Corporate governance and earnings management nexus: Evidence from the UK and Egypt using neural networks

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Corporate Governance and Earnings Management Nexus: Evidence from the UK and Egypt Using Neural Networks

Abstract

Using conventional regressions and Generalized Regression Neural Networks (GRNN), we examine the relationship between Corporate Governance (CG) and Earnings Management (EM). We also examine whether governance quality moderates the association between EM and CG for a sample of British and Egyptian companies. Our findings show that: (a) UK firms are likely to have lower levels of EM if they: have smaller boards, are dominated by independent outside directors, and have a low percentage of female directors; (b) Egyptian firms are likely to have lower levels of EM if they: have larger boards, are dominated by independent outside directors, and have a low percentage of female directors; (c) The governance quality (control of corruption) has a significant hidden effect on EM. Since our results provide empirical evidence that the board of directors plays a vital role in mitigating EM, these findings might lead to an improvement in the credibility of financial statements for investors in both the UK and Egypt. As policy implications, our findings inform regulators and policy-makers that corruption has a very strong hidden effect on EM and that they can deter EM by controlling the corruption level in their countries.

Keywords: Earnings management; Corporate governance; Governance quality, Neural networks; Corruption.

JEL Classification: C45, G34, G38, K42, M41

1. Introduction

The aftermath of the considerable rise in earnings restatement and financial scandals, such as WorldCom, Enron, MG Rover Group, and Northern Rock, has raised investor concerns about corporate governance (CG). The concept of CG has attracted the interest of many authors and researchers as a possible solution to the agency problems of the relationships between managers and owners. Previous research suggests that CG plays an important role in monitoring managers' actions in addition to restricting possible opportunistic behaviour: hence, CG mechanisms will be able to reduce agency costs (González & García-Meca, 2014). The board of directors (BoDs) is a key CG mechanism, which is responsible for aligning the interest of stockholders and managers and mitigating the inherent agency problems. Moreover, it has been argued that the BODs deters opportunistic behaviour (Park & Shin 2004; Marra et al., 2011). Fama and Jensen (1983) argued that the BoDs plays a leading role in CG, especially in monitoring top management. Thus, this study examines the governance role of the BoDs on mitigating earnings management (EM).

The theoretical and empirical literature offers mixed findings related to the association between BoDs and EM (Ramdani & Witteloostuijn, 2010). Agency theorists suggest that the board should be denominated by outside directors in order to mitigate EM. Furthermore, they argue that a small board size is preferable, and that separation between the CEO and the chairperson

of the BoDs is critical for the effectiveness of the board's monitoring responsibility (e.g. Eckles et al., 2011). From the viewpoint of stewardship theory, larger and independent boards are preferable to mitigate agency problems (Bhagat & Black, 1999). Moreover, stewardship theory argues that CEO duality is essential to unify firm leadership (Donaldson and Davis, 1991). This contradictory theoretical framework is also mirrored in previous empirical studies.

Although a number of prior studies have investigated the relationship between BoDs and corporate EM practices (Anglin et al., 2013; Chen & Zhang, 2012; Leventis & Dimitropoulos, 2012; Ramdani & Witteloostuijn, 2010), a prudent evaluation of this literature reveals a number of weaknesses. First, the governance role of the BoDs has recently been a growing area of research, although most prior empirical research has concentrated on developed countries. Little attention has been focused on the relationship between CG and EM in developing contexts such as India (Sarkar et al., 2008), Jordan (Al-Thuneibat, 2009), and Egypt, where most companies are family owned (Soliman & Ragab, 2014). Second, it can be noticed that the vast majority of CG and EM research has been conducted within a single country (Doupnik, 2008). Third, previous research (e.g., Elghuweel et al., 2017; Judge, 2010) suggests that the extent to which formal and informal CG structures are employed vary worldwide. For instance, equity-based markets tend to be the key CG arrangements in Anglo-American economies (e.g., UK and US) compared to concentrated ownership constructions in Arab countries (e.g., Egypt, Saudi Arabia) African (e.g., South Africa and Nigeria) and Asian (e.g., China, Malaysia and Singapore) economies. In developing countries (e.g., China and Egypt), however, the main CG mechanism is often the state/informal systems. Notwithstanding these variances in CG structure worldwide, current studies have directed excessively to evaluate the influence of Anglo-Saxon CG arrangements on EM to the neglect of the others (Alves, 2012; Bekiris & Doukakis, 2011; Elghuweel et al., 2017; Ghosh et al., 2010), and thus debatably weakening present understanding of the influence of CG on EM in different countries. Fourth and although a number of studies have examined the relationship between CG and EM (Bowen et al., 2008; Jiang et al., 2008; McNichols, 2000), they are noticeably focused in a few developed countries, such as US and UK, which tend to have principally similar CG, economic, legal and institutional contexts (Elghuweel et al., 2017; Gavious et al., 2012; Krishnan & Parsons, 2008). Though, it can be claimed that in developing countries, such as Egypt with dissimilar CG, economic and legal environment, formal CG mechanisms ability to restrain managers to engage in EM may differ, and consequently the link between CG and EM can be likely to vary (Elghuweel et al., 2017).

The comparison between the UK and Egypt is interesting, since the two countries offer unique sets of characteristics and differences. Firstly, the UK is one of the developed countries in the Group of Eight (G8), which includes the leading industrial countries, whilst Egypt is one of the developing countries in the (D8) Organization for Economic Cooperation. Secondly, the UK has a strong common law tradition, whilst Egypt is a civil law country. Thirdly, the UK has a market-based economy (relying on capital markets and the issuance of securities to finance corporate investment), whilst Egypt is considered as a bank-based economy (relying on debt markets and the issuance of bonds to finance corporate investment). Finally, the UK is one of the highest ranked countries in terms of having the lowest perceived levels of corruption, whilst Egypt is one of the lowest ranked countries in this regard, being perceived as having excessive levels of corruption (Corruption Perceptions Index, 2015). In addition, there are historical relations between the two nations, as Egypt was one of the largest British colonies in the early/mid-19th century: as such, Egyptian firms can use UK firms as a benchmark to develop their CG mechanisms.

Our paper contributes to current research as follows. First, we use a non-parametric technique, namely the Generalized Regression Neural Network (GRNN), as well as using conventional techniques, namely OLS and fixed/random effect regressions. Our study offers a *unique* contribution by empirically incorporating GRNN, which may extend and improve future governance research. We argue that the use of neural networks is an area of methodological improvement in future governance-related literature. Specifically, GRNN is better able to capture nonlinear relationships compared to conventional techniques. In addition, the complexity in the current environment and firms provides further motivation to use neural networks, as one of their advantages is that they are able to represent complex relationships between a set of variables. Second, our results extend the nascent research on the relationship between CG and EM in Egypt. To the best of our knowledge, there is no research, to date, which examines the relationship between gender diversity on boards and EM in Egypt. Third, in developing our hypotheses, we use a multi-theoretical framework which relies on insights from the agency, stewardship, resource dependence, information asymmetry, managerial signalling, organizational and stakeholder theories. Fourth, our findings have important policy implications by casting light on the effect of corruption on EM. To the best of our knowledge, this study presents a first attempt to examine the moderating effect of governance quality, measured in terms of the control of corruption, on the relationship between EM and CG. Finally, our study contributes to understanding international differences in EM by applying

comparison between two countries, as the vast majority of previous studies rely only on one single country.

Our findings suggest that for the UK, firms with a high percentage of independent outside directors, small board size, and low percentage of female board members are likely to have lower levels of EM. For Egypt, firms with a high percentage of independent outside directors, bigger boards, and low percentage of female board members are likely to have lower levels of EM. Further investigation indicates that corruption has a strong hidden effect on EM in the Egyptian firms.

The remainder of this paper is structured as follows. Section 2 offers a background on EM and different CG codes in the UK and Egypt. Section 3 provides the theoretical framework, synthesizes relevant literature, and develops hypotheses. Section 4 describes the research design. Section 5 discusses the empirical findings. Section 6 concludes.

2. Literature review and hypothesis development

We employ a multi-theoretical framework due to the complex nature of CG and in response to the call for the adoption of a multiple-theoretical framework (Filatotchev & Boyd, 2009). Moreover, Nicolae and Violeta (2013) report that for effective CG, it is better to apply a blend of existing theories rather than an individual theory. Hence, our study relies on insights from the agency, stewardship, resource dependence, information asymmetry, managerial signalling, organizational and stakeholder theories.

2.1. Theoretical Framework

The variations in EM could be explained through a multi-theoretical lense because a generally accepted theory that links BoDs and EM is still elusive (Gabrielsson & Huse, 2004; van Ees et al., 2009; Huse et al., 2011). In addition, we employ a multi-theoretical perspective as a direct response to the latest calls for multi-theoretical approaches to studying CG and EM (Elghuweel et al., 2017; Huse et al., 2011; van Ees et al., 2009). One reason is that single theories may not be able to offer a complete understanding of how BoDs mechanisms may affect EM on their own. By contrast, linking insights from a multi-theoretical perspective may offer unique insights towards interpreting and explaining EM in different regulatory and institutional contexts, such as the UK and Egypt. Also, a multi-theoretical perspective may facilitate the examination of the potential interactions among BoDs, governance quality and EM (Elamer et

al., 2017, 2018, 2019a, b; Elghuweel et al., 2017; Huse et al., 2011; van Ees et al., 2009; Zona et al., 2015). From this perspective, joint insights from agency, stewardship, resource dependence, information asymmetry, managerial signalling, organizational and stakeholder theories may help in improving the relevance of BoDs and governance quality mechanisms in explaining the varied motivations for engaging in EM. This is particularly important given the regulatory, and socio-demographical diversity of the UK and Egypt, where multi-theoretical approach could help in explaining results relating to the relationship between BoDs, governance quality and EM (Elghuweel et al., 2017; Zattoni & Van Ees, 2012; Zona et al., 2015).

In particular, there are several theoretical reasons why firms could be motivated to mitigate EM. Agency theory predicts that effective mechanisms relating to BoDs may lead to more transparent financial reporting. Consequently, mitigate EM can mitigate agency conflicts and reduce the information asymmetry between management and shareholders (Elghuweel et al., 2017; Jensen & Meckling, 1976). Signalling theory literature suggests that firms mitigate EM in order to send signals about the quality of their reporting to prospective investors (Connelly et al., 2011; Elghuweel et al., 2017). However, the explanatory power of agency and signalling theories is limited as they tend to focus exclusively on managers and shareholders/investors to the detriment of other stakeholders, such as the local community. From stewardship and stakeholder theories perspective, mitigate EM may be a strategic approach towards enhancing their legitimacy to exist and conduct their operations with key stakeholders (Elghuweel et al., 2017; Pittroff, 2014). Similarly, stakeholder theory has been criticised for being vague about the identity of the key stakeholders of the firm, and therefore, limited ability to elucidate observable differences in EM.

Resources dependence theory predicts that mitigate EM can offer firms access to critical resources, such as funding and contracts (Elghuweel et al., 2017; Pfeffer & Salancik, 2003). Also, resources dependence theory offers a number of benefits, resulting from the firm and national governance effectiveness through wider interdependencies of companies. Specifically, firm and national governance effectiveness work as an instrument for firms to reduce uncertainty and dependence through mitigate EM. However, the ability of resource dependence theory to explain discernible differences in EM is also limited by its excessive focus on directing EM at securing resources, especially financial resources and stakeholders, who may not necessarily be the main drivers of EM.

With these apparent limitations of each individual theory, but yet different firm motivations for engaging in EM, this study seeks to enhance these theories explanatory power by drawing insights from all of them together (i.e., agency, stewardship, resource dependence, information asymmetry, managerial signalling, organizational and stakeholder perspectives) in examining and understanding the associations among BoDs, governance quality, and EM. To add further theoretical nuance to our multi-theoretical lense, we cogitate how national governance quality may influence EM.

2.2. Empirical literature and hypotheses development

2.2.1. Independent outside directors

One of the most important characteristics associated with strong CG is the board composition, which denotes the separation between inside directors and outside directors. The term "insider" refers to directors who are engaged in companies' management: in other words, they are managers and/ or controlling shareholders (De Andres et al., 2005). Outsiders are directors who are independent of the firm's management. There are different definitions of "independence": one of the commonly used definitions is "having no relationships or circumstances which could affect the director's judgment" (Mallin, 2006). Another definition of board independence refers to the ratio of outside directors on the board (Klien, 2002). In general, Becht et al. (2003) define independent directors as those with no relation with the company's management except for their presence on the BoDs.

Proponents of more independent outside directors rely on three theories: the agency, resource independence, and information asymmetry and signalling theories. Agency theory emphasises conflicts of interest between stockholders and management, which result because of the separation of ownership and management. Thus, agency theory suggests that independent boards should be more efficient to monitor and enhance management performance. Therefore, the board composition should be denominated by outside directors (Jensen & Meckling, 1976). Moreover, Fama and Jensen (1983) contend that outside directors enhance the viability of the board, as in order to maintain and develop their reputation as independent directors, they have to monitor effectively. Baranchuk and Dybvig (2009) report that outside directors enhance firms' resources by offering experience and expertise. Additionally, Black et al. (2006) state that independent directors reduce information asymmetry by signalling insiders to deal with potential shareholders reasonably. Another stream of the theoretical (stewardship) literature suggests that managers are good agents. Hence, insider directors are preferable (Davis et al.,

1997). Previous studies show conflicting results regarding the relation between independent outside directors and EM.

Previous studies (Peasnell et al., 2005; Xie et al., 2003) conclude that chances of committing EM are lower for companies that have larger numbers of independent outside directors. For example, Hutchinson et al. (2008) find that the percentage of independent outside directors on the board is related to lower performance-adjusted discretionary accruals. Additionally, other studies find that independent outside directors will effectively control managers and hence reduce the possibility of EM (Lo et al., 2010; Marra et al., 2011; Zalata & Roberts, 2015). On the contrary, other studies support stewardship theory, which proposes that increasing the number of independent outside directors may not achieve improvement in monitoring EM. For example, Bhagat and Black (1999) find that there is no empirical evidence that firms should have "supermajority independent boards". Other research (Park & Shin, 2004; Laux, 2008) finds that there is no significant relationship between EM and the percentage of outside directors on the board. Hence, we hypothesized that:

H_1: Firms with more outside directors, in the UK and Egypt, tend to have lower levels of EM.

2.2.2. Board Size

There is no consensus regarding the relationship between the size of the board and EM. On one hand, larger boards have been shown to offer more advantages for their firms by sharing experience, knowledge, and opinions from different resources that lead to improving the board's monitoring function, and hence decrease the incidence of EM (Peasnell et al., 2005). On the other hand, Jensen (1993) argues that smaller boards play a controlling role. Also, Lipton and Lorsch (1992) show that larger boards are less efficient and more time-consuming, and that it is harder to communicate when the board size is large. Dechow et al. (1996) find that firms engaged in EM have larger boards than do those not engaged in EM. Hermalin and Weisbach (2003) argue that the larger the board size, the greater the agency problems. Zalata and Roberts (2015) find that larger boards are more likely to have a higher extent of EM.

A contrary theoretical view (agency and resource dependence) is that larger boards are more effective in avoiding corporate failure and securing critical resources (Kiel & Nicholson, 2003; Haniffa & Hudaib, 2006). Additionally, some studies find that larger boards are related to lower

levels of discretionary accruals (Xie et al., 2003; Peasnell et al., 2005). We therefore hypothesized that:

H_2: Firms with smaller BoDs, in the UK and Egypt, tend to have lower levels of EM.

2.2.3. CEO Duality

Another board characteristic is the leadership structure. There are two types of leadership: combined and separated leadership (Coles et al., 2001). Combined leadership means that the CEO is acting as a board chairman, while separated leadership means that positions of the CEO and the chairperson are held by different people. There is a theoretical debate between the agency, resource dependence, and stewardship theories on leadership type (Ramdani & Witteloostuijn, 2010). Agency theory suggests that separation between the CEO and the chairperson is important for the effectiveness of the board's monitoring responsibility. Separated leadership is likely to decrease earnings management because the chairman monitors the actions of the CEO. Additionally, Eckles et al. (2011) find that CEO duality leads to an increase in agency conflicts because managers and shareholders might create reserves depending on their compensation. Sarkar et al. (2008) find a positive relationship between CEO duality and EM. Other studies also support the agency theory viewpoint of separation between the CEO and the chairman (Lo et al., 2010; Zalata & Roberts, 2015).

However, stewardship and resource dependence theorists suggest that CEO duality is essential to unify firm leadership and that when the roles of the CEO and chair of the board are held by the same person, this will lead to unified objectives. Hence, stewardship theory assumes that firms which have CEO duality will perform better than those which have not and will be less likely to have EM (Ramdani & Witteloostuijn, 2010). Xie et al.'s (2003) and Bedard et al.'s (2003) results support the stewardship theory viewpoint that there is a negative relationship between CEO duality and EM. We therefore hypothesized that:

H_3: Firms with CEO duality, in the UK and Egypt, tend to have higher levels of EM.

2.2.4. Board Diversity

Gender is the most disputed diversity issue. In the current study, board diversity will be measured in terms of the percentage of female members on the board. Countries such as Norway and Italy have designed systems and rules to enforce companies to increase female

representation on the board, while similar legislations are taking place in the UK and France. The relationship between board diversity, EM, earnings quality, and corporate financial outcomes has been predicted by mixed theoretical propositions. Proponents of diversity rely on the agency, resource dependence, signalling, and stakeholder theories (Gull et al., 2018).

Agency theory (Jensen & Meckling, 1976) supports board gender diversity. Indeed, board diversity increases board independence, which in turn enhances monitoring of management (Gull et al, 2018). Moreover, it deters conflicts of interest between stockholders and management. A number of studies argue that increasing the number of females on the board has numerous advantages: they can provide new ideas and perspectives, improve communication, increase firm value, make effective decisions, improve earnings quality, mitigate the practice of EM, provide more reliable financial reports, reduce agency problems and costs, improve financial performance, and create a competitive advantage (Srinidhi et al., 2011; Hutchinson et al., 2015; Isidro & Sobral, 2015). Moreover, it is shown that female directors actively attend board meetings, which strengthens board supervision (Adams & Ferreira, 2009). Moreover, resource dependence theory shows that female diversity helps to secure critical resources, including skills and business contacts (Goodstein et al., 1994). Additionally, board diversity may help to offer a better connection with a firm's stakeholders (Gull et al, 2018).

In line with the theories supporting female diversity, Krishnan and Parsons (2008) report a positive relationship between earnings quality and the proportion of woman participating on the board. Similarly, Srinidhi et al. (2011) and Gavious et al. (2012) find a negative relationship between EM and the percentage of females on the board. Thiruvaid and Huang (2011) find that the presence of female directors mitigates EM by increasing negative discretionary accruals. Liu et al. (2016) find that gender diversity reduces EM if the workplace environment empowers women. Nonetheless, based on agency and organization opponents, board diversity does not necessarily result in more effective monitoring. Moreover, organization theory shows that board diversity precludes the board's ability to take conclusive action regarding strategic changes. Sun et al. (2011) find that there is no relationship between female directors and EM. Arun et al. (2015) find a positive relationship between the percentage of females on the board and EM. In a nutshell, and based on agency theory, we can say that having more females participating on the board is considered to be one of the most important CG mechanisms for monitoring managers and mitigating EM. We therefore hypothesized that:

H_4: Firms with more female directors, in the UK and Egypt, tend to have lower levels of EM.

2.2.5. The Moderating Influence of Governance Quality on the Relationship between Board Structure and EM

While corruption is widespread in emerging economics, there is a growing focus on the degree of its predictability to influence the effective operational of governments and economies (Elamer et al., 2017, 2018, 2019a, b, c). Elamer et al. (2019 a) examind the impact of corruption on risk management and disclosure in a sample of MENA banks. Dela Rama (2011) looks at how the CG affect different forms of corruption in Asia. Although there has been extensive research on the impact of CG mechanisms on EM, extant research has not, to the best of our knowledge, examined the moderating effect of control of corruption on the relationship between CG and EM. On one hand, some previous studies show that the role of CG is to combat corruption (Wu, 2005; Nanda, 2006; Weitzel & Berns, 2006; Krishnamurthy et al., 2011; Caron et al., 2012) and their results show a negative relationship between CG and corruption. On the other hand, other research examines the impact of corruption on EM (e.g., Leuz et al., 2003; Han et al., 2010; González & García-Meca, 2014). Lourenço (2018) shows a positive link between the level of corruption and EM. We expect that the presence of corruption increases the risks of the EM, because managers may tend to be less conservative and risk averse when making financial investment-related decisions which can lead to smaller board vigilance in the monitoring of financial statements. Thus, managers may have opportunistic behavior, a situation that is feasible due to the relatively high levels of asymmetry information that characterize the economic activity (Elghuweel et al., 2017). In addition, corruption, inefficiency of governments and other weaknesses in the developing countries compare to developed countries infrastructure, increase transaction and agency costs, therefore limiting firm's income (Manzetti and Wilson 2007) and, accordingly, increase the opportunistic behavior of mangers. We therefore hypothesized that:

H_5: Governance quality, in the UK and Egypt, moderates the relationship between board structure and EM.

2.2.6. Corporate governance-earnings management nexus statistical techniques

We identified a research gap in our investigation of the effect of corporate governance on earnings management in both the UK and Egypt. We found that neural networks, namely

GRNN, have been neglected in extant research. Following previous literature on other finance disciplines such as dividend policy (Abdou et al., 2012a), which has found that nonlinear neural networks outperformed conventional regressions and capital structure (Abdou et al., 2012b; Pao, 2008), and that neural networks accomplish better model-fitting and predictions, we expect that our GRNN can enhance the quality of conventional regressions and provide results that are more robust. The following hypothesis is therefore proposed:

H_6: GRNNs offer better model-fitting and predictions than do conventional regressions in analysing the corporate governance-earnings management nexus in both the UK and Egypt.

3. Data and methods

3.1. Data

A sample of non-financial firms in the UK and Egypt over a period of seven years from 2004 to 2010 has been used to analyse the impact of CG on mitigating EM. Banks and financial services firms are not included in our sample due to the fact that their reported earnings, as well as cash flow from operations, differ dramatically from other firms, or in other words because of capital structure and regulatory reasons (e.g., Adams & Ferreira, 2009). Companies are selected for this study based on the following reasons: firstly, the availability of financial data over seven years, starting in 2004 and ending in 2010; secondly, the availability of information about the BoDs, such as the percentage of independent directors, board size, CEO duality, and the proportion of females on the board. These criteria are set based on several motives. Firstly, and in line with past studies (Henry, 2008), the criteria allowed this research to satisfy the constraints for a balanced panel data analysis. The advantages of employing panel data are that it provides both time-series and cross-sectional sample observations, more degrees of freedom and less multicollinearity amongst the variables (Wooldridge, 2010). Secondly, an examination of seven-year cross-sectional time-series datasets might be beneficial in defining whether the observed cross-sectional relationship between board characteristics and EM sustains over time (Ntim et al., 2012). Thirdly, the sample starts in 2004 because data were available from 2004 onwards. Our sample period ends in 2010 because of the 2011 Egyptian revolution, which destroyed the Egyptian economy and caused a collapse in the financial situation for most companies. In addition, we found that corporate governance data was not available for years 2011 onwards. Fourth, Egyptian companies have been selected from the most active 50 companies listed in the Egyptian stock market, as these companies represent the community binding the application of the rules and standards of CG issued by the Capital Market Authority.

Data required for this study were collected from the Egyptian companies for information dissemination; companies' websites (the published annual financial reports); and the Kompass Egypt financial yearbook. On the other hand, UK companies were selected from FTSE 100 and data were collected from the published annual reports and the Fame Database. The Corruption Perceptions Index (2015) was used to collect annual data about the level of corruption for each country. Using the above criteria, the final sample consisted of 742 firm-year observations (66 British non-financial firms with 462 firm-year observations and 40 Egyptian non-financial firms with 280 firm-year observations) after excluding firms that had been suspended, those that were newly listed and those with missing data.

3.2. Variables and measures

In our empirical examination, we use three main types of variables. Firstly, our main independent variable is board characteristics. Secondly, EM is our main dependent variable. Thirdly, we use control of corruption as a proxy for governance quality to examine H_5. Finally, based on literature (e.g., Lo et al., 2010), this study includes a number of exogenous variables. Table 1 defines all variables employed in this research.

Insert Table 1 about here

3.2.1. Earnings management (EM)

Absolute discretionary accruals have been employed as a proxy for EM (dependent variable). Most prior literature has used a cross-sectional regression of the Modified Jones model (1991) because prior research finds this model to be superior in identifying abnormal accruals (e.g., Dechow et al., 1995; Jaggi & Leung, 2007). As a result of larger sample size, the cross-sectional form of the model has been found to be superior to the time-series form of the model (Peasnell et al., 2005). The cross-sectional model takes into consideration the influence of changes in the economic setting that influence a specific industry in a particular year. As a result, the discretionary accruals are calculated using the modified Jones cross-sectional model. The model first establishes total accruals, which are then partitioned into discretionary (managed) and non-discretionary accruals. The discretionary portion is then regressed on CG variables of sampled companies. The following are the steps for applying the modified Jones cross-sectional model:

$$TA = NIBEI - CFO \quad \ldots (1)$$

$$NDA_t = \alpha_0 + \alpha_1 [1/A_{t-1}] + \alpha_2 [(\Delta REV_t - \Delta REC_t) / A_{t-1}] + \alpha_3 [PPE_t / A_{t-1}] \quad \ldots (2)$$

where,

TA refers to total accruals; NIBEI refers to net income before extraordinary items; CFO refers to cash flows from operating activities; NDA_t refers to non-discretionary accruals of year *t*; A_{t-1} refers to total assets at the end of year *t-1*; ΔREV_t refers to revenues in year *t* less revenue in year *t-1*; ΔREC_t refers to net receivables in year *t* less net receivable in year *t-1*; PPE_t refers to gross property plant and equipment at the end of year *t*; and α_1, α_2, α_3 are model parameters, which can be estimated using the following equation:

$$DA_t = TA_t/A_{t-1} - \alpha_1 [1/A_{t-1}] + \alpha_2 [(\Delta REV_t - \Delta REC_t)/ A_{t-1}] + \alpha_3 [PPE_t / A_{t-1}] \quad \ldots (3)$$

3.2.2. Corporate governance (CG)

Our main independent variable is CG, represented by four sub-variables. Firstly, the proportion of independent outside directors is calculated as the number of non-executive outside directors to the total number of the BoDs. Secondly, the board size is the total number of board directors. Thirdly, CEO Duality, a dichotomous variable, explores the separation of the chairperson and CEO; the variable is allocated a value of 0 if the chairperson and CEO are separate and 1 otherwise. Fourthly, board diversity is the number of females on the board relative to the total number of members on the BoDs.

4.2.3. Exogenous variables

Based on the CG and EM literature (e.g., Lo et al., 2010), we controlled for a number of exogenous variables. Those variables broadly affect EM. First, audit firm denotes whether the firm's auditor is a Big 4 firm: it gives a value of 1 if the auditor is a Big 4 firm and 0 otherwise (Gavious et al., 2012). Second, large firms have more incentives to manage earnings downward in order to get rid of political costs (Watts & Zimmerman, 1978). Moreover, Lobo & Zhou (2006) state that users are unable to detect overstatement in large firm size due to complexity. However, other studies have argued that large firms are less likely to manage earnings because of having a better governance structure and lower information asymmetry (Atik 2008). Thus, we include firm size, calculated by the log of total assets (LASS), but without estimates about the sign of the coefficient. Third, we also accounted for firm profitability using return on assets (ROA). Jaggi et al. (2009) suggest a negative relationship between ROA and EM. In contrast,

Kasznik (1999) finds a positive coefficient on ROA. Due to this unclear relationship, we posit a non-directional prediction for ROA.

Fourth, we also controlled for firm capital structure and liquidity. Leverage (LEV) is used as a proxy for firm capital structure, calculated as the ratio of total debt to total assets (Bekiris & Doukakis, 2011). Lee et al. (2007) showed a negative relationship between EM and leverage. On the other hand, Othman and Zhegal (2006) found a positive relationship. Firm liquidity (FLIQ) is calculated as the ratio of total current assets to total current liabilities. We do not predict the sign for the correlations of both Leverage (LEV) and Firm liquidity (FLIQ) with EM due to the contradictory theoretical expectations. Fifth, firm growth is calculated using the ratio of the difference between the current year's sales and last year's sales to last year's sales. Consistent with the previous studies, there is a positive link between sales growth (SGROW) and EM (Dimitropoulos & Asteriou, 2010). Finally, to reduce losses, companies facing financial difficulties have a strong incentive to increase reported income. Thus, the loss is controlled where a value of 1 is assigned if the firms have a loss and 0 otherwise (Dabor & Adeyemi, 2009).

4.3. Model specification

We firstly use OLS and fixed-effects regression analyses (e.g., Elamer et al., 2017, 2018, 2019a, b; Elghuweel et al., 2017; Ghosh et al., 2010; Huse et al., 2011; van Ees et al., 2009; Zona et al., 2015) to investigate the effect of CG on EM, and to investigate whether this relationship is moderated by governance quality (i.e. control of corruption). Therefore, our regression models to be considered are identified as follows:

$$EM_{it} = \alpha_0 + \sum_{i=1}^{4} \beta_i CG_{it} + \sum_{i=1}^{7} \beta_i CONTROLS_{it} + \delta_{it} + \varepsilon_{it} \quad \ldots (4)$$

$$EM_{it} = \alpha_0 + \sum_{i=1}^{4} \beta_i CG_{it} + \beta_i CGQ_{it} + \sum_{i=1}^{4} \beta_i CG_{it} \times CGQ_{it} + \sum_{i=1}^{7} \beta_i CONTROLS_{it} + \delta_{it} + \varepsilon_{it} \quad \ldots (5)$$

where,

EM refers to the absolute value of discretionary accruals as a proxy of EM for firm *i* during year *t*; *CG* refers to four corporate governance variables, namely independent outside directors (*PIOD*), board size (*BSIZ*), CEO duality (*DUAL*) and board females (*BFEM*); CGQ refers to governance quality, measured by control of corruption; *CONTROLS* refers to firm-level control variables, namely audit firm (*AUDF*), firm size (*FSIZ*), firm profitability (*FPROF*), firm capital

structure (*FCS*), firm liquidity (*FLIQ*), firm growth (*FGROW*), and firm loss (*FLOSS*); δ is the firm-year specific fixed-effects, and ε is the white noise error term.

Secondly, we uniquely employ GRNNs as alternative non-parametric technique to conventional regressions (see for example, Abdou, et al., 2012a; 2012b). Recently, neural networks have started to gain prominence as a method to capture nonlinearities in complex relationships and as a substitute for more conventional statistical methods, such as OLS regression. Neural networks are an endeavour to model and simulate the capabilities of human brains. Vellido et al. (1999) exemplify the advantages of applying neural networks in the following points. As non-parametric methods, neural networks do not make previous assumptions about the normality and distribution of the data; they are able to deal with complex nonlinear mapping and missing data, and the process is highly automated, thus minimizing human involvement. In addition, GRNN does not require stationarity tests, as stated by Abdou et al. (2012a). GRNNs are structured to include four layers as follows: an input layer, a pattern layer, a summation layer and a decision layer, as shown in Figure 1.

Insert Figure 1 about here

For GRNN, we firstly take the whole data-set for analytical purposes, and then we divide our sample into a training (used in building the GRNN models) sub-set and a hold-out (used for testing the predictive ability of the fitted models) sub-set. The training sub-set comprises 80% of the overall data-set, whilst the hold-out sub-set comprises 20% of the overall data-set. These sub-sets are randomly selected using the Palisade software (Palisade Corporation, 2017). We use GRNNs, as the most accurate neural networks within this software package. We present the empirical analyses, including the descriptive statistics, bivariate correlations, multivariate regression and GRNN analyses, in the following sections.

5. Empirical analyses

5.1. Descriptive statistics and bivariate analyses

Table 2 shows the descriptive statistics for all variables included in our study for the UK and Egyptian firms. We do not present a detailed explanation, for brevity, but generally wide variations have been shown within the variables. Table 2 indicates, for example, that in UK firms, EM ranges from a minimum of 0.00 to a maximum of 0.53, with a mean of 0.05, while

in the Egyptian context, EM ranges from a minimum of 0.00 to a maximum of 5.72, with a mean of 0.57, which shows a strong difference between the two countries. Consistent with Arun et al. (2015), the ratio of females on the board (*BFEM*) is between 0.00 and 0.73, with a median of 22% of females on the board. Notwithstanding the fact that there are firms in Egypt with no female directors, as in the UK, Egypt has an extremely low maximum percentage of females on the board, at 27%. Regarding board size (*BSIZ*), the range of board members is very close in both countries. In Egypt, board size ranges from 5.00 to 15.00, with a median of 9 board members, while in the UK it ranges from 7.00 to 17.00, with a median of 11 board members. Other variables of CG mechanisms (independent outside directors and CEO duality), as well as the exogenous variables, show wide variations, consequently diminishing the possibilities of any bias in sample selection.

Furthermore, there are significant variances in the EM, CG, and control variables between the two countries, as shown by the *t-test* results. The difference of EM indicates that UK firms tend, on average, to have less EM than do Egyptian firms. It can be seen that the *t-scores* for all the means are significant at 0.01 confidence level, except for firm profitability, which is significant at 0.05, and firm loss, which is not significant. Additionally, it is noticed that UK firms have become relatively larger than those in Egypt in terms of board size (*BSIZ*), the ratio of females on the board (*BFEM*), audit firm (*AUDF*), and firm leverage (*FCS*), and *vice versa* for the rest of the variables. Such contrasts can be discussed in light of the basic institutional foundations of these two countries, which mirror the conflicting cultural, economic, and regulatory milieus that exist between the UK (a developed country) and Egypt (a developing country).

Insert Table 2 about here

Panels A and B of Table 3 represents the Pearson's parametric and Spearman's non-parametric correlation matrices of all variables included in the study for the UK and Egypt, respectively, to test for multicollinearity. As a robustness test, Table 3 shows both Pearson's parametric and Spearman's non-parametric correlation matrices. Distinctly, there are no multicollinearity problems, as proved by the prominence and direction of both coefficients in both countries. Of interest, in the UK context, *PIOD* and *BSIZ* are significantly and positively related to EM, suggesting that firms with a high proportion of independent outside directors and a large board tend to have higher levels of EM. Importantly, while there is a significant negative relationship

between *BFEM* and EM in UK firms, there is a significant positive relationship between *BFEM* and EM in Egypt firms, indicating that firms in Egypt with a high percentage of females on the board tend to have higher EM opportunities, and *vice versa* for UK firms. With reference to the control variables, the coefficients show that in the UK, the larger *FSIZ* and *FLOSS,* the larger EM. In contrast, the larger the firm size, the lower the level of EM. There is, however, no evidence to prove that greater firm profitability (*FPROF*) and firm liquidity (*FLIQ*) lead to significantly less or more EM.

Insert Table 3 about here

5.2. Empirical results from conventional and GRNN statistical techniques

We use three main types of statistical methods to test our hypotheses. Firstly, we conduct OLS regression analysis. Secondly, we undertake the fixed/random effect for each model: these two tests (OLS and fixed/random effect) are the most commonly used (the non-flexible models). Thirdly, this study runs a Generalized Regression Neural Network (GRNN), which is a completely flexible model of the determinants of the CG. We firstly apply the GRNN for each country, and then, under each country, we build our models using the overall sample and using the training sub-set and the hold-out sub-set separately. These sub-sets are randomly chosen by the software across different years for training and hold-out purposes. Additionally, in order to determine the importance of each of the CG determinants, we provide a variable impact analysis, which is automatically calculated by the software. Furthermore, we run these models (i.e. OLS, fixed/random effect, and GRNN) twice. The first time is the original model; then we re-run the test to show the moderating effect of governance quality (GQ), measured in terms of control of corruption quality, on the relationship between CG and EM.

5.2.1. Multivariate regression analyses

Table 4 shows the OLS regression results of the impact of CG (independent outside directors, board size, CEO duality, and females' percentage on board) on EM. Model I of the table shows a comparison between the UK and Egypt based on the overall sample for each country from 2004 to 2010. Results indicate that for UK firms, from the CG variables, only the proportion of females has a significant positive relationship with EM, but with the wrong sign for hypothesis H_4 (t=1.89 at the 10 percent confidence level), which means that firms with a high percentage of females on the board tend to have higher levels of EM. This supports agency and organization theorists, which suggest that board diversity does not necessarily result in more

effective monitoring. Moreover, organization theory shows that board diversity precludes the board's ability to take conclusive action regarding strategic changes. Our evidence reinforces Arun et al. (2015), which find a positive relationship between the percentage of females on the board and EM. For Egyptian firms, the model provides a higher adjusted R^2 compared to the UK model (30% versus 3%). The Egypt model yields two significant results, namely CEO duality (t= -2.33 at the 5 percent confidence level) and females on the board (t=1.94 at the 10 percent confidence level), but with the reverse sign for hypotheses H_3 and H_4. These results are consistent with prior research (Arun et al., 2015; Ramadani & Witteloostuijn, 2010; Xie et al., 2003), albeit contradictory to our hypotheses *H_3 and H_4*, and provide support for the multi-theoretical framework. Moreover, Model I of Table 4 shows that for both countries, the proportion of independent outside directors on the board (*PIOD*) is negatively related to EM, which is in line with our expectations based on the agency, resource independence, and information asymmetry and signalling theories. In terms of board size, there is a difference between the two countries. For instance, in UK firms, board size is positively related to EM, as we would expect, whilst for Egypt, board size is negatively related to EM. This implies that, in Egypt, smaller boards play a better controlling role compare to large boards (Jensen, 1993; Lipton & Lorsch, 1992). This is in line with Dechow et al. (1996), Hermalin and Weisbach (2003) and Zalata and Roberts (2015); they suggest that firms engaged in EM have larger boards than do those not engaged in EM.

Insert Table 4 about here

Table 5 presents the regression analysis results of the moderating influence of governance quality (GQ), measured in terms of control of corruption, on the relationship between CG and EM. As previously explained, we build our first model on the table based on the overall sample from each country. However, to show the effect of governance quality and to test hypothesis *H_5*, we multiply each governance variable by the value of corruption for each country. Hence, we obtain four additional governance variables: proportion of independent outside directors multiplied by corruption (*PIODCORR*); board size multiplied by corruption (*BSIZCORR*); CEO duality multiplied by corruption (*DUALCORR*); and proportion of females on the board multiplied by corruption (*BFEMCORR*).

Insert Table 5 about here

To facilitate comparison, according to the UK context, Model I of Table 5 produces similar results to the main results shown by Model I of Table 4, which reflect that the control of corruption has no effect on UK firms. Surprisingly, in the Egyptian context, corruption has an inverse effect on CG variables. For instance, *PIOD* and *DUAL* have negative relationships with EM, and *BFEM* has a positive relationship with EM; after taking into account the moderation effect of corruption, it gives an inverse relation (inverse sign) with EM (+ *PIODCORR*, + *DUALCORR*, and – *BFEMCORR*), which provides support to the sign of our hypotheses H_3 *and* H_4 and is consistent with previous research (Srinidhi et al., 2011). This finding sends an urgent message to the regulators of Egypt that corruption has a very strong hidden effect on EM and that they can deter EM by controlling the corruption level in their country. To sum up, as firms have a tendency to vary in the opportunities and difficulties that they face over time, this can bring about a circumstance where CG practices and EM are jointly controlled by surreptitiously firm-particular variables, such as firm complexity (Ntim, 2012), which multiple regressions may be unable to discover. Hence, we will re-test our hypotheses using fixed/random effect regression.

Table 6 reports the results of fixed/random effect regression analysis of the effect of board characteristics on EM. For Model I (overall sample as Model I in Table 4), we use the fixed effect for UK firms; however, for Egypt, we rely on the random effect model, since the Hausman test confirmed the null hypothesis that the error term did not correlate with the regressors. For UK firms, the results show that board size (*BDSZ*) is positively related to the *EM* in Model I (t=1.89 at the 10 percent confidence level). This provides empirical support for H_2 and is consistent with the agency theory, which suggests that large boards are less effective, more time-consuming and make it harder to communicate, which leads to more agency problems. These findings are similar to those reported in previous studies, suggesting that firms with large board size tend to have higher levels of EM (Dechow et al., 1996; Hermalin & Weisbach, 2003; Zalata & Roberts, 2015). For the Egyptian firms, the random effect regression analysis shows no significant relationship between all the CG variables and EM.

Insert Table 6 about here

To examine the moderating effect of governance quality (GQ), we re-ran the fixed/random effect regression analysis, as shown in Table 7. As previously discussed in Model I of Table 6, since the Hausman test confirmed the null hypothesis that the error term did not correlate with

the regressors, we use the fixed effect for UK firms; however, for Egypt, we rely on the random effect model (e.g., Elamer et al., 2017, 2018, 2019a, b; Elghuweel et al., 2017; Ghosh et al., 2010; Huse et al., 2011; van Ees et al., 2009; Zona et al., 2015). Based on the overall sample (Model I) for UK firms, the results support the moderating effect of governance quality (GQ), showing that firms with a high proportion of independent outside directors multiplied by corruption (*PIODCORR*) have a negative coefficient (t=-1.80 at the 10 percent confidence level). Furthermore, the results provide empirical support for H_2, as the coefficient of the board size (*BSIZ*) is positive (t=2.39 at the 5 percent confidence level). However, the results are contradictory to H_4 by providing a positive coefficient (t=2.07 at the 5 percent confidence level) for board females (*BFEM*). For Egypt, Model I of Table 6 shows that corruption has an inverse sign effect on *PIOD*, *BSIZ*, and *DUAL*, whilst it has no effect on *BFEM*.

Insert Table 7 about here

Noticeably and before leaving the discussion of the conventional regression techniques, the results for the Egyptian firm sample in Model I of Tables 4, 5, 6, and 7, show a negative relationship between firm size (*FSIZ*) and EM. These results support previous literature (Bekiris & Doukakis, 2011; Dabor & Adeyemi, 2009; Dimitropoulos & Asteriou, 2010; Lee et al., 2007). From this results, joint insights from agency, stewardship, resource dependence, information asymmetry, managerial signalling, organizational and stakeholder theories may help in improving the relevance of BoDs and governance quality mechanisms in explaining the varied motivations for engaging in EM (Elghuweel et al., 2017; Filatotchev & Boyd, 2009; Huse et al., 2011; Nicolae & Violeta, 2013; van Ees et al., 2009). To sum up, for the two countries, previous analyses revealed that the predictive power of non-flexible models (OLS, and fixed/random effect) is weak, and that model I (in Tables 4, 5, 6, and 7, respectively) performs badly. It can be shown that for all models, the *adjusted* R^2 ranged from 1% to 33%. Hence, we conduct a *GRNN* analyses.

5.2.2. Generalized regression neural network analyses

$GRNN_1$-Model employs the whole data and shows remarkable findings for the comparison between the two countries, as shown in Table 9. Regarding variable impact, the main determinants of EM vary between the UK and Egypt. For UK firms, the impact of CG variables shows that both independent outside directors (*PIOD:* 20.7%) and females on the board (*BFEM:* 18.9%) are key determinants of EM, presenting more than 39% of the overall model

importance. Other CG measures, namely board size (*BSIZ:* 6.3%) and CEO duality (*DUAL:* 0%) are significantly less important. Since OLS and fixed effect regression models provide low *adjusted* R^2 (ranging from 0% to 5%) for UK models, it may be expected that the substitute methodology, employing GRNN, would have generated a low prediction rate for the UK. Indeed, our neural network technique, namely $GRNN_1$-$Model_1$, produces a low bad prediction percentage (100%- 76.4% = 23.6%), as shown in Table 9. GRNN yields superficial acceptance compare to the findings of traditional multiple regression. For Egypt, the results have lower bad prediction rates than for the UK (100% - 83.6% = 16.4%). The impacts of CG variables are less important as follows: female on the board (*BFEM:* 11.8%); independent outside directors (*PIOD:* 2.7%); board size (*BSIZ:* 0.1%); and CEO duality (*DUAL:* 0%), as shown in Table 9.

Insert Table 9 about here

Comparing the two countries highlighted a number of findings. Firstly, for the UK, the main CG indicator is *PIOD*, whilst for Egypt the main CG indicator is *BFEM*. Secondly, although *BFEM* is the main variable in Egypt, it has a greater value in the UK model (i.e. 18.9% versus 11.8%), which implies that females on the board have a stronger effect in the UK context than in the Egyptian context. Thirdly, board size has a stronger effect in the UK than in Egypt (6.2% versus 0.1%). Fourthly, for both countries, CEO duality has almost no effect (00.1%). Finally, the most influential year for the UK is 2007 (8%), whilst for Egypt it is 2008 (4%), which reflects the effect of the financial crisis. Noticeably, in Egypt, firm size (*FSIZ*) has more than half of the impact (56.9%), which is consistent with our conventional regression findings.

We then divide our sample into a training sub-set and a hold-out sub-set (see Table 10). The hold-out sub-set plays no role in building the model, whilst the training sub-set is used to build the models. As expected, $GRNN_2$-$Model_1$ shows that, for Egypt, the predictive capabilities for both the training and the hold-out set are better compared to the UK. In terms of error rates (*RMSE* and *MAE*), our results show that they are much lower in Egypt compared to the UK for both sub-sets. The results presented in Table 10 show that the variable impact analysis for *PIOD* (23.79%) and *BFEM* (21.43%) are the key determinants of EM in the UK, whilst for Egypt, *BFEM* (20.24%) is the key determinant of EM. These results are in line with our findings using the overall sample analysis.

Insert Tables 9&10 about here

The $GRNN_1$-$Model_2$ of Table 11, which utilizes the whole dataset, exposes very strong consequences after adding the variables of corruption specifically for the Egyptian context as follows. Firstly, the Egypt model has a 100% good prediction rate. Secondly, in terms of error rates, the model for Egypt shows no errors (i.e. 0% *RMSE*; 0% *MAE*). Thirdly, our results, presented in Table 10, show that there is no effect of CEO duality on EM in Egypt; however, after adding corruption, our results, shown in Table 11, show a strong effect for *DUAL* (i.e. 8.5%). Fourthly, the impacts of CG variables are as follows – *BSIZCORR* (9.2%), *BFEMCORR* (8.7%), *DUALCORR* (8.5%) – implying a significant impact of the level of corruption on governance in Egypt. Fifthly, and consistent with conventional regression results, firm size (*FSIZ*) has a strong relationship with EM in Egyptian companies (i.e. 12.97). Finally, the weighted importance of corruption in Egypt has more than double the value compared to the UK (5.91% versus 2.63%). In the UK context, after adding the moderating effect of governance quality, the percentage of females on the board becomes the key variable (i.e. 25.90%), followed by the percentage of independent outside directors on the board (i.e. 20.56%). These finding are in line with the findings obtained from $GRNN_1$-$Model_1$.

Insert Table 11 about here

Following similar methodology, Table 12 shows the results for $GRNN_2$-$Model_2$ using the training and the hold-our sets, randomly selected by the software. We use this model to examine the moderating influence of governance quality (GQ), calculated by control of corruption quality, on the relationship between CG and EM with the same variables that have been used in the $GRNN_1$-$Model_2$ in Table 11. To simplify the differentiation process, the findings in Table 12 provide strong support for the findings in Table 11, which relies on the overall sample for each country. For Egypt, yet again, the predictive power from the training set is superior to that of the UK. Egypt has a 100% good prediction rate, a lower RMSE and MAE of zero compared to the UK (60%, 2%, and 1%, respectively).

In summary, using mutually supportive techniques (i.e. GRNN and conventional regression), our purpose is to compare the UK as a developed country with Egypt as a developing country based on the internal governance mechanisms that play effective roles in mitigating earnings management. We also show the impact of governance quality as a moderating variable on the

relationship between CG and EM. We have been able to produce a range of critical and significant findings. Our results cast light mainly on the effect of corruption on Egyptian firms, whilst for the UK firms, corruption has only a slight impact. For both countries, firms with a high percentage of independent outside directors and low numbers of females on the board tend to have low levels of EM. Meanwhile, based on board size, findings provide support for small board size in the UK and large board size in Egypt. Further investigation shows that, for both countries, CEO duality has no effect until the moderating variables of governance quality are added: the findings then reveal a strong effect of CEO duality on the Egyptian firms.

5.3. Additional analyses

To demonstrate the effect and consequences of the financial crisis on the firms and to ascertain whether there are contrasts in our results with respect to the period of examination, we re-estimate our analyses (OLS regression, fixed/random effect, and GRNN) by dividing our sample into three sub-samples in each table as follows: Model II Pre-crisis (i.e., from 2004 to 2006); Model III during the crisis (i.e., 2007 and 2008); and Model IV Post-crisis (i.e., 2009 and 2010). The main model and three pairwise comparisons of models differentiate them based on the time-period that each model covers.

Firstly, we re-run the OLS regression for the main CG variables (*PIOD, BSIZ, DUAL,* and *BFEM*). Table 4 shows that the only significant CG variable for the UK before the financial crisis (II) is the number of females on the board (t=2.21 at the 5 percent confidence level). However, this finding has wrong sign to support our hypothesis H_4. Meanwhile, for Egyptian firms, both *BSIZ* and *BFEM* are significant (with t=-1.86 and t=1.94, respectively, at the 10 percent confidence level), but with the wrong sign to support our hypotheses H_3 and H_4. Furthermore, during the crisis, UK firms have a significant positive relationship between CEO duality (*DUAL*) and EM (t=2.22 at the 5 percent confidence level), providing empirical support for H_3. After the crisis, UK firms have no significant relationship between CG variables and EM. Noticeably, models III and IV (during and after the financial crisis) show that the governance mechanisms (*PIOD, BSIZ, DUAL,* and *BFEM)* are not able to detect EM within the Egyptian firms. During the crisis, CG is not able to deter EM in the Egyptian firms (as shown in Table 4 Model II). Table 5 reports that the coefficient of board females (*BFEM*) and duality corruption (*DUALCORR*) are positive (t= 1.78 and t=1.95, respectively, at the 10 percent confidence level), providing empirical support for H_5.

Secondly, we run fixed/random effect regression analysis for the three sub-models, as shown in Table 6. Before the crisis (II), the two countries each have a significant effect of board size. However, for the UK, *BSIZ* is positive (t= 2.40 at the 5 percent confidence level), and for Egypt, it is negative (t=-1.87 at the 10 percent confidence level). Moreover, within the crisis, the coefficient of CEO duality (*DUAL*) is positive (t=1.93 at the 10 percent confidence level), thus providing empirical support for H_2 and H_3 and demonstrating that UK firms with large board size and CEO duality tend to have high levels of EM. For Egypt, in the post-financial-crisis model, CEO duality (*DUAL*) is negatively associated with EM, which is contradictory to our hypotheses.

Observably, for the three models (II, III, and IV), the influence of CG on UK firms before the financial crisis (II) is stronger than in Egypt, and the opposite is true during (III) and after the crisis (IV). For the UK context, board females multiplied by corruption (*BFEMCORR*) is negatively related to EM in Model II of Table 7 (t=-2.43 at the 5 percent confidence level); thus, H_5 is empirically supported. However, during and after the crisis, board females (*BFEM)* has no effect on EM. For Egypt before the financial crisis, the results are almost the same as the UK results; however, these results show that during and after the crisis, Egypt has a more significant coefficient than does the UK. During the crisis, firms with CEO duality (*DUAL*) have higher levels of EM (t= 2.06 at the 5 percent confidence level). Post-crisis results indicate that firms with CEO duality (*DUAL*) and lower numbers of females on the board (*BFEM*) tend to have lower levels of EM, contrary to our hypotheses.

Thirdly, we repeat our examination using an alternative measure of EM, namely Kothari et al.'s (2005) model, given the limitations of the original Jones model (see Kothari et al., 2005). This model calculates a firm-year EM and has the advantages of varying through time and reducing Type I errors (Kothari et al., 2005). We measure EM using the Kothari et al. (2005) model as follows.

$$\frac{TA_t}{A_{t-1}} = \alpha_0 + \beta_1 \frac{1}{A_{t-1}} + \beta_2 \frac{(\Delta REV_t - \Delta REC_t)}{A_{t-1}} + \beta_3 \frac{PPE_t}{A_{t-1}} + \beta_4 ROA_t + \varepsilon_t \quad \ldots (6)$$

Findings in Table 8 indicate that effective governance structures are associated with reporting less EM by Egyptian firms. Again, we find that effective independent boards and Audit firm type are associated negatively and significantly with EM. More importantly, we have additional

evidence to suggest that governance quality (GQ) moderates both board size–EM and board diversity–EM relationships.

Insert Table 8 about here

Fourthly, we use GRNN to compare the situation before, during and after the financial crisis within the two countries. $GRNN_1$-$Model_1$, shown in Table 9, reveals that for the UK pre-crisis, the main key indicator is the proportion of independent outside directors (*PIOD*, with an impact factor of 33.33%), board females (*BFEM*, with an impact factor of 24.11%), and board size (*BSIZ*, with an impact factor of 16.84%), whilst within the crisis there is only one key CG indicator, namely board females (*BFEM*, with an impact factor of 21.38%). After the crisis, UK firms are back to the original condition where the main variables are similar to that pre-crisis: *PIOD* (with an impact factor of 8.18%), *BFEM* (with an impact factor of 8.09%), and *BSIZ* (with an impact factor of 8.08%). The results presented in Table 9 show that for Egypt, the three models (II, III, and IV) give 100% good prediction rates. Using horizontal comparison between models (II, III, and IV), we find that *PIOD* gradually loses its effect in the Egyptian firms (with impact factors of 13%, 9%, and 4%, respectively), whilst *BFEM* gains more weight within the models (with impact factors of 6%, 13%, and 19%, respectively). As previously discussed, we divide our sample into two sub-sets (see Table 10). To unwrap the comparison, the results of training samples analyse for models II, III, and IV provide support for the results shown in Table 9.

The results in Tables 11 and 12 provide support for the main finding of the overall sample model (I) for the two countries, which state that for Egyptian firms, corruption plays a vital role in EM and that we can deter EM by controlling the corruption level in this country. Finally, Model I of Table 9 shows that the most significant year for the UK is 2007 (with an impact factor of 8%), while for Egypt it is 2008 (with an impact factor of 4%). Both represent the financial crisis: hence, we rerun GRNN for the two years separately to show why they are the most significant years. The 2007 results for the UK show that the main variables in this year are as follows: the proportion of independent outside directors (with an impact factor of 14.57%), board females (with an impact factor of 8.62 %), and board size (with an impact factor of 7.47%), which is consistent with the main model (I). However, for the Egyptian firms, the only key CG variable is board size (with an impact factor of 4.20%). Our results using the

training and the hold-out sets for the 2007 and 2008 models in Table 10 provide support for the results shown in Table 9 based on the overall sample for the two years.

After adding the moderating effect of governance quality for the models for the two years, surprisingly, the results show that the UK firms have a higher percentage of corruption than do the Egyptian firms (with an impact factor of 8% versus an impact factor of 1%), which is contradictory to our previous findings. For Egypt firms, consistent with the results from Tables 9 and 10 in 2008, the results shown in Table 11 confirm that the key CG variable for this year is board size. However, for UK firms, all the CG variables range from an impact factor of 4% to an impact factor of 7%. The results of the analyses of the training samples for the 2007 and 2008 models in Table 12 provide support for the results shown in Table 11 based on the overall sample for the two years.

6. Conclusion and areas for future research

Although a substantial number of studies have explored the influence of a number of corporate governance mechanisms on the level of earnings management (EM), their results are mostly mixed. Using a sample of 742 firm-year observations from the UK and Egypt from 2004 to 2010, this study examines how the characteristics of the BoDs (i.e. independent outside directors, board size, CEO duality, and females on the board) can deter EM in the UK and Egypt over a seven-year period. We freshly apply a new methodology by using generalized regression neural networks in addition to the conventional regression models in this study. Our results indicate that for both countries, firms with a high proportion of independent outside directors tend to have lower levels of EM. In terms of board size, findings provide support for the benefits of small board size in the UK and large board size in Egypt.

Moreover, our results show that CEO duality has no effect until the moderating variables of governance quality (measured by level of corruption) are added. The findings reveal a strong effect of CEO duality on the Egyptian firms. Furthermore, for the UK and Egypt, firms with a high percentage of *females* participating on the board tend to have high levels of EM. Overall, our results are consistent with the multi-theoretical framework, which relies on insights from the agency, stewardship, resource dependence, information asymmetry and managerial signalling, organizational and stakeholder theories. These results were determined after controlling for a number of variables, namely audit firm, firm size, ROA, leverage, firm liquidity, firm growth, and loss. This paper also investigates the moderating effect of

governance quality, measured in terms of control of corruption, on the relationship between EM and CG. Our results cast light mainly on the effect of corruption on the Egyptian firms, whilst for UK firms, corruption has only a slight impact.

This study contributes to the existing literature in three main ways. First, using a unique (hand collected) dataset that imitates different corporate governance structures and settings helps us shed further light on the function of the institutional features of developing countries in describing the relation between BoDs and earnings management. The analysis of this study also offers more insights into the monitoring usefulness and the role of BoDs mechanisms. Furthermore, this study, largely, deal with the question whether there is a worldwide corporate governance arrangement that should be pursued regardless of institutional and structural variances across countries. Additionally, our study highlights the fact that institutional environment and the incentives for managers may have a larger influence in rationalizing the internal corporate governance–earnings management association. Similarly, our study extends the research to ethical features that are rare and have not been examined yet in the relation between the internal mechanisms of CG and EM in developing countries (e.g., Egypt), such as corruption. Finally, the results also add to the gender literature by providing evidence that board diversity effectiveness in curbing earnings management depends on country governance quality.

There are several important implications of our study. First, this study suggests that specific corporate governance mechanisms such as the adoption of independent directors emphasized in the UK could produce effective monitoring in mitigating earnings management even in a country like Egypt where there is a lack of complementary legal infrastructure. Second, our results have implications for regulators and policy-makers by sending an urgent message to the regulators of Egypt that corruption has a very strong hidden effect on EM and that they can deter EM by controlling the corruption level in their country. Third, these results improve the credibility of financial statements for investors in both the UK and Egypt, since they provide empirical evidence that the BoDs plays a vital role in mitigating EM. Fourth, the results of our study should be of considerable interest to regulators and policymakers in developing countries, and highlight the fact that there is no exclusive and universal corporate governance system that fits all and that the Anglo-Saxon model of corporate governance may not always be the optimal to follow. Thus, each country should design its corporate governance code in a way that matches its institutional, legal and political needs. Future research should consider including

more countries when investigating the impact of CG on EM, and extending the Egyptian data beyond 2011 where available to investigate the effect of the recent unrest on EM. Further research can also consider other CG mechanisms and take into account the external CG mechanisms. We also suggest the use of real EM or classification shifting to measure EM. Future research could study the role of CG in reducing levels of corruption in emerging markets and how this can constrain the level of EM. The issues of data limitation in quality, variety and quantity need to be confronted rather than avoided by an on-going emphasis on data-rich developed countries.

References

Abdou, H. A., Pointon, J., El-Masry, A., Olugbode, M., & Lister, R. J. (2012a). A variable impact neural network analysis of dividend policies and share prices of transportation and related companies. *Journal of International Financial Markets, Institutions and Money*, *22*(4), 796-813.

Abdou, HA., Kuzmic, A., Pointon, J., and Lister, RJ. (2012b). Determinants of capital structure in the UK retail industry: A comparison of multiple regression and generalized regression neural network. *Intelligent Systems in Accounting, Finance and Management.* 19(3), 151-169.

Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, *94*(2), 291-309.

Arun, T. G., Almahrog, Y. E., & Aribi, Z. A. (2015). Female directors and earnings management: Evidence from UK companies. *International Review of Financial Analysis*, *39*, 137-146.

Atik, A. (2009). Detecting income-smoothing behaviors of Turkish listed companies through empirical tests using discretionary accounting changes. *Critical Perspectives on Accounting*, *20*(5), 591-613.

Ball, R., & Shivakumar, L. (2005). Earnings quality in UK private firms: comparative loss recognition timeliness. *Journal of Accounting and Economics*, *39*(1), 83-128.

Baranchuk, N., & Dybvig, P. H. (2009). Consensus in diverse corporate boards. *Review of Financial Studies*, *22*(2), 715-747.

Barth, M. E., Landsman, W. R., & Lang, M. H. (2008). International accounting standards and accounting quality. *Journal of Accounting Research*, *46*(3), 467-498.

Becht, M., Bolton, P., & Röell, A. (2003). Corporate governance and control. *Handbook of the Economics of Finance*, *1*(3), 1-109.

Bedard, J., Chtourou, S. M., & Courteau, L. (2004). The effect of audit committee expertise, independence, and activity on aggressive earnings management. *Auditing: A Journal of Practice & Theory*, *23*(2), 13-35.

Bekiris, F. V., & Doukakis, L. C. (2011). Corporate governance and accruals earnings management. *Managerial and Decision Economics*, *32*(7), 439-456.

Bhagat, S., & Black, B. (1999). The uncertain relationship between board composition and firm performance. *The Business Lawyer*, *54* (3), 921-963.

Black, B. S., Love, I., & Rachinsky, A. (2006). Corporate governance indices and firms' market values: Time series evidence from Russia. *Emerging Markets Review*, *7*(4), 361-379.

Coles, J. W., McWilliams, V. B., & Sen, N. (2001). An examination of the relationship of governance mechanisms to performance. *Journal of Management*, *27*(1), 23-50.

Dabor, E. L., & Adeyemi, S. B. (2009). Corporate governance and the credibility of financial statements in Nigeria. *Journal of Business Systems, Governance and Ethics*, *4*(1), 13-24.

Dahawy, K. (2008). Developing Nations and Corporate Governance: The Story of Egypt. The Global Corporate Governance Forum. The International Financial Corporation (IFC).

Davis, J. H., Schoorman, F. D., & Donaldson, L. (1997). Toward a stewardship theory of management. *Academy of Management Review*, *22*(1), 20-47.

De Andres, P., Azofra, V., & Lopez, F. (2005). Corporate boards in OECD countries: Size, composition, functioning and effectiveness. *Corporate Governance: An International Review*, *13*(2), 197-210.

Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. *The Accounting Review*, *70* (2), 193-225.

Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1996). Causes and consequences of earnings manipulation: An analysis of firms subject to enforcement actions by the SEC. *Contemporary Accounting Research*, *13*(1), 1-36.

Dimitropoulos, P. E., & Asteriou, D. (2010). The effect of board composition on the informativeness and quality of annual earnings: Empirical evidence from Greece. *Research in International Business and Finance*, *24*(2), 190-205.

Donaldson, L. & Davis, J.H. (1991). Stewardship theory or agency theory: CEO governance and shareholder returns. *Australian Journal of Management*, 16(1), 49-65.

Doupnik, T. S. (2008). Influence of culture on earnings management: A note. *Abacus*, *44*(3), 317-340.

Eckles, D. L., Halek, M., He, E., Sommer, D. W., & Zhang, R. (2011). Earnings smoothing, executive compensation, and corporate governance: evidence from the property–liability insurance industry. *Journal of Risk and Insurance*, *78*(3), 761-790.

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *Journal of Law and Economics, 26* (2), 301-325.

Filatotchev, I., & Boyd, B. K. (2009). Taking stock of corporate governance research while looking to the future. *Corporate Governance: An International Review*, *17*(3), 257-265.

Gavious, I., Segev, E., & Yosef, R. (2012). Female directors and earnings management in high-technology firms. *Pacific Accounting Review*, *24*(1), 4-32.

González, J. S., & García-Meca, E. (2014). Does corporate governance influence earnings management in Latin American markets? *Journal of Business Ethics*, *121*(3), 419-440.

Goodstein, J., Gautam, K., & Boeker, W. (1994). The effects of board size and diversity on strategic change. *Strategic Management Journal*, *15*(3), 241-250.

Gull, A. A., Nekhili, M., Nagati, H. and Chtioui, T. (2018). Beyond gender diversity: How specific attributes of female directors affect earnings management. *The British Accounting Review*. 50, 255- 274.

Han, S., Kang, T., Salter, S., & Yoo, Y. K. (2010). A cross-country study on the effects of national culture on earnings management. *Journal of International Business Studies*, *41*(1), 123-141.

Haniffa, R., & Hudaib, M. (2006). Corporate governance structure and performance of Malaysian listed companies. *Journal of Business Finance & Accounting*, *33*(7-8), 1034-1062.

Hassan, M. K. (2008). The development of accounting regulations in Egypt: Legitimating the International Accounting Standards. *Managerial Auditing Journal*, *23*(5), 467-484.

Henry, D. (2008). Corporate governance structure and the valuation of Australian firms: Is there value in ticking the boxes? *Journal of Business Finance & Accounting*, *35*(7), 912-942.

Hermalin, B. E., & Weisbach, M. S. (2003). Boards of directors as an endogenously determined institution: a survey of the economic literature. *Economic Policy Review*, *9*(3), 17-26.

Hutchinson, M. R., Percy, M., & Erkurtoglu, L. (2008). An investigation of the association between corporate governance, earnings management and the effect of governance reforms. *Accounting Research Journal*, *21*(3), 239-262.

Hutchinson, M., Mack, J., & Plastow, K. (2015). Who selects the 'right 'directors? An examination of the association between board selection, gender diversity and outcomes. *Accounting & Finance*, *55*(4), 1071-1103.

Isidro, H., & Sobral, M. (2015). The effects of women on corporate boards on firm value, financial performance, and ethical and social compliance. *Journal of Business Ethics*, *132*(1), 1-19.

Jaggi, B., & Leung, S. (2007). Impact of family dominance on monitoring of earnings management by audit committees: Evidence from Hong Kong. *Journal of International Accounting, Auditing and Taxation*, *16*(1), 27-50.

Jensen, M. C. (1993). The modern industrial revolution, exit, and the failure of internal control systems. *The Journal of Finance*, *48*(3), 831-880.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305-360.

Jones, J. J. (1991). Earnings management during import relief investigations. *Journal of Accounting Research*, *29*(4), 193-228.

Kasznik, R. (1996). On the association between voluntary disclosure and earnings management. *Journal of Accounting Research*, *37* (1), 57-81

Kiel, G. C., & Nicholson, G. J. (2003). Board composition and corporate performance: How the Australian experience informs contrasting theories of corporate governance. *Corporate Governance: An International Review*, *11*(3), 189-205.

Krishnamurthy, P., Rangaswamy, D., & Prabhakaran, C. (2011). Impact of Corruption on Corporate Governance-An Overview under the Context of Policy Framework against Corporate Corruption. *Available at SSRN 1937733*.

Krishnan, G. V., & Parsons, L. M. (2008). Getting to the bottom line: An exploration of gender and earnings quality. *Journal of Business Ethics*, *78*(1), 65-76.

Laux, V. (2008). Board independence and CEO turnover. *Journal of Accounting Research*, *46*(1), 137-171.

Lee, K. W., Lev, B., & Yeo, G. (2007). Organizational structure and earnings management. *Journal of Accounting, Auditing & Finance*, *22*(2), 293-331.

Leuz, C., Nanda, D., & Wysocki, P. D. (2003). Earnings management and investor protection: an international comparison. *Journal of Financial Economics*, *69*(3), 505-527.

Levine, R. (2002). Bank-based or market-based financial systems: which is better? *Journal of Financial Intermediation*, *11*(4), 398-428.

Lipton, M., & Lorsch, J. W. (1992). A modest proposal for improved corporate governance. *The Business Lawyer*, *48* (1), 59-77.

Liu, Y., Wei, Z. and Xie, F. (2016). CFO gender and earnings management: Evidence from China. *Review of Quantitative Finance and Accounting*, 46(4), 881-905.

Lo, A. W., Wong, R. M., & Firth, M. (2010). Can corporate governance deter management from manipulating earnings? Evidence from related-party sales transactions in China. *Journal of Corporate Finance*, *16*(2), 225-235.

Lobo, G. J., & Zhou, J. (2006). Did conservatism in financial reporting increase after the Sarbanes-Oxley Act? Initial evidence. *Accounting Horizons*, *20*(1), 57-73.

Lourenço, I.C., Rathke, A., Santana, V. and Branco, M. C. (2018) "Corruption and earnings management in developed and emerging countries", *Corporate Governance: The International Journal of Business in Society*, 18 (1), 35-51.

Lui, F. T. (1986). A dynamic model of corruption deterrence. *Journal of Public Economics, 31*(2), 215-236.

Mallin, C. A. (2006). *Handbook on international corporate governance: Country analyses*. Cheltenham: Edward Elgar.

Marra, A., Mazzola, P., & Prencipe, A. (2011). Board monitoring and earnings management pre-and post-IFRS. *The International Journal of Accounting*, *46*(2), 205-230.

Nanda, V. P. (2006). The "good governance" concept revisited. *The ANNALS of the American Academy of Political and Social Science*, *603*(1), 269-283.

Ntim, C. G., Opong, K. K., & Danbolt, J. (2012). The relative value relevance of shareholder versus stakeholder corporate governance disclosure policy reforms in South Africa. *Corporate Governance: An International Review*, *20*(1), 84-105.

Othman, H. B., & Zeghal, D. (2006). A study of earnings-management motives in the Anglo-American and Euro-Continental accounting models: The Canadian and French cases. *The International Journal of Accounting*, *41*(4), 406-435.

Pao H-T. 2008. A comparison of neural network and multiple regression analysis in modeling capital structure. *Expert Systems with Applications* 35, 720–727.

Park, Y. W., & Shin, H. H. (2004). Board composition and earnings management in Canada. *Journal of Corporate Finance*, *10*(3), 431-457.

Peasnell, K. V., Pope, P. F., & Young, S. (2005). Board monitoring and earnings management: do outside directors influence abnormal accruals? *Journal of Business Finance & Accounting*, *32*(7), 1311-1346.

Ramdani, D., & Witteloostuijn, A. V. (2010). The impact of board independence and CEO duality on firm performance: A quantile regression analysis for Indonesia, Malaysia, South Korea and Thailand. *British Journal of Management*, *21*(3), 607-627.

Sarkar, J., Sarkar, S., & Sen, K. (2008). Board of directors and opportunistic earnings management: Evidence from India. *Journal of Accounting, Auditing & Finance*, *23*(4), 517-551.

Shleifer, A., & Vishny, R. W. (1993). Corruption. *The Quarterly Journal of Economics*, *108*(6), 599-618.

Soliman, M. M., & Ragab, A. A. (2014). Audit committee effectiveness, audit quality and earnings management: an empirical study of the listed companies in Egypt. *Research Journal of Finance and Accounting*, *5*(2), 155-166.

Srinidhi, B., Gul, F. A., & Tsui, J. (2011). Female Directors and Earnings Quality. *Contemporary Accounting Research*, *28*(5), 1610-1644.

Sun, J., Liu, G., & Lan, G. (2011). Does female directorship on independent audit committees constrain earnings management? *Journal of Business Ethics*, *99*(3), 369-382.

Transparency International. (2015). *Corruption Perceptions Index.* Retrieved from https://www.transparency.org/research/cpi/.

Vellido, A., Lisboa, P. J., & Vaughan, J. (1999). Neural networks in business: a survey of applications (1992–1998). *Expert Systems with Applications*, *17*(1), 51-70

Watts, R. L., & Zimmerman, J. L. (1978). Towards a positive theory of the determination of accounting standards. *The Accounting Review*, 112-134.

Weitzel, U., & Berns, S. (2006). Cross-border takeovers, corruption, and related aspects of governance. *Journal of International Business Studies*, *37*(6), 786-806.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. Cambridge, MA: MIT press.

Wu, X. (2005). Corporate governance and corruption: A cross-country analysis. *Governance: An International Journal of Policy, Administration and Institutions*, *18*(2), 151-170.

Xie, B., Davidson, W. N., & DaDalt, P. J. (2003). Earnings management and corporate governance: the role of the board and the audit committee. *Journal of Corporate Finance*, *9*(3), 295-316.

Zalata, A., & Roberts, C. (2015). Internal corporate governance and classification shifting practices an analysis of UK corporate behavior. *Journal of Accounting, Auditing & Finance*, *31*(1), 51-78.

Tables

Table 1: Summary of variables definitions and measurement methods

Coding	Variable	Measurement
Panel A: Earnings management (Dependent) Variable		
EM	Earnings management	The absolute value of discretionary accruals is used as a proxy of EM
Panel B: Corporate governance (Independent) Variables		
PIOD	Independent outside directors	The ratio of independent outside directors to total number of the board of directors
BSIZ	Board size	Total Number of members on the board of directors
DUAL	CEO duality	A value of (1) is assigned if the chairman and CEO are the same person and (0) otherwise
BFEM	Board female	The ratio of females on the board to total number of the board of directors.
Panel C: Governance quality indicator		
CGQ	Governance quality (Corruption)	Control of Corruption will be used as a proxy
Panel D: Control (Exogenous) Variables		
AUDF	Audit firm	A value of (1) is assigned if the firm's external auditor is one of the Big 4 and (0) otherwise.
FSIZ	Firm size	Measured as the natural log of total assets
FPROF	Firm profitability	Using ROA, the ratio of net income before interest and taxes to total assets
FCS	Firm capital structure	Using Leverage, the ratio of total debt to total assets
FLIQ	Firm liquidity	The ratio of Current Assets minus Inventory to Current Liabilities
FGROW	Firm growth	The ratio of the difference between current year's sales last year's sales to last year's sales
FLOSS	Firm loss	A value of (1) is assigned if the firm's has loss and (0) otherwise

Table 2: Descriptive statistics of all variables for the UK and Egypt (742) firm years

	UK								Egypt								Difference
Variable	N	Mean	Med.	S.D.	Min.	Max.	Skew.	Kurt.	N	Mean	Med.	S.D.	Min.	Max.	Skew.	Kurt.	t-statistics
Panel A: Earnings management (Dependent) Variable																	
EM	462	0.05	0.04	0.06	0.00	0.53	3.45	18.98	280	0.57	0.29	0.88	0.00	5.72	3.79	16.61	12.65***
Panel B: Corporate governance (Independent) Variables																	
PIOD	462	0.38	0.44	0.23	0.00	0.83	-0.20	-1.08	280	0.57	0.57	0.18	0.20	0.86	-0.12	-1.09	12.91***
BSIZ	462	11.15	11.00	2.43	7.00	17.00	0.49	-0.47	280	9.35	9.00	2.89	5.00	15.00	0.24	-0.70	-9.10***
DUAL	462	0.12	0.00	0.33	0.00	1.00	2.33	3.44	280	0.75	1.00	0.43	0.00	1.00	-1.16	-0.66	22.39***
BFEM	462	0.24	0.22	0.12	0.00	0.73	0.62	0.26	280	0.08	0.08	0.08	0.00	0.27	0.76	-0.23	-19.63***
Panel C: Control Variables																	
AUDF	462	0.86	1.00	0.35	0.00	1.00	-2.05	2.20	280	0.45	0.00	0.50	0.00	1.00	0.20	-1.97	-13.03***
FSIZ	462	4.96	4.55	1.12	3.22	6.96	0.35	-1.34	280	6.12	6.04	0.63	4.73	7.98	0.47	0.19	15.92***
FPROF	462	0.08	0.08	0.10	-0.52	0.84	0.69	14.09	280	0.10	0.09	0.10	-0.24	0.46	0.44	1.12	2.16**
FCS	462	1.43	1.06	1.22	0.00	6.71	1.87	4.01	280	0.34	0.12	0.48	0.00	2.46	2.05	4.16	- 14.23***
FLIQ	462	0.93	0.81	0.78	0.05	7.58	4.01	23.77	280	1.30	1.03	1.03	0.01	5.59	1.79	3.40	5.52***
FGROW	462	6.75	5.79	22.49	-88.83	86.15	-0.30	3.83	280	13.95	11.25	32.94	-86.78	133.60	0.41	2.13	3.53***
FLOSS	462	0.07	0.00	0.25	0.00	1.00	3.47	10.10	280	0.08	0.00	0.26	0.00	1.00	3.24	8.59	0.41

Notes: **Panel A** of this table shows for each country the descriptive statistics of the dependent variable, which is the Earrings Management (EM). It also explains the difference between the UK and Egypt firms over the seven-year period. ***indicate significance at the.01 level. **Panel B** of this table gives the descriptive statistics of the independent variables for each country including the following: independent outside directors (PIOD), board size (BSIZ), CEO duality (DUAL), and female ratio (BFEM). It further identifies the differences, by reporting the t-statistics for those variables between the British and Egyptian firms over the seven-year period. *, ** and ***indicate significance at the .1, .05 and .01 level, respectively. **Panel C** of this table shows for each country the descriptive statistics of the control variables defined as follows: audit firm size (AUDF), firm size(FSIZ), firm profitability (FPROF), firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) .N., Med., SD., Min., Max., Skew. Kurt. denote: Number of observations, Median, Standard deviation, Minimum, Maximum, Skewness, and Kurtosis. Table 1 fully defines all the variables used.

Table 3: Correlation analysis of all variables for UK and Egypt (742) firm years

Variable	EM	PIOD	BSIZ	DUAL	BFEM	AUDF	FSIZ	FPROF	FCS	FLIQ	FGROW	FLOSS
Panel A: UK												
EM		.106*	.022*	.017	-.006***	-.043	.128**	-.038	.018	-.013	-.031	.135**
PIOD	-.031*		.066	.244**	-.152**	.045	.097*	-.070	-.055	-.014	-.027	.023
BSIZ	-.004**	.029		-.110*	-.349**	-.023	-.221**	-.030	.107*	.013	-.070	.044
DUAL	-.026	.259**	-.111*		.004	.000	.173**	-.024	-.075	-.065	.021	.006
BFEM	.057***	-.095*	-.366**	.039		.019	.022	.140**	.046	-.057	.046	-.118*
AUDF	-.083	.051	-.019	0.000	.026		.039	-.031	.012	-.003	-.048	.035
FSIZ	.077**	.102*	-.144**	.158**	.034	.053		-.078	.017	.077	.027	.176**
FPROF	-.056	-.089	-.031	.050	.157**	-.027	-.182**		.019	.174**	.191**	-.469**
FCS	-.007	-.136**	.130**	-.103*	.133**	.000	-.004	-.065		.045	-.024	-.037
FLIQ	.054	-.045	.032	-.064	.083	.028	-.081	.131**	.139**		.115*	-.059
FGROW	-.067	-.022	-.088	-.010	.055	-.083	.032	.164**	-.019	.052		-.144**
FLOSS	.135**	.017	.044	.006	-.105*	.035	.171**	-.430**	-.048	-.063	-.159**	
Panel B: Egypt												
EM		.037*	-.108	-.124*	.043**	.196**	-.344**	.044	-.037	.002	.125*	-.034
PIOD	.011*		.062	-.158**	.250**	.156**	-.024	.118*	-.348**	.127*	.070	.078
BSIZ	-.107	.084		-.050	.448**	.047	.280**	.247**	-.045	.046	.057	-.110
DUAL	-.139*	-.193**	-.076		-.223**	-.174**	-.143*	-.203**	-.119*	-.213**	-.011	.102
BFEM	.091**	.250**	.423**	-.168**		-.008	.054	.026	-.060	.053	.023	.012
AUDF	.087	.179**	.069	-.174**	.020		.262**	-.142*	.235**	-.041	.081	.124*
FSIZ	-.452**	-.055	.321**	-.153*	.053	.198**		.140*	.127*	.021	.080	-.114
FPROF	-.011	.069	.195**	-.217**	.004	-.103	.210**		-.106	.199**	.065	-.484**
FCS	.137*	-.224**	.056	-.175**	-.050	.263**	.277**	-.140*		-.178**	.045	.056
FLIQ	-.017	.133*	.090	-.131*	.096	-.065	-.031	.129*	-.222**		.034	-.007
FGROW	.066	.058	.084	-.032	.024	.108	.103	.177**	.052	.031		.054
FLOSS	-.065	.089	-.104	.102	.019	.124*	-.146*	-.456**	.059	-.039	.028	

Notes: Panel A and Panel B of this table give the Pearson and Spearman correlations for the UK and Egyptian firms, respectively. The bottom left half for each panel contains Pearson's parametric correlation coefficients, while the upper right half for each panel shows Spearman's non- parametric correlation coefficients. *, ** and ***indicate significance at the 1%, 5% and .01 level, respectively. Variables are defined as follows: Earrings management (EM), independent outside directors (PIOD), board size (BSIZ), CEO duality (DUAL), female ratio (BFEM), audit firm size (AUDF), firm size (FSIZ), firm profitability (FPROF), firm capital structure (FCS), firm liquidity (FLIQ), firm growth (FGROW), firm loss (FLOSS). Table 1 fully defines all the variables used.

Table 4: OLS regression analysis

	ES	Model I: Overall Sample				Model II: Pre-Crisis				Model III: Crisis				Model IV: Post Crisis			
Variable		UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt	
Corporate Governance Variables																	
PIOD	(-)	-0.22	(0.83)	-0.42	(0.68)	-0.49	(0.62)	-0.44	(0.66)	0.42	(0.68)	0.38	(0.70)	0.73	(0.47)	-0.04	(0.97)
BSIZ	(+)	0.46	(0.65)	-0.54	(0.59)	-0.26	(0.80)	-1.86*	(0.07)	1.53	(0.13)	-0.06	(0.95)	0.34	(0.73)	0.73	(0.47)
DUAL	(+)	-0.55	(0.58)	-2.33**	(0.02)	-1.43	(0.15)	0.20	(0.84)	2.22**	(0.03)	-0.90	(0.37)	-0.46	(0.65)	-2.99	(0.90)
BFEM	(-)	1.89*	(0.06)	1.94*	(0.05)	2.21**	(0.03)	1.94*	(0.06)	0.24	(0.81)	1.08	(0.28)	-0.45	(0.65)	0.80	(0.43)
Control Variables																	
AUDF	(-)	-----	-----	3.38***	(0.00)	-----	-----	2.21**	(0.03)	-----	----	1.23	(0.22)	-----	----	1.76	(0.08)
FSIZ	(+/-)	1.45	(0.15)	-10.17***	(0.00)	1.11	(0.27)	-4.47***	(0.00)	-0.35	(0.73)	-4.89***	(0.00)	1.56	(0.12)	-7.19***	(0.00)
FPROF	(+/-)	0.05	(0.96)	0.25	(0.80)	-0.51	(0.61)	0.49	(0.62)	-0.16	(0.87)	-0.22	(0.83)	1.47	(0.15)	0.51	(0.61)
FCS	(+/-)	-0.32	(0.75)	2.57**	(0.01)	-0.75	(0.45)	0.05	(0.96)	0.60	(0.55)	0.94	(0.35)	0.19	(0.85)	3.55***	(0.00)
FLIQ	(+/-)	1.40	(0.16)	-0.22	(0.83)	0.25	(0.81)	0.92	(0.36)	3.49***	(0.00)	-0.62	(0.54)	0.19	(0.85)	-0.87	(0.39)
FGROW	(+)	-1.52	(0.13)	1.87*	(0.06)	-1.66	(0.10)	1.49	(0.14)	0.94	(0.35)	1.83*	(0.07)	-0.30	(0.76)	0.51	(0.61)
FLOSS	(+)	2.45**	(0.01)	-2.44**	(0.02)	0.89	(0.37)	-1.73*	(0.09)	3.52***	(0.00)	-1.47	(0.15)	1.09	(0.28)	0.35	(0.72)
Years	(+/-)	Included		Included		Included		Included		Included		Included		Included		Included	
Constant		0.06	(0.95)	10.30***	(0.00)	0.47	(0.64)	4.99***	(0.00)	-0.24	(0.81)	5.09***	(0.00)	0.29	(0.77)	6.79***	(0.00)
Durbin-W.		1.38		0.79		1.51		1.07		1.87		1.95		1.58		1.10	
Adj. R^2		0.03		0.30		0.08		0.18		0.17		0.22		-0.03		0.53	
F		2.025**		8.024***		1.40		2.986***		3.397***		2.859***		0.62		8.524***	
N		462		280		198		120		132		80		132		80	

Notes: This table presents the estimated coefficients from four different models examining the effects of corporate governance (CG) practices on Earnings management as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. Variables are defined as follows: independent outside directors (PIOD), board size (BSIZ), CEO duality (DUAL), female ratio (BFEM), audit firm size (AUDF), firm size (FSIZ), firm profitability (FPROF), firm capital structure (FCS), firm liquidity (FLIQ), firm growth (FGROW), firm loss (FLOSS). Table 1 fully defines all the variables used. P-values are in parentheses. Following Petersen (2009), coefficients are estimated by using the robust clustered standard errors technique. ***, **, and * denote significance at the .1%, 1%, 5%, and 10% level.

Table 5: OLS regression analysis with governance quality moderation

	ES	Model I: Overall Sample				Model II: Pre-Crisis				Model III: Crisis				Model IV: Post Crisis			
Variable		UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt	
Corporate Governance Variables																	
PIOD	(-)	-0.16	(0.87)	-0.42	(0.67)	0.54	(0.59)	-0.12	(0.91)	0.36	(0.72)	1.23	(0.22)	0.01	(0.99)	0.19	(0.85)
PIODCORR	(-)	-0.77	(0.44)	0.34	(0.73)	-0.55	(0.58)	-0.16	(0.87)	-0.12	(0.90)	0.88	(0.38)	-0.09	(0.93)	0.49	(0.62)
BSIZ	(+)	0.40	(0.69)	-0.53	(0.59)	-0.14	(0.89)	-0.54	(0.59)	1.38	(0.17)	-0.45	(0.66)	-0.07	(0.94)	0.13	(0.90)
BSIZCORR	(+)	-----	-----	-1.38	(0.17)	-----	-----	-0.39	(0.70)	-----	-----	-0.14	(0.89)	-0.87	(0.38)	-0.38	(0.70)
DUAL	(+)	-0.56	(0.57)	-2.34**	(0.02)	-----	-----	0.49	(0.62)	2.23	(0.03)	2.00	(0.05)	-0.26	(0.80)	-2.32	(0.02)
DUALCORR	(+)	-1.07	(0.29)	0.94	(0.35)	-1.49	(0.14)	-0.34	(0.73)	0.37	(0.71)	1.95*	(0.06)	-0.21	(0.83)	-0.18	(0.86)
BFEM	(-)	1.79*	(0.07)	1.94*	(0.05)	-0.09	(0.93)	1.36	(0.18)	0.50	(0.62)	1.78*	(0.08)	0.28	(0.78)	1.07	(0.29)
BFEMCORR	(-)	2.35**	(0.02)	-0.12	(0.90)	0.20	(0.84)	-0.52	(0.60)	1.42	(0.16)	0.97	(0.33)	0.33	(0.74)	0.69	(0.49)
Control Variables																	
Corruption	(+)	0.45	(0.65)	-0.13	(0.90)	-0.13	(0.89)	0.00	(1.00)	-0.06	(0.95)	-----	-----	-0.94	(0.35)	-----	-----
AUDF	(-)	-----	-----	3.37***	(0.00)	-----	-----	2.25	(0.03)	-----	-----	1.18	(0.24)	-----	-----	1.73*	(0.09)
FSIZ	(+/-)	1.39	(0.17)	-10.15***	(0.00)	1.08	(0.28)	-4.19***	(0.00)	-0.45	(0.65)	-5.48***	(0.00)	1.62	(0.11)	-7.03***	(0.00)
FPROF	(+/-)	0.06	(0.95)	0.25	(0.80)	-0.54	(0.59)	0.65	(0.52)	-0.09	(0.93)	-0.79	(0.43)	1.39	(0.17)	0.37	(0.71)
FCS	(+/-)	-0.16	(0.88)	2.57**	(0.01)	-0.73	(0.47)	-0.16	(0.88)	0.66	(0.51)	1.64	(0.11)	0.21	(0.83)	3.48***	(0.00)
FLIQ	(+/-)	1.51	(0.13)	-0.22	(0.83)	0.30	(0.76)	0.82	(0.41)	3.59***	(0.00)	-0.86	(0.39)	0.21	(0.83)	-0.91	(0.36)
FGROW	(+)	-1.42	(0.16)	1.86*	(0.06)	-1.70*	(0.09)	1.40	(0.16)	0.69	(0.49)	0.12	(0.90)	-0.28	(0.78)	0.36	(0.72)
FLOSS	(+)	2.54**	(0.01)	-2.43**	(0.02)	0.90	(0.37)	-1.30	(0.20)	3.57***	(0.00)	-2.33**	(0.02)	1.08	(0.28)	0.26	(0.80)
Years	(+/-)	Included		Included		Included		Included		Included		Included		Included		Included	
Constant		0.46	(0.64)	10.49***	(0.00)	0.16	(0.87)	2.93***	(0.00)	-0.50	(0.62)	1.75*	(0.09)	-0.93	(0.36)	6.44***	(0.00)
Durbin-W.		1.40		0.81		1.51		1.06		1.89		1.80		1.62		1.08	
Adj. R^2		0.05		0.30		0.01		0.15		0.16		0.25		0.07		0.51	
F		2.15***		6.64***		1.13		2.24***		2.62***		2.68***		0.48		6.17***	
N		462		280		198		120		132		80		132		80	

Notes: This table presents the estimated coefficients from four different models examining the moderating effect of Governance Quality measured by the corruption variable on the relationship between corporate governance (CG) and Earnings management as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. Variables are defined as follows: independent outside directors (PIOD), independent outside directors multiplied by corruption (PIODCORR), board size (BSIZ), board size multiplied by corruption (BSIZZCORR); CEO duality (DUAL), CEO duality multiplied by corruption (DUALCORR), female ratio (BFEM) , board female multiplied by corruption (BFEMCORR) , corruption used as a proxy for governance quality (Corruption), audit firm size (AUDF), firm size (FSIZ), firm profitability (FPROF) , firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) . Table 1 fully defines all the variables used. P-values are in parentheses. Following Petersen (2009), coefficients are estimated by using the robust clustered standard errors technique. ***, **, and * denote significance at the .1%, 1%, 5%, and 10% level.

Table 6: Fixed/random effects regression analysis

	ES	Model I: Overall Sample				Model II: Pre-Crisis				Model III: Crisis				Model IV: Post Crisis			
Variable		UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt	
Corporate Governance Variables																	
PIOD	(-)	-0.15	(0.88)	-0.24	(0.81)	0.23	(0.82)	0.44	(0.68)	0.47	(0.64)	0.39	(0.69)	0.60	(0.55)	-0.18	(0.86)
BSIZ	(+)	1.89*	(0.06)	0.19	(0.85)	2.40**	(0.02)	-1.87*	(0.06)	1.45	(0.15)	0.00	(1.00)	0.37	(0.71)	0.04	(0.97)
DUAL	(+)	-----	-----	-1.18	(0.24)	-----	-----	0.71	(0.48)	1.93*	(0.05)	-0.85	(0.40)	-0.34	(0.74)	-2.07**	(0.04)
BFEM	(-)	0.53	(0.60)	0.75	(0.54)	0.62	(0.54)	1.10	(0.27)	0.27	(0.79)	1.00	(0.32)	-0.44	(0.66)	0.62	(0.54)
Control Variables																	
AUDF	(-)	-1.71*	(0.09)	1.69*	(0.09)	0.39	(0.70)	0.04	(0.97)	-----	-----	1.12	(0.26)	-----	-----	1.28	(0.20)
FSIZ	(+/-)	-0.23	(0.82)	-10.09***	(0.00)	-1.62	(0.10)	5.17***	(0.00)	-0.13	(0.90)	-4.55***	(0.00)	1.43	(0.15)	-4.42***	(0.00)
FPROF	(+/-)	-2.46**	(0.02)	-0.05	(0.96)	-3.82***	(0.00)	1.07	(0.29)	-0.44	(0.66)	-0.37	(0.71)	1.45	(0.15)	2.23**	(0.03)
FCS	(+/-)	-0.33	(0.74)	2.55**	(0.01)	-0.01	(0.90)	-0.32	(0.75)	0.14	(0.68)	0.99	(0.32)	0.15	(0.88)	2.64**	(0.01)
FLIQ	(+/-)	-0.41	(0.69)	1.34	(0.18)	-0.71	(0.48)	0.01	(0.99)	3.09***	(0.00)	-0.57	(0.57)	-0.03	(0.98)	-0.99	(0.32)
FGROW	(+)	-1.04	(0.30)	1.49	(0.14)	0.18	(0.86)	2.34**	(0.02)	0.78	(0.44)	1.76	(0.08)	-0.28	(0.78)	0.31	(0.75)
FLOSS	(+)	-0.42	(0.67)	-1.48	(0.14)	-0.89	(0.37)	-0.97	(0.33)	3.04***	(0.00)	-1.43	(0.15)	0.34	(0.73)	3.13***	(0.00)
Years	(+/-)	Included		Included		Included		Included		Included		Included		Included		Included	
Constant		0.06	(0.95)	7.89***	(0.00)	0.25	(0.80)	-4.75***	(0.00)	-0.15	(0.88)	4.71***	(0.00)	0.22	(0.83)	4.35***	(0.00)
R^2		0.00		0.32		0.00		0.12		0.23		0.34		0.05		0.58	
F (Wald chi2)		1.72*		124.19***		2.76**		7.78***		30.55***		29.97***		4.82		51.28***	
N		462.00		280.00		198		120		132		80		132		80	

Notes: This table presents the estimated fixed and random effects coefficients from four different models examining the effects of corporate governance (CG) practices on Earnings management as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. Variables are defined as follows: independent outside directors (PIOD), board size (BSIZ), CEO duality (DUAL), female ratio (BFEM), audit firm size (AUDF), firm size (FSIZ), firm profitability (FPROF), firm capital structure (FCS), firm liquidity (FLIQ), firm growth (FGROW), firm loss (FLOSS). Table 1 fully defines all the variables used. P-values are in parentheses. Following Petersen (2009), coefficients are estimated by using the robust clustered standard errors technique. ***, **, and * denote significance at the .1%, 1%, 5%, and 10% level.

Table 7: Fixed/random effects regression analysis with governance quality moderation

	ES	Model I: Overall Sample				Model II: Pre-Crisis				Model III: Crisis				Model IV: Post Crisis			
Variable		UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt	
Corporate Governance Variables																	
PIOD	(-)	0.56	(0.58)	-0.21	(0.84)	0.35	(0.73)	0.83	(0.41)	0.33	(0.74)	1.32	(0.19)	0.33	(0.74)	0.05	(0.96)
PIODCORR	(-)	-1.80*	(0.07)	0.15	(0.88)	-0.35	(0.73)	-1.26	(0.21)	-0.29	(0.77)	0.98	(0.33)	0.24	(0.81)	1.00	(0.32)
BSIZ	(+)	2.39**	(0.02)	0.23	(0.82)	-0.94	(0.35)	-2.12**	(0.03)	1.38	(0.17)	-0.47	(0.64)	0.27	(0.79)	-0.27	(0.79)
BSIZCORR	(+)	0.70	(0.49)	-1.90*	(0.06)	1.12	(0.27)	-0.40	(0.69)	-1.24	(0.22)	-0.14	(0.89)	-0.43	(0.67)	-1.20	(0.23)
DUAL	(+)	-----	-----	-1.25	(0.21)	-----	-----	1.35	(0.17)	2.11**	(0.04)	2.06**	(0.04)	-0.24	(0.81)	-2.13**	(0.03)
DUALCORR	(+)	-1.51	(0.13)	1.03	(0.30)	-----	-----	-0.45	(0.65)	0.42	(0.67)	2.03**	(0.04)	-0.20	(0.84)	-1.05	(0.30)
BFEM	(-)	2.07**	(0.04)	0.61	(0.54)	2.43**	(0.02)	0.88	(0.38)	0.54	(0.59)	1.79*	(0.07)	0.25	(0.80)	1.05	(0.30)
BFEMCORR	(-)	2.57**	(0.01)	0.28	(0.78)	-2.43**	(0.02)	-2.08**	(0.04)	1.49	(0.14)	1.03	(0.30)	0.33	(0.74)	2.55**	(0.01)
Control Variables																	
Corruption	(+)	0.61	(0.51)	0.22	(0.83)	2.30**	(0.02)	-1.58	(0.12)	-0.66	(0.51)	-0.09	(0.93)	-0.42	(0.68)	0.29	(0.77)
AUDF	(-)	-1.42	(0.16)	1.79*	(0.07)	0.88	(0.38)	0.21	(0.83)	-----	-----	1.08	(0.28)	-----	-----	1.15	(0.25)
FSIZ	(+/-)	2.01	(0.05)	-9.89***	(0.00)	-1.73*	(0.09)	5.32***	(0.00)	-0.36	(0.72)	-5.16***	(0.00)	1.43	(0.15)	-4.53***	(0.00)
FPROF	(+/-)	-2.38**	(0.02)	0.01	(0.99)	-3.81***	(0.00)	1.02	(0.31)	-0.34	(0.74)	-0.84	(0.40)	1.37	(0.17)	1.85*	(0.06)
FCS	(+/-)	0.26	(0.79)	2.62**	(0.01)	-0.53	(0.60)	-0.95	(0.35)	0.60	(0.55)	1.65	(0.10)	0.16	(0.87)	2.84***	(0.00)
FLIQ	(+/-)	-0.21	(0.84)	1.40	(0.16)	-0.06	(0.96)	0.03	(0.97)	3.40***	(0.00)	-0.73	(0.46)	0.03	(0.97)	-1.67	(0.10)
FGROW	(+)	-1.33	(0.18)	1.50	(0.13)	0.23	(0.82)	2.35**	(0.02)	0.46	(0.65)	0.07	(0.95)	-0.32	(0.75)	0.22	(0.83)
FLOSS	(+)	-0.57	(0.57)	-1.54	(0.12)	-0.93	(0.35)	-0.74	(0.46)	3.30***	(0.00)	-2.30**	(0.02)	0.51	(0.61)	3.20***	(0.00)
Years	(+/-)	Included		Included		Included		Included		Included		Included		Included		Included	
Constant		-2.42**	(0.02)	8.00***	(0.00)	0.35	(0.11)	-5.00***	(0.00)	-0.23	(0.82)	1.76*	(0.08)	-0.34	(0.73)	4.49***	(0.00)
R^2		0.02		0.33		0.00		0.10		0.25		0.40		0.05		0.59	
F (Wald chi2)		2.79***		131.32***		3.19***		5.40***		35.00***		38.51***		5.15		65.54***	
N		462		280		198		120		132		80		132		80	

Notes: This table presents the estimated fixed and random effects coefficients from four different models examining the moderating effect of Governance Quality measured by the corruption variable on the relationship between corporate governance (CG) and Earnings management as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. Variables are defined as follows: independent outside directors (PIOD), independent outside directors multiplied by corruption (PIODCORR), board size (BSIZ), board size multiplied by corruption (BSIZZCORR); CEO duality (DUAL), CEO duality multiplied by corruption (DUALCORR), female ratio (BFEM) , board female multiplied by corruption (BFEMCORR) , corruption used as a proxy for governance quality (Corruption), audit firm size (AUDF), firm size(FSIZ), firm profitability (FPROF) , firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) . Table 1 fully defines all the variables used. P-values are in parentheses. Following Petersen (2009), coefficients are estimated by using the robust clustered standard errors technique. ***, **, and * denote significance at the .1%, 1%, 5%, and 10% level.

Table 8: The effects of governance on earnings management

	ES	Model I: Random effect				Model II: Random effect				Model III: 2SLS				Model IV: 2SLS			
Variable		UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt	
Corporate Governance Variables																	
PIOD	(-)	0.70	(0.49)	-3.26***	(0.00)	0.53	(0.59)	-4.05***	(0.00)	0.74	(0.46)	-3.38***	(0.00)	0.59	(0.55)	-4.71***	(0.00)
PIODCORR	(-)					0.13	(0.90)	-0.76	(0.45)					0.17	(0.86)	-0.65	(0.52)
BSIZ	(+)	0.76	(0.45)	-1.56	(0.12)	0.96	(0.34)	-2.44**	(0.02)	0.79	(0.43)	-1.79*	(0.07)	0.99	(0.32)	-2.81**	(0.01)
BSIZCORR	(+)					-1.85*	(0.07)	2.11**	(0.04)					-1.86*	(0.06)	1.95*	(0.05)
DUAL	(+)	-0.48	(0.63)	-0.31	(0.76)	-0.43	(0.66)	-0.46	(0.65)	-0.51	(0.61)	-0.35	(0.73)	-0.48	(0.63)	-0.55	(0.59)
DUALCORR	(+)					1.25	(0.21)	0.53	(0.59)					1.23	(0.22)	0.54	(0.59)
BFEM	(-)	2.00*	(0.05)	1.48	(0.14)	2.04**	(0.04)	2.22**	(0.03)	2.09**	(0.04)	1.65	(0.10)	2.11**	(0.04)	2.54**	(0.01)
BFEMCORR	(-)					1.90*	(0.06)	-0.31	(0.76)					1.89*	(0.06)	-0.08	(0.94)
Control Variables																	
Corruption	(+)	-0.72	(0.47)	0.27	(0.79)	-1.91*	(0.06)	0.20	(0.84)	-0.71	(0.48)	0.26	(0.80)	-1.89*	(0.06)	0.20	(0.84)
AUDF	(-)	3.85***	(0.00)	-0.19	(0.85)	3.15***	(0.00)	0.43	(0.67)	3.81***	(0.00)	-0.09	(0.93)	3.10***	(0.00)	0.88	(0.38)
FSIZ	(+/-)	-0.29	(0.77)	2.18**	(0.03)	-0.39	(0.70)	0.95	(0.34)	-0.31	(0.76)	1.88*	(0.06)	-0.40	(0.69)	0.42	(0.67)
FPROF	(+/-)	-0.63	(0.53)	-1.04	(0.30)	-0.51	(0.61)	-0.04	(0.97)	-0.50	(0.61)	-0.85	(0.39)	-0.36	(0.72)	0.60	(0.55)
FCS	(+/-)	-3.22***	(0.00)	-1.38	(0.17)	-3.00***	(0.00)	-3.29***	(0.00)	-3.28***	(0.00)	-1.86*	(0.06)	-3.09***	(0.00)	-4.22***	(0.00)
FLIQ	(+/-)	0.64	(0.52)	1.07	(0.29)	0.68	(0.50)	1.18	(0.24)	0.77	(0.44)	1.11	(0.27)	0.84	(0.40)	1.27	(0.20)
FGROW	(+)	0.75	(0.45)	0.76	(0.45)	0.91	(0.36)	0.74	(0.46)	0.69	(0.49)	0.76	(0.45)	0.83	(0.41)	0.68	(0.49)
FLOSS	(+)	1.20	(0.23)	-0.16	(0.87)	1.43	(0.15)	0.30	(0.76)	1.29	(0.20)	-0.08	(0.93)	1.54	(0.12)	0.62	(0.54)
Years	(+/-)	Included		Included		Included		Included		Included		Included		Included		Included	
Constant		-0.05	(0.96)	0.18	(0.85)	-0.05	(0.96)	1.31	(0.19)	-0.08	(0.94)	0.41	(0.69)	-0.07	(0.95)	1.92*	(0.05)
R^2		0.08		0.09		0.09		0.08		0.08		0.09		0.09		0.17	
F (Wald chi2)		36.48***		27.12***		42.92***		40.52***		36.64***		27.20***		43.03***		48.58***	
N		462		280		462		280		462		280		462		280	

Notes: This table presents the estimated fixed and random effects coefficients from four different models examining the moderating effect of Governance Quality measured by the corruption variable on the relationship between corporate governance (CG) and Earnings management as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. Variables are defined as follows: independent outside directors (PIOD), independent outside directors multiplied by corruption (PIODCORR), board size (BSIZ), board size multiplied by corruption (BSIZZCORR); CEO duality (DUAL), CEO duality multiplied by corruption (DUALCORR), female ratio (BFEM) , board female multiplied by corruption (BFEMCORR) , corruption used as a proxy for governance quality (Corruption), audit firm size (AUDF), firm size(FSIZ), firm profitability (FPROF) , firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) . Table 1 fully defines all the variables used. P-values are in parentheses. Following Petersen (2009), coefficients are estimated by using the robust clustered standard errors technique. ***, **, and * denote significance at the .1%, 1%, 5%, and 10% level.

Table 9: $GRNN_1$ (overall sample: 2004/10) $Model_1$

Model Analysis	Model I: Overall Sample		Model II: Pre-Crisis		Model III: Crisis		Model IV: Post Crisis		2007	2008
	UK	Egypt	UK	Egypt	UK	Egypt	UK	Egypt	UK	Egypt
Diagnostic criteria										
Good prediction%	76.41%	83.57%	94.44%	100.00 %	34.09%	100.00 %	50.00%	100.00 %	59.09%	65.00%
RMSE	0.013	0.07	0.005	0	0.028	0	0.023	0	0.019	0.147
MAE	0.007	0.038	0.002	0	0.022	0	0.015	0	0.012	0.074
SDAE	0.011	0.059	0.005	0	0.018	0	0.018	0	0.014	0.127
Number of Cases	462	280	198	120	132	80	132	80	66	40
Corporate Governance VIA										
PIOD	20.74%	2.73%	33.33%	13.27%	0.12%	8.80%	8.18%	4.08%	14.57%	0.15%
BSIZ	6.29%	0.13%	16.84%	3.09%	0.06%	12.09%	8.09%	19.30%	7.47%	4.20%
DUAL	0.01%	0.01%	0.00%	0.00%	0.95%	0.51%	2.99%	0.08%	2.85%	0.00%
BFEM	18.95%	11.84%	24.11%	6.38%	21.38%	12.85%	8.08%	19.11%	8.62%	0.87%
Control VIA										
AUDF	0.92%	0.07%	0.02%	0.00%	0.00%	0.09%	2.47%	0.01%	3.22%	0.07%
FSIZ	4.77%	56.87%	1.00%	34.30%	11.12%	13.96%	9.12%	50.09%	10.23%	94.62%
FPROF	17.31%	16.66%	24.39%	5.32%	60.49%	13.68%	15.54%	0.00%	17.20%	0.00%
FCS	14.87%	1.18%	0.29%	13.81%	0.03%	12.10%	11.82%	0.46%	8.76%	0.00%
FLIQ	4.18%	2.28%	0.00%	15.91%	0.14%	12.64%	11.31%	3.09%	11.91%	0.06%
FGROW	0.12%	2.49%	0.00%	7.36%	0.22%	13.27%	14.81%	0.14%	9.62%	0.00%
FLOSS	0.01%	0.05%	0.00%	0.00%	5.44%	0.00%	3.76%	1.41%	5.55%	0.01%
Y4	0.92%	0.04%	0.02%	0.13%						
Y5	1.06%	0.03%	0.00%	0.00%						
Y6	0.03%	1.19%	0.00%	0.44%						
Y7	7.91%	0.11%			0.02%	0.00%				
Y8	1.78%	3.85%			0.02%	0.00%				
Y9	0.10%	0.13%					2.07%	1.12%		
Y10	0.04%	0.33%					1.74%	1.12%		
Σ	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Notes: The table shows the generalized regression neural network models ($GRNN_1$-$Model_1$) for each of the two countries combined with root mean square error (RMSE) mean absolute error (MAE), and Std. Deviation of Abs. Error (SDAE) as measures for model accuracy. VIA denotes variables impact analysis. It also shows four models as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. As well as it includes analysis for the most significant year of each country: UK (2007) and Egypt (2008). Variables are defined as follows: independent outside directors (PIOD), board size (BSIZ), , CEO duality (DUAL), female ratio (BFEM) , audit firm size (AUDF), firm size(FSIZ), firm profitability (FPROF) , firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) . Table 1 fully defines all the variables used.

Table 10: $GRNN_2$ (training/hold-out sub-sets) $Model_1$

Model Analysis	Model I: Overall Sample 2004/10				Model II: Pre-Crisis				Model III: Crisis				Model IV: Post Crisis				2007		2008	
	UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt	
	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.
Diagnostic criteria																				
Good prediction%	75%	22%	89%	43%	91%	18%	100%	50%	39%	31%	100%	44%	60%	19%	98%	44%	70%	23%	69%	50%
RMSE	0.18	0.27	0.03	0.05	0.01	0.07	0.00	0.28	0.03	0.04	0.00	0.26	0.02	0.04	0.00	0.09	0.02	0.05	0.19	0.26
MAE	0.14	0.17	0.02	0.04	0.00	0.04	0.00	0.18	0.02	0.03	0.00	0.19	0.01	0.04	0.00	0.07	0.02	0.04	0.10	0.18
SDAE	0.06	0.21	0.03	0.05	0.01	0.05	0.00	0.21	0.02	0.03	0.00	0.17	0.02	0.01	0.00	0.05	0.01	0.03	0.17	0.19
Number of Cases	370	92	224	56	158	40	96	24	106	26	64	16	106	26	64	16	53	13	32	8
Corporate Governance VIA																				
PIOD	23.79%		7.20%		19.46%		16.19%		0.63%		11.99%		13.69%		2.17%		22.44%		0.25%	
BSIZ	6.40%		0.29%		12.43%		12.60%		0.59%		0.61%		8.45%		4.03%		13.20%		13.51%	
DUAL	0.06%		0.02%		0.13%		0.05%		0.66%		11.58%		3.35%		0.10%		2.15%		0.03%	
BFEM	21.43%		20.24%		18.05%		10.91%		31.15%		13.87%		9.92%		14.14%		18.40%		0.18%	
Control VIA																				
AUDF	0.00%		0.05%		1.51%		0.17%		0.01%		0.00%		1.54%		0.00%		5.28%		0.08%	
FSIZ	20.73%		63.26%		11.10%		17.58%		0.46%		13.28%		12.26%		19.89%		6.16%		84.80%	
FPROF	0.65%		13.83%		22.13%		12.80%		42.33%		13.90%		12.68%		10.09%		5.20%		0.01%	
FCS	10.07%		0.50%		13.00%		12.68%		0.01%		11.94%		9.97%		30.06%		9.02%		0.92%	
FLIQ	0.08%		4.86%		0.13%		12.95%		0.07%		10.11%		16.67%		0.05%		7.47%		0.12%	
FGROW	0.00%		2.25%		0.52%		2.51%		0.40%		12.71%		7.36%		19.03%		4.24%		0.08%	
FLOSS	0.00%		0.03%		0.04%		0.00%		23.67%		0.00%		2.88%		0.02%		6.44%		0.01%	
Y4	0.00%		0.05%		1.51%		0.07%													
Y5	0.00%		0.04%		0.05%		0.00%													
Y6	0.01%		0.27%		0.03%		1.50%													
Y7	16.41%		0.09%						0.02%		0.00%									
Y8	0.22%		4.73%						0.02%		0.00%									
Y9	0.14%		0.14%										2.79%		0.21%					
Y10	0.00%		0.15%										2.57%		0.21%					
Σ	100%		100%		100%		100%		100%		100%		100%		100%		100%		100%	

Notes: The table shows the generalized regression neural network models ($GRNN_2$-$Model_1$) for each of the two countries combined with root mean square error (RMSE), mean absolute error (MAE), and Std. Deviation of Abs. Error (SDAE) as measures for model accuracy. Train. Denotes training sub-sample and Hold out (H.O.). Denotes testing sub-sample. VIA denotes variables impact analysis. We divide our sample into data for (training sub-set) and data for (testing sub-set). The training data is used in building the neural network models, whilst the testing data is used for testing the predictive ability of the fitted model. In the testing case the data plays no role in building the models. It also shows four models as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. As well as it includes analysis for the most significant year of each country: UK (2007) and Egypt (2008). Variables are defined as follows: independent outside directors (PIOD), board size (BSIZ), , CEO duality (DUAL), female ratio (BFEM) , audit firm size (AUDF), firm size (FSIZ), firm profitability (FPROF) , firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) . Table 1 fully defines all the variables used.

Table 11: $GRNN_1$ (overall sample: 2004/10) $Model_2$ with governance quality moderation

Model Analysis	Model I: Overall Sample		Model II: Pre-Crisis		Model III: Crisis		Model IV: Post Crisis		2007	2008
	UK	Egypt	UK	Egypt	UK	Egypt	UK	Egypt	UK	Egypt
Diagnostic criteria										
Good prediction%	64.94%	100.00%	66.67%	100.00%	31.82%	81.25%	98.48%	88.75%	65.15%	100.00%
RMSE	0.02	0.00	0.02	0.00	0.03	0.08	0.00	0.03	0.02	0.00
MAE	0.01	0.00	0.01	0.00	0.02	0.04	0.00	0.02	0.01	0.00
SDAE	0.01	0.00	0.02	0.00	0.02	0.07	0.00	0.03	0.02	0.00
Number of Cases	462	280	198	120	132	80	132	80	66	40
Corporate Governance VIA										
PIOD	20.56%	4.26%	8.86%	3.97%	0.23%	0.00%	0.12%	0.00%	7.33%	0.00%
PIODCORR	1.53%	0.08%	8.87%	8.07%	0.00%	0.01%	6.15%	0.04%	5.25%	0.00%
BSIZ	5.06%	8.20%	1.91%	9.06%	0.66%	0.30%	21.49%	21.17%	4.86%	0.02%
BSIZCORR	0.26%	9.20%	1.91%	9.59%	0.00%	1.44%	14.73%	0.13%	5.24%	2.52%
DUAL	0.09%	0.00%	0.14%	0.00%	0.26%	0.00%	0.00%	0.05%	2.66%	0.00%
DUALCORR	1.08%	8.52%	0.39%	7.70%	0.00%	0.00%	0.00%	0.02%	4.28%	0.00%
BFEM	0.38%	7.34%	10.80%	3.88%	26.41%	1.84%	0.00%	20.57%	6.72%	0.00%
BFEMCORR	25.90%	8.72%	10.80%	9.49%	0.00%	0.19%	0.01%	2.99%	6.69%	0.02%
Control VIA										
Corruption	2.63%	5.91%	1.91%	0.00%	0.25%	7.77%	0.01%	0.13%	8.69%	1.28%
AUDF	0.74%	0.11%	0.66%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
FSIZ	10.69%	12.97%	8.80%	11.06%	12.99%	71.48%	13.78%	50.56%	5.24%	93.00%
FPROF	25.13%	8.95%	22.93%	9.19%	27.18%	1.28%	25.62%	0.69%	9.82%	0.01%
FCS	1.05%	7.18%	9.58%	9.06%	0.51%	0.00%	17.57%	0.18%	9.23%	0.94%
FLIQ	0.05%	8.99%	0.08%	9.71%	0.28%	0.68%	0.51%	0.00%	13.45%	0.03%
FGROW	0.88%	0.01%	6.35%	9.07%	0.05%	14.94%	0.00%	1.43%	6.29%	2.19%
FLOSS	0.03%	0.09%	2.97%	0.00%	31.16%	0.06%	0.00%	1.75%	4.17%	0.00%
Y4	0.74%	0.11%	0.66%	0.00%						
Y5	1.75%	0.00%	2.36%	0.00%						
Y6	0.01%	0.00%	0.03%	0.00%						
Y7	1.15%	0.55%			0.01%	0.00%				
Y8	0.09%	0.00%			0.01%	0.00%				
Y9	0.04%	0.59%					0.00%	0.14%		
Y10	0.18%	8.23%					0.00%	0.14%		
Σ	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Notes: The table shows the generalized regression neural network models ($GRNN_1$-$Model_2$) for each of the two countries combined with root mean square error (RMSE), mean absolute error (MAE), and Std. Deviation of Abs. Error (SDAE) as measures for model accuracy. VIA denotes variables impact analysis. It explains the moderation effect of Governance quality measured by corruption on the relationship between corporate governance and earnings management. It also shows four models as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. As well as it includes analysis for the most significant year of each country: UK (2007) and Egypt (2008). Variables are defined as follows: independent outside directors (PIOD), independent outside directors multiplied by corruption (PIODCORR), board size (BSIZ), board size multiplied by corruption (BSIZZCORR); CEO duality (DUAL), CEO duality multiplied by corruption (DUALCORR), female ratio (BFEM) , board female multiplied by corruption (BFEMCORR) , corruption used as a proxy for governance quality (Corruption), audit firm size (AUDF), firm size(FSIZ), firm profitability (FPROF) , firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) . Table 1 fully defines all the variables used.

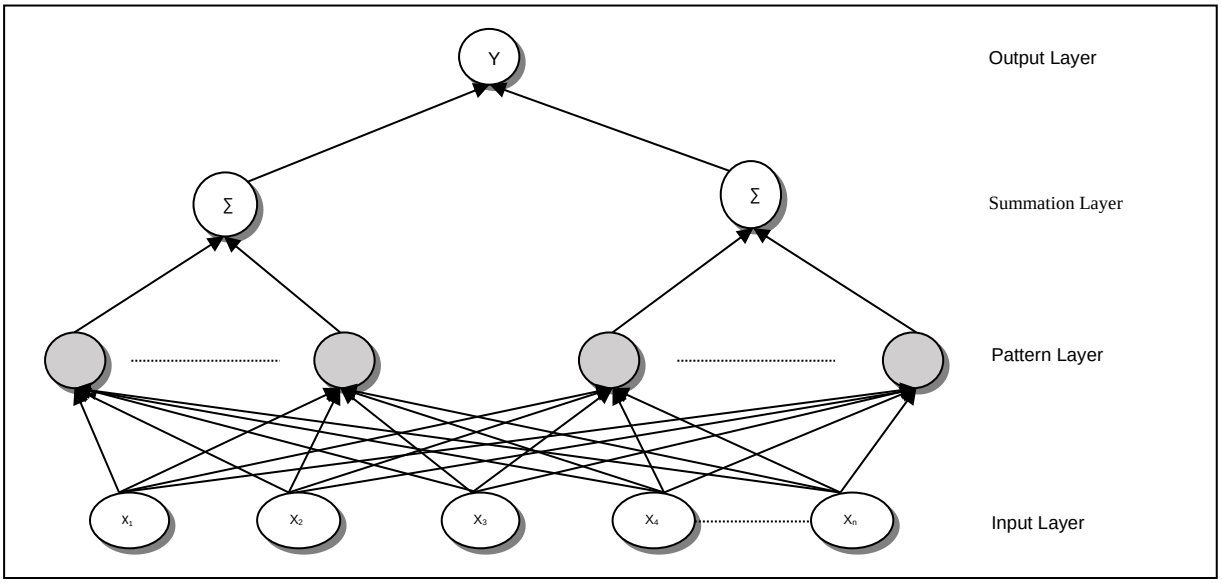
Table 12: $GRNN_2$ (training/hold-out sub-sets) $Model_2$ with governance quality moderation

Model Analysis	Model I: Overall Sample 2004/10				Model II: Pre-Crisis				Model III: Crisis				Model IV: Post Crisis				2007		2008	
	UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt		UK		Egypt	
	Train	H.O.	Train	H.O	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O.	Train	H.O	Train	H.O.
Diagnostic criteria																				
Good prediction%	60%	30%	100%	30%	87%	10%	100%	33%	38%	31%	100%	25%	86%	23%	84%	31%	58%	8%	100%	25%
RMSE	0.02	0.05	0.00	0.58	0.01	0.09	0.00	0.59	0.03	0.05	0.00	1.04	0.01	0.04	0.04	0.23	0.01	0.06	0.00	0.49
MAE	0.01	0.03	0.00	0.33	0.00	0.07	0.00	0.35	0.02	0.03	0.00	0.54	0.00	0.03	0.02	0.15	0.01	0.05	0.00	0.33
SDAE	0.02	0.04	0.00	0.48	0.01	0.07	0.00	0.47	0.02	0.03	0.00	0.89	0.01	0.02	0.04	0.18	0.01	0.04	0.00	0.36
Number of Cases	370	92	224	56	158	40	96	24	106	26	64	16	106	26	64	16	53	13	32	8
Corporate Governance VIA																				
PIOD	16.90%		4.72%		15.30%		5.43%		0.27%		7.79%		12.34%		0.23%		3.11%		0.02%	
PIODCORR	0.04%		2.61%		15.30%		5.78%		0.00%		7.44%		0.47%		0.08%		2.11%		0.22%	
BSIZ	5.13%		5.33%		0.43%		6.66%		0.03%		3.12%		22.39%		0.00%		2.13%		3.24%	
BSIZCORR	0.05%		9.80%		0.43%		10.66%		0.04%		8.20%		16.52%		0.02%		2.13%		0.00%	
DUAL	0.11%		0.00%		0.01%		0.00%		11.95%		0.00%		0.02%		0.00%		3.00%		0.00%	
DUALCORR	0.67%		7.74%		0.01%		9.66%		0.00%		8.30%		0.02%		0.01%		1.14%		0.00%	
BFEM	19.26%		4.74%		17.07%		3.66%		23.79%		6.67%		0.51%		24.61%		7.67%		0.00%	
BFEMCORR	1.88%		8.71%		17.06%		8.19%		4.53%		8.15%		3.13%		4.40%		7.66%		0.00%	
Control VIA																				
Corruption	0.40%		5.06%		0.43%		0.57%		19.80%		7.09%		0.76%		0.42%		1.13%		0.00%	
AUDF	0.59%		0.06%		0.43%		0.00%		0.00%		0.00%		0.00%		0.01%		4.00%		0.00%	
FSIZ	3.38%		11.73%		0.65%		16.31%		0.05%		9.71%		9.09%		69.41%		4.25%		95.20%	
FPROF	46.76%		7.91%		25.94%		10.46%		0.01%		8.39%		25.34%		0.43%		42.95%		0.01%	
FCS	0.25%		7.90%		0.04%		10.57%		6.22%		8.81%		7.56%		0.04%		6.80%		0.00%	
FLIQ	0.03%		7.89%		0.01%		1.99%		0.03%		6.47%		1.62%		0.05%		0.74%		0.52%	
FGROW	0.19%		7.75%		4.16%		10.07%		0.02%		9.86%		0.06%		0.00%		9.53%		0.78%	
FLOSS	0.02%		0.00%		0.00%		0.00%		33.21%		0.00%		0.00%		0.04%		1.64%		0.00%	
Y4	0.59%		0.00%		0.43%		0.00%													
Y5	0.14%		0.00%		2.30%		0.00%													
Y6	0.02%		0.00%		0.01%		0.00%													
Y7	3.44%		0.00%						0.03%		0.00%									
Y8	0.02%		0.00%						0.03%		0.00%									
Y9	0.03%		0.64%										0.09%		0.13%					
Y10	0.08%		7.41%										0.09%		0.13%					
Σ	100%		100%		100%		100%		100%		100%		100%		100%		100%		100%	

Notes: This Table shows the generalized regression neural network models ($GRNN_2$-$Model_2$) for each of the two countries combined with root mean square error (RMSE), mean absolute error (MAE), and Std. Deviation of Abs. Error (SDAE) as measures for model accuracy. Train. denotes training sub-sample and Hold out. (H.O.) denotes testing sub-sample; VIA denotes variables impact analysis. We divide our sample into data for (training sub-set) and data for (testing sub-set). The training data is used in building the neural network models, whilst the testing data is used for testing the predictive ability of the fitted model. In the testing case the data plays no role in building the models. The table explains the moderation effect of Governance quality measured by corruption on the relationship between corporate governance and earnings management. It also shows four models as follows: Model I examines whether CG mechanisms reduces earnings management within the whole period of seven years from 2004 to 2010 ; Model II shows the impact of corporate governance on earnings management within a period of three years 2004, 2005, and 2006 which is the period before the financial crisis; Model III examines the impact of corporate governance on earnings management within the financial crisis 2007 and 2008 ; and Model IV investigates whether internal CG mechanisms can detect earnings management after the financial crisis for the two years 2009 and 2010. As well as it includes analysis for the most significant year of each country: UK (2007) and Egypt (2008). Variables are defined as follows: independent outside directors (PIOD), independent outside directors multiplied by corruption (PIODCORR), board size (BSIZ), board size multiplied by corruption (BSIZZCORR); CEO duality (DUAL), CEO duality multiplied by corruption (DUALCORR), female ratio (BFEM) , board female multiplied by corruption (BFEMCORR) , corruption used as a proxy for governance quality (Corruption), audit firm size (AUDF), firm size(FSIZ), firm profitability (FPROF) , firm capital structure (FCS) , firm liquidity (FLIQ) , firm growth (FGROW) , firm loss (FLOSS) . Table 1 fully defines all the variables.

FIGURES

Figure 1: Generalized Regression Neural Network Structure



Notation: This Figure presents a structure of a number of independent predictor variables for GRNN. The input layer contains a neuron for every independent variable in the model. Each node in the pattern layer, which contains one node for each training case, measures the distance between each of the input values and the training values reintroduced by each of the node. Then, each of these values pass to each of the nodes in the summation layer (Numerator and denominator nodes), which is a function of the distance in the smoothing factors. One node per dependant variable is in the summation layer, each node computes a weighted average using the training cases in that category. In the summation layer, the nodes sum its inputs, whilst the output node divide then to generate the best possible predictions. Source: own figure adapted from Abdou, et al., (2012a, p. 800); and Abdou et al., (2012b, p. 158).