Essays on Earnings Management in Response to Natural Disasters

Submitted by Supavinee Jevasuwan to the University of Exeter

as a thesis for the degree of

Doctor of Philosophy in Accountancy

In September 2018

I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: ……Supavinee Jevasuwan ……..

Abstract

This study examines earnings management practices in the wake of natural disasters and investigates how earnings management affects credit ratings during such events.

Initially, we provide an extensive literature on earnings management and earnings quality, an inverse measure of earnings management, as the foundation for our empirical development.

Beginning with the first set of studies, the primary objective is to assess the level of earnings management used by firms around natural disasters. Our main analyses are performed across two different disasters, namely the 2004 tsunami in the Indian Ocean and the 2011 flooding in Thailand, in order to investigate whether the different intensity of the disaster matters for firms' earnings management strategies. We employ a differences-in-differences (diff-in-diff) approach to test how firms engage in earning management when facing the disaster. We further examine how the severity of the disaster affects managers' incentives to manage earnings by considering the difference in the country-level financial damage caused by the tsunami and the flooding. Our findings show that firms manage earnings to misrepresent economic performance after going through the disasters and that the levels of earnings management hinge upon the severity of the natural disaster.

For the second set of empirical evidence, the primary objective is to analyze the implications of earnings management for credit ratings. That is, we examine whether (how) credit rating agencies see through (react to) earnings

management used by firms in the event of a natural disaster. Similar to the first empirical study, we also investigate whether the effect of earnings management on credit ratings are conditional on the disaster intensity. Moreover, we explore those effects across the types of credit ratings, i.e. investment and speculative grades. Our evidence further suggests that credit rating agencies impose penalties for firms that manage earnings during disasters. The higher the intensity of the disaster, the more likely the credit rating agencies will adjust their credit ratings for earnings management. Lastly, credit rating agencies tend to adjust their credit rating in speculative-grade vs. investment-grade firms in different ways.

Overall, this dissertation provides new and novel evidence that firms engage in earnings management when managers are incentivized, as in our case, by natural disasters. We contribute to the literature on earnings management by shedding light on natural disasters as both a determinant of earnings management and on its consequences for the relation between earnings management and credit ratings.

Acknowledgement

I would like to thank the persons below who have helped contribute to the success of this research and supported me in accomplishing my goals.

First of all, I would like to take this opportunity to express my profound gratitude and deep regards to my supervisors Professor Giovanna Michelon and Dr. Fani Kologirou for their exemplary guidance, valuable feedback, and constant encouragement throughout my Ph.D. studies. They have always guided me at every step and strongly supported me throughout. With their care and attention, it was possible to accomplish this task.

Next, I would like to express my warm thanks to my colleagues for sharing and inspiring discussions during the course of this research. Moreover, I would like to also express special thankfulness to Kasetsart University for the financial support of my doctoral studies.

Finally, I would like to thank my family who also extended their moral and emotional support for me throughout my life.

List of Contents

Page

List of Tables

Page

Chapter 2

Chapter 3

Chapter 4

List of Figures

Page

Chapter 1

Chapter 2

Chapter 3

Chapter 4

List of Appendices

Page

Essays on Earnings Management in Response to Natural Disasters

Chapter 1

Introduction

1 Background and motivation

Numerous studies have been conducted on the determinants and consequences of earnings management. This study is of special interest because it considers both the determinants and consequences of earning management around natural disasters. It sheds light on how natural disasters affect the incentives to engage in earnings management and how it affects the relationship between earnings management and credit ratings.

