237**	-0.0140***	-0.0137***	-0.0156***

	(0.00147)	(0.00131)	(0.00104)	(0.00448)	(0.00446)	(0.00447)
LEV	0.000279**	0.000332***	0.000259**	0.000431	0.000368	0.000471
	(0.000136)	(0.000126)	(0.000107)	(0.000336)	(0.000333)	(0.000341)
ROA	0.000947	0.00145**	0.000924	0.00203	0.00168	0.00220
	(0.000717)	(0.000685)	(0.000588)	(0.00173)	(0.00173)	(0.00171)
Big4	-0.00301	-0.00385	-0.00253	0.0103	0.0108	0.0108
	(0.00398)	(0.00372)	(0.00313)	(0.0124)	(0.0123)	(0.0123)
Conc5	-0.0172	-0.0155	-0.0119	0.0778**	0.0783**	0.0770*
	(0.0109)	(0.0101)	(0.00901)	(0.0394)	(0.0397)	(0.0397)
INDUS	-0.00164	-0.00186	-0.00263	0.0210*	0.0211*	0.0216*
	(0.00370)	(0.00352)	(0.00301)	(0.0126)	(0.0125)	(0.0126)
Constant	0.0445**	0.0413**	0.0468***	0.229***	0.229***	0.249***
	(0.0216)	(0.0193)	(0.0151)	(0.0632)	(0.0634)	(0.0647)
Sig	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Wald chi2	52.52	60.86	47.86	60.17	55.12	41.86
between	0.1478	0.1778	0.1770	0.1594	0.1684	0.1602
overall	0.1098	0.1244	0.1020	0.1277	0.1308	0.1061
Observations	864	864	864	864	864	864
Sample	288	288	288	288	288	288

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. All variables are as defined in Table 1.

Robustness tests

Standardized the value of AEM and REM

Further tests were conducted to examine the robustness of the main Model 1 and Model 2 and to find out whether or not the results are similar to the main Models. For instance, this study used standardized values of Roychowdhury (2006), namely the ABCFO, ABDISEXP and ABPROD (Chen *et al.*, 2012; Chen, Cheng, & Wang, 2010; Chi *et al.*, 2011; Cohen *et al.*, 2008; Cohen & Zarowin, 2010; Haji-Abdullah & Wan-Hussin, 2015; Liu & Tsai, 2015), and the sum of these values is calculated. Lastly, the study used the absolute value of the sum of the standardized value of Roychowdhury (2006) and also standardized the value of DA (Kim & Sohn, 2013). The findings in Table 5 correspond to those in Table 4, meaning that they are not differentiated by the standardized or non-standardized values.

Table 5
Random effect regression the Standardized value of AEM and REM

VARIABLES	Model 1 (AEM)			Model 2 (REM)		
	AEM_J	AEM_D	AEM_K	REM	REM	REM
REM	0.145***	0.139***	0.102***			
	(0.0230)	(0.0234)	(0.0238)			
AEM_J				0.623***		
				(0.105)		
AEM_D					0.609***	
					(0.107)	
AEM_K						0.312***
						(0.0856)
BSIZE	-0.0223	-0.0279*	-0.0472***	0.0373	0.0406	0.0454
	(0.0181)	(0.0167)	(0.0168)	(0.0381)	(0.0387)	(0.0419)
BMEET	0.0444**	0.0376*	0.0777***	0.0204	0.0241	0.0235
	(0.0220)	(0.0204)	(0.0220)	(0.0436)	(0.0433)	(0.0455)
BIND	-0.129	-0.240	-0.577**	1.315**	1.382**	1.542**
	(0.284)	(0.269)	(0.279)	(0.599)	(0.601)	(0.615)
ACSIZE	-0.00482	0.0156	0.0752	-0.156	-0.165	-0.198*
	(0.0550)	(0.0536)	(0.0691)	(0.112)	(0.113)	(0.113)
ACMEET	-0.00768	0.000648	-0.0494**	-0.0161	-0.0222	-0.00342
	(0.0264)	(0.0251)	(0.0237)	(0.0480)	(0.0481)	(0.0499)
ACIND	0.393**	0.525***	0.526***	-0.792	-0.852*	-0.769
	(0.191)	(0.178)	(0.204)	(0.505)	(0.508)	(0.522)
ACEXP	0.0534	0.0475	0.0431	0.155	0.156	0.203
	(0.138)	(0.124)	(0.132)	(0.304)	(0.301)	(0.307)
FSIZE	-0.0282	-0.0359**	-0.0457**	-0.144***	-0.140***	-0.167***
	(0.0195)	(0.0175)	(0.0204)	(0.0483)	(0.0483)	(0.0486)
LEV	0.00358**	0.00436***	0.00504**	0.00484	0.00405	0.00552
	(0.00182)	(0.00169)	(0.00210)	(0.00373)	(0.00371)	(0.00384)
ROA	0.0116	0.0187**	0.0178	0.0227	0.0183	0.0258
	(0.00953)	(0.00918)	(0.0116)	(0.0182)	(0.0184)	(0.0186)
Big4	-0.0420	-0.0532	-0.0501	0.102	0.109	0.108
	(0.0535)	(0.0502)	(0.0619)	(0.134)	(0.134)	(0.135)
Conc5	-0.238	-0.214	-0.233	0.748*	0.754*	0.733*

	(0.146)	(0.137)	(0.178)	(0.430)	(0.434)	(0.436)
INDUS	-0.0290	-0.0311	-0.0551	0.238*	0.240*	0.245*
	(0.0499)	(0.0477)	(0.0593)	(0.136)	(0.135)	(0.137)
Constant	0.520*	0.491*	0.894***	2.440***	2.459***	2.753***
	(0.282)	(0.258)	(0.300)	(0.709)	(0.723)	(0.736)
Sig	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Wald chi2	62.41	68.01	50.03	75.87	65.82	42.64
between	0.1667	0.1961	0.1902	0.1770	0.1859	0.1698
overall	0.1362	0.1477	0.1101	0.1518	0.1523	0.1123
Observations	864	864	864	864	864	864
Sample	288	288	288	288	288	288

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. All variables are as defined in Table 1.

Including the year's dummy variables

This study re-estimated Model 1 and Model 2 by setting a dummy variable for the year (Cai, Luo, & Wan, 2012; Luo, Wan, Cai, & Liu, 2013; Sakawa & Watanabel, 2017, 2018; Su, Xu, & Phan, 2008). The argument is that the business cycle (years) may influence the outcome of the regression (see Baatwah, Salleh, & Ahmad, 2015; Datta, Iskandar-Datta, & Singh, 2013). Table 6 presents the results of the re-estimated Model 1 and Model 2 by including a year dummy variable to control for these effects. Table 6 shows the same results as those reported in Table 4. Additional robustness tests including dummy variables were also conducted (tables provided upon request). For example, the study re-estimated Model 1 and Model 2 by removing the manufacturing dummy variable (INDUST) and instead setting dummy variables for the sectors, i.e., construction, industrial products, property, technology, plantation and trading and services. It also re-estimated Model 1 and Model 2 by including the year's dummy variables besides the dummy variables for the sectors. The results were the same as those presented in Table 4 in terms of association between AEM and REM. Regarding the control variable, it is similar to the previous study, except for AC size and meetings with only AEM-K, and ACIND and FSIZE with only AEM-J.

Table 6
Random effect regression using the dummy year's variable

VARIABLES	Model 1 (AEM)			Model 12 (REM)		
	AEM_J	AEM_D	AEM_K	REM	REM	REM
REM	0.0977***	0.0955***	0.0518***			
	(0.0180)	(0.0183)	(0.0132)			
AEM_J				0.633***		
				(0.131)		
AEM_D					0.633***	
					(0.137)	
AEM_K						0.510***
						(0.156)
BSIZE	-0.00160	-0.00200	-0.00237***	0.00303	0.00329	0.00372
	(0.00135)	(0.00124)	(0.000851)	(0.00351)	(0.00356)	(0.00382)
BMEET	0.00334**	0.00281*	0.00390***	0.00257	0.00283	0.00264
	(0.00165)	(0.00152)	(0.00111)	(0.00404)	(0.00400)	(0.00414)
BIND	-0.00553	-0.0143	-0.0279**	0.109**	0.114**	0.128**
	(0.0212)	(0.0200)	(0.0142)	(0.0546)	(0.0546)	(0.0553)
ACSIZE	-0.000480	0.00104	0.00382	-0.0163	-0.0169*	-0.0195*
	(0.00406)	(0.00393)	(0.00349)	(0.00993)	(0.0100)	(0.00998)
ACMEET	-0.000684	-7.38e-05	-0.00250**	-0.000405	-0.000854	0.000679
	(0.00194)	(0.00184)	(0.00118)	(0.00440)	(0.00438)	(0.00450)
ACIND	0.0270*	0.0369***	0.0259**	-0.0624	-0.0671	-0.0614
	(0.0141)	(0.0131)	(0.0103)	(0.0463)	(0.0463)	(0.0473)
ACEXP	0.00472	0.00412	0.00244	0.0124	0.0124	0.0160
	(0.0103)	(0.00922)	(0.00670)	(0.0282)	(0.0279)	(0.0282)
FSIZE	-0.00217	-0.00275**	-0.00227**	-0.0146***	-0.0141***	-0.0160***
	(0.00148)	(0.00132)	(0.00105)	(0.00451)	(0.00449)	(0.00452)
LEV	0.000273**	0.000328***	0.000255**	0.000446	0.000382	0.000482
	(0.000136)	(0.000126)	(0.000107)	(0.000338)	(0.000334)	(0.000343)
ROA	0.000845	0.00138**	0.000883	0.00219	0.00180	0.00230
	(0.000712)	(0.000680)	(0.000584)	(0.00175)	(0.00175)	(0.00175)
Big4	-0.00327	-0.00401	-0.00265	0.0109	0.0114	0.0113
	(0.00399)	(0.00372)	(0.00315)	(0.0123)	(0.0122)	(0.0123)
Conc5	-0.0173	-0.0156	-0.0120	0.0781**	0.0785**	0.0773*

	(0.0109)	(0.0101)	(0.00901)	(0.0394)	(0.0397)	(0.0397)
INDUS	-0.00146	-0.00176	-0.00257	0.0206	0.0208*	0.0213*
	(0.00369)	(0.00352)	(0.00302)	(0.0126)	(0.0125)	(0.0126)
Constant	0.0433**	0.0402**	0.0454***	0.237***	0.237***	0.255***
	(0.0214)	(0.0192)	(0.0150)	(0.0627)	(0.0628)	(0.0643)
Years dummy	Included	Included	Included	Included	Included	Included
Sig	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Wald chi2	55.06	61.54	48.99	67.34	61.06	46.41
between	0.1474	0.1777	0.1776	0.1602	0.1691	0.1609
overall	0.1120	0.1259	0.1038	0.1300	0.1329	0.1082
Observations	864	864	864	864	864	864
Sample	288	288	288	288	288	288

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. All variables are as defined in Table 1.

Using lagged dependent variable

Although a wide range of variables related to corporate and firm-specific characteristics are employed in the present study's models in an attempt to minimize the possibility of omitted variables, the literature documented that the issue of endogeneity is a severe econometric problem which needs to be investigated. Researchers have argued that the strategy of including the one-year lagged dependent variable in the model, as an independent variable, could deal with the endogeneity concerns (Al-Jaifi, 2017; Al-Jaifi, Al-Rassas, & AL-Qadasi, 2017). This study therefore re-estimates Model 1 (AEM) by including the one-year lagged AEM as an independent variable. Similarly, it re-estimates Model 2 (REM) by including the one-year lagged REM as an independent variable. The results in Table 7 demonstrate that even after including for one-year lagged dependent variable in the main Models, the majority of results are similar to those shown in Table 4. Thus, the results of this study seem to be robust.

Table 7
Random effect regression using lagged dependent variable

VARIABLES	Model 1 (AEM)			Model 2 (REM)		
	AEM_J	AEM_D	AEM_K	REM	REM	REM
AEM_J t - 1	0.182***					
	(0.0480)					
AEM_D t - 1		0.129***				
		(0.0453)				
AEM_K t - 1			0.253***			
			(0.0493)			
REM	0.0736***	0.0730***	0.0316**			
	(0.0207)	(0.0216)	(0.0134)			
REM t - 1				0.375***	0.378***	0.370***
				(0.0942)	(0.0945)	(0.0986)
AEM_J				0.548***		
				(0.171)		
AEM_D					0.538***	
					(0.176)	
AEM_K						0.262
						(0.193)
BSIZE	-0.000643	-0.00148	-0.00192**	0.00412	0.00447	0.00431
	(0.00140)	(0.00137)	(0.000776)	(0.00284)	(0.00285)	(0.00314)
BMEET	0.00237	0.00198	0.00313**	0.00691	0.00728*	0.00781*
	(0.00153)	(0.00154)	(0.00130)	(0.00423)	(0.00423)	(0.00443)
BIND	-0.0118	-0.0239	-0.0304**	0.0637	0.0713	0.0723
	(0.0208)	(0.0208)	(0.0134)	(0.0475)	(0.0471)	(0.0484)
ACSIZE	-0.00242	3.22e-05	0.00338	-0.0108	-0.0124	-0.0141
	(0.00389)	(0.00410)	(0.00297)	(0.00962)	(0.00960)	(0.00950)
ACMEET	-0.000879	-2.45e-05	-0.00136	-0.00469	-0.00521	-0.00500
	(0.00203)	(0.00216)	(0.00123)	(0.00472)	(0.00477)	(0.00488)
ACIND	0.0191	0.0347**	0.0334***	-0.0652	-0.0735*	-0.0655
	(0.0143)	(0.0142)	(0.00999)	(0.0398)	(0.0401)	(0.0422)
ACEXP	0.00351	-0.000507	0.00283	-0.00262	5.27e-05	0.000784
	(0.0108)	(0.00987)	(0.00734)	(0.0218)	(0.0213)	(0.0218)

FSIZE	-0.00187	-0.00233	-0.00224**	-0.0109***	-0.0107***	-0.0122***
	(0.00148)	(0.00147)	(0.00103)	(0.00368)	(0.00366)	(0.00383)
LEV	0.000284**	0.000317**	0.000206*	0.000171	0.000165	0.000310
	(0.000138)	(0.000142)	(0.000110)	(0.000305)	(0.000302)	(0.000311)
ROA	0.000552	0.000985	0.000475	0.000766	0.000635	0.00124
	(0.000825)	(0.000834)	(0.000650)	(0.00206)	(0.00209)	(0.00210)
Big4	-0.00125	-0.00376	-0.00189	0.0111	0.0124	0.0112
	(0.00390)	(0.00400)	(0.00305)	(0.0103)	(0.0104)	(0.0105)
Conc5	-0.0145	-0.0100	-0.0109	0.0456	0.0427	0.0416
	(0.0118)	(0.0116)	(0.00934)	(0.0277)	(0.0279)	(0.0286)
INDUS	0.000595	-0.000702	-0.00228	0.0176*	0.0182*	0.0192*
	(0.00376)	(0.00381)	(0.00278)	(0.0104)	(0.0104)	(0.0108)
Constant	0.0446**	0.0404*	0.0304*	0.177***	0.181***	0.208***
	(0.0206)	(0.0210)	(0.0158)	(0.0577)	(0.0579)	(0.0600)
Sig	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wald chi2	62.65	53.50	72.72	86.83	86.28	75.71
between	0.3459	0.2726	0.4315	0.6192	0.6241	0.6290
overall	0.1383	0.1268	0.1822	0.2693	0.2678	0.2398
Observations	576	576	576	576	576	576
Sample	288	288	288	288	288	288

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. AEM_J t – 1, AEM_D t - 1, AEM_K t – 1 and REM t - 1 are a one-year lag of AEM_J, AEM_D, AEM_K and REM, respectively. The remain variables are defined in Table 1.

Using alternative estimator's techniques

The study further tests the robustness of the results by using alternative estimator techniques. First, it re-estimates Model 1 and Model 2 using pooled OLS regression. The reason for using this type of regression is that including only a three-year period (2013 to 2015) may give different results from those calculated over a longer period. Further, it was expected that most of the CG characteristics are time-invariant, especially considering the short period. The results presented in Table 8 are largely similar to those shown in Table 4. Thus, the results of this study seem to be robust.

Table 8
OLS regression of the main models

VARIABLES	Model 1 (AEM)			Model 2 (REM)		
	AEM_J	AEM_D	AEM_K	REM	REM	REM
REM	0.0909***	0.0908***	0.0554***			
	(0.0162)	(0.0163)	(0.0123)			
AEM_J				0.668***		
				(0.125)		
AEM_D					0.701***	
					(0.127)	
AEM_K						0.687***
						(0.155)
BSIZE	-0.00195*	-0.00224**	-0.00258***	0.00485	0.00511	0.00540
	(0.00104)	(0.00104)	(0.000700)	(0.00317)	(0.00319)	(0.00329)
BMEET	0.00384***	0.00308**	0.00428***	0.000741	0.00114	0.000447
	(0.00138)	(0.00137)	(0.00105)	(0.00365)	(0.00366)	(0.00370)
BIND	-0.00792	-0.0164	-0.0304**	0.131***	0.137***	0.150***
	(0.0176)	(0.0168)	(0.0121)	(0.0488)	(0.0486)	(0.0487)
ACSIZE	-0.000487	0.00135	0.00418	-0.0190**	-0.0202**	-0.0227***
	(0.00325)	(0.00326)	(0.00275)	(0.00887)	(0.00890)	(0.00870)
ACMEET	-0.00145	-0.000604	-0.00284**	-0.00155	-0.00209	-0.000630
	(0.00168)	(0.00166)	(0.00113)	(0.00427)	(0.00426)	(0.00429)
ACIND	0.0302**	0.0401***	0.0316***	-0.0806**	-0.0883**	-0.0836**
	(0.0120)	(0.0116)	(0.00915)	(0.0368)	(0.0368)	(0.0374)
ACEXP	0.00460	0.00371	0.00249	0.0235	0.0239	0.0255
	(0.00814)	(0.00732)	(0.00579)	(0.0225)	(0.0220)	(0.0222)
FSIZE	-0.00211*	-0.00263**	-0.00213**	-0.0171***	-0.0166***	-0.0175***
	(0.00116)	(0.00111)	(0.000830)	(0.00332)	(0.00329)	(0.00335)
LEV	0.000285**	0.000321***	0.000244***	0.000247	0.000211	0.000280
	(0.000110)	(0.000106)	(8.80e-05)	(0.000258)	(0.000258)	(0.000266)
ROA	0.00108*	0.00149**	0.000899*	0.00226	0.00193	0.00244
	(0.000646)	(0.000656)	(0.000514)	(0.00187)	(0.00190)	(0.00191)
Big4	-0.00331	-0.00409	-0.00274	0.0152*	0.0158*	0.0152
	(0.00334)	(0.00323)	(0.00262)	(0.00919)	(0.00920)	(0.00933)
Conc5	-0.0163*	-0.0142	-0.0103	0.0832***	0.0820***	0.0811***
	(0.00942)	(0.00901)	(0.00733)	(0.0287)	(0.0284)	(0.0288)

INDUS	-0.00127	-0.00161	-0.00254	0.0174*	0.0176**	0.0187**
	(0.00324)	(0.00318)	(0.00256)	(0.00901)	(0.00898)	(0.00910)
Constant	0.0418**	0.0375**	0.0382***	0.281***	0.282***	0.291***
	(0.0175)	(0.0169)	(0.0128)	(0.0501)	(0.0495)	(0.0495)
Sig	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F-Value	5.10	5.67	5.01	7.05	7.05	6.12
R^2	0.1105	0.1247	0.1027	0.1311	0.1338	0.1101
Observations	864	864	864	864	864	864
Sample	288	288	288	288	288	288

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. All variables are as defined in Table 1.

Secondly, the study re-estimates Model 1 and Model 2 by using FGLS regression, which delivers reliable estimates in the presence of heteroscedasticity (Wooldridge, 2010). Therefore, FGLS regression with the option "panels (heteroscedastic)" was used to solve the heteroscedasticity problem (Podestà, 2002; StataCorp, 2015), as adopted in previous studies (Al-Absy, Ku Ismail, & Chandren, 2019d; Cai et al., 2012; Sakawa & Watanabel, 2017, 2018; Yoshikawa & Rasheed, 2010). Table 9 shows the findings of the FGLS regression. The findings for Model 1 (AEM) are consistent with those presented in Table 4; REM is significantly and positively associated with all models of AEM (AEM-J, AEM-D and AEM-K), supporting the complement hypothesis. The results for Model 2 (REM) are also consistent with those in Table 4; all models of AEM (AEM-J, AEM-D and AEM-K) are significantly and positively associated with REM. However, the results of control variables are somewhat different due to the difference of FGLS from other methods of analysis.

Table 9
FGLS regression of the main models

VARIABLES	Model 1 (AEM)			Model 2 (REM)		
	AEM_J	AEM_D	AEM_K	REM	REM	REM
REM	0.0960***	0.0911***	0.0490***			
	(0.00849)	(0.00946)	(0.00664)			
AEM_J				0.707***		
				(0.0526)		
AEM_D					0.745***	
					(0.0498)	
AEM_K						0.570***

						(0.0730)
BSIZE	-0.00109**	-0.00149***	-0.00234***	0.00286**	0.00369***	0.00268*
	(0.000504)	(0.000516)	(0.000397)	(0.00136)	(0.00131)	(0.00148)
BMEET	0.00390***	0.00308***	0.00371***	0.00230*	0.00321***	0.00150
	(0.000498)	(0.000591)	(0.000494)	(0.00132)	(0.00116)	(0.00153)
BIND	-0.0129	-0.0194**	-0.0180**	0.0772***	0.0962***	0.0812***
	(0.00930)	(0.00909)	(0.00697)	(0.0226)	(0.0225)	(0.0243)
ACSIZE	-0.000300	0.000323	0.00460***	-0.0130***	-0.0152***	-0.0133***
	(0.00146)	(0.00153)	(0.00143)	(0.00381)	(0.00388)	(0.00413)
ACMEET	-0.00159**	-0.000586	-0.00238***	-0.00330*	-0.00427**	-0.00191
	(0.000703)	(0.000759)	(0.000597)	(0.00168)	(0.00170)	(0.00194)
ACIND	0.0338***	0.0399***	0.0251***	-0.0434***	-0.0520***	-0.0301*
	(0.00646)	(0.00608)	(0.00500)	(0.0158)	(0.0157)	(0.0179)
ACEXP	0.0107***	0.00555*	0.00600*	0.00584	0.00777	0.0193*
	(0.00311)	(0.00295)	(0.00330)	(0.00923)	(0.00904)	(0.00989)
FSIZE	-0.00198***	-0.00157***	-0.00135***	-0.0126***	-0.0129***	-0.0135***
	(0.000481)	(0.000481)	(0.000472)	(0.00155)	(0.00152)	(0.00163)
LEV	0.000311***	0.000333***	0.000215***	0.000194	0.000212	0.000279*
	(5.30e-05)	(5.59e-05)	(4.90e-05)	(0.000137)	(0.000134)	(0.000150)
ROA	0.000799***	0.00125***	0.00124***	0.000767	0.000273	0.000896
	(0.000302)	(0.000350)	(0.000271)	(0.000783)	(0.000764)	(0.000800)
Big4	-0.00366**	-0.00546***	-0.00249*	0.0116***	0.0101**	0.00838*
	(0.00173)	(0.00177)	(0.00145)	(0.00431)	(0.00424)	(0.00474)
Conc5	-0.0164***	-0.0128**	-0.0133***	0.0670***	0.0718***	0.0667***
	(0.00525)	(0.00508)	(0.00403)	(0.0107)	(0.0106)	(0.0110)
INDUS	-0.000915	-5.83e-05	-0.00271*	0.0244***	0.0252***	0.0208***
	(0.00162)	(0.00167)	(0.00138)	(0.00408)	(0.00402)	(0.00454)
Constant	0.0251***	0.0160*	0.0203***	0.215***	0.217***	0.218***
	(0.00916)	(0.00878)	(0.00699)	(0.0204)	(0.0211)	(0.0237)
Sig	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wald chi2	492.53	356.82	242.63	592.32	763.76	391.77
Observations	864	864	864	864	864	864
Sample	288	288	288	288	288	288

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. All variables are as defined in Table 1.

Lastly, the study re-estimates Model 1 and Model 2 by using fixed effect-panel data regression, as this style of regression could control the time-invariant firm-level factors, and test for endogeneity (Al-Jaifi, 2017). The results of this regression in terms of the association between AEM and REM, in both Model 1 and Model 2, are exactly the same as those reported in Table 4. However, the results of control variables are different, given the difference of the fixed effect-panel data regression from other methods of analysis (table provided upon request).

Conclusion

Managers' attitude toward engaging in earnings manipulation remains a problem, and the arguments about whether managers are likely to practice AEM or REM are also ongoing. Most recent studies argue that managers are shifting to REM activities and away from AEM. However, there is evidence that managers still resort to both types of EM to achieve the maximum effect on the earnings report. Thus, the question of whether the two types of EM are used as substitute or complementary tools has still not been definitively answered. Hence, this study examines the association between AEM and REM of listed companies in the main market of Malaysia.

The study provides evidence of a significant positive relationship between REM activities and AEM practices, supporting the complement hypothesis. The same results are found in both the AEM Model when REM is included as an independent variable, and the REM Model, where AEM is included as an independent variable. This empirical evidence is robust as the study implements several robustness tests; standardized the value of AEM and REM, including the year's dummy variables in the Models, using lagged dependent variable and using alternative estimator's techniques, and finds the same results. Therefore, it seems that managers use these two techniques, AEM and REM, jointly when preparing financial reports. These findings could be of importance to policy makers, regulators, investors and practitioners worldwide, but particularly in Malaysia. They enable further research into the relationship between AEM and REM. Notably, in overcoming the limitations of the study where it is focused only on firms with the lowest positive firms' performance based on the ROA ratio. Future studies should increase the sample size and the period under investigation and will be of especial value if they are able to predict the presence of variables which might affect the relationship between AEM and REM.

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