Environmental risk is the actual or potential economic and social threat of adverse effects on living organisms, arising out of a human or an organization's activities (i.e. global warming, pollution, oil and toxic material spills) (Queensland Government, 2014). Although natural disasters are events that result from natural processes such as earthquakes, floods, landslides, volcanic eruptions, tsunami, and hurricanes (Abbott, 1996; and Smith, 1992), science seems to converge that human activities may be related to their happening and they still bear economic and social adverse effects. For example, with flooding, the volume of water in the river becomes greater than the capacity of the stream channel, causing negative effects on humans and firms, and in severe cases may disrupt both the local and the national economy (Kliesen, 1994). Flooding

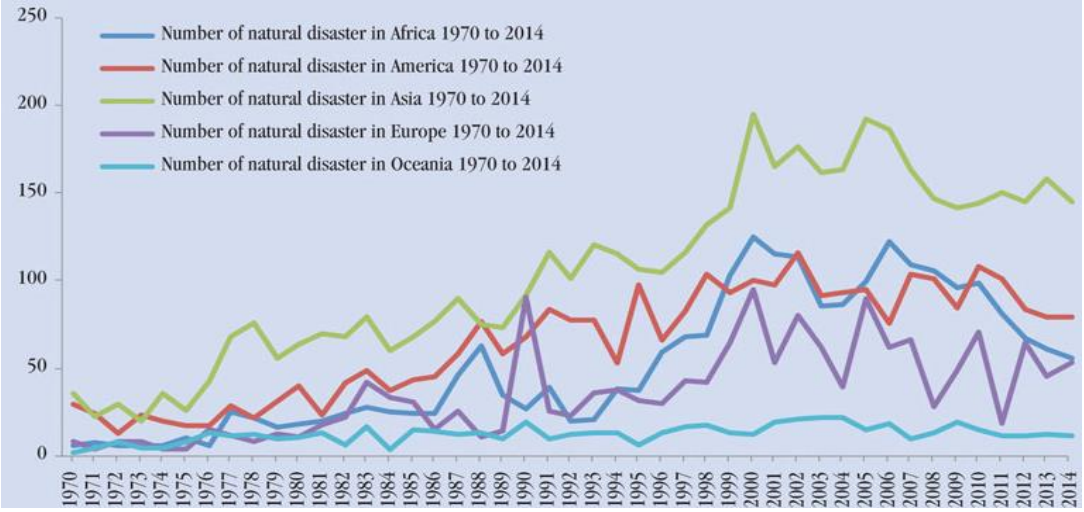
may be attributed directly to human activities (i.e. increased construction on floodplains, poor levee design, and destruction of natural areas that would contain the impact of flooding). Furthermore, natural disaster may be attributed directly to inappropriate activities by the company's management (i.e. the explosion at the upper big branch mine in Montcoal on April 5, 2010) (Union of Concerned Scientists, 2018; and Koehler and Hespenheide, 2013). Interestingly, Spiegel et al. (2007) identify that the occurrence of one type of disaster may enhance the risk of another type of disaster. For example, fires can be ignited as a result of earthquakes or floodings can be caused by a landslide into a river (Smith, 1992; and Nelson, 2018). Therefore, natural disaster and environmental risk are closely linked. For example, the Union of Concerned Scientists (2018) suggests that global warming related floods are becoming more frequent because of the shifting in the rainfall patterns. The more global temperatures rise, the more water evaporates from the oceans, rivers, and lakes, making heavy rain more frequent in many areas of the world (The Weather Gamut, 2018). In the end, both natural disasters (floods) and environmental risks (global warming) can cause significant negative impacts on both human lives and businesses.

The occurrence of natural disasters may encourage manager to engage in upward earning management to convey information about the firm's ability to survive after the disaster as the market incentive hypothesis or engage in downward earning management to benefit from the government help as the political cost hypothesis. Furthermore, the occurrence of natural disasters affects a firm through downgraded credit rating due to a significant loss of firm financial performance (Standard and Poor's, 2015). Credit rating is the analysis of credit risk associated with financial statements of a firm by various credit

rating agencies like Standard & Poor's, Moody's, and Fitch. Credit rating agencies focus on earnings, profitability, interest coverage, liquidity, leverage, changing debt burdens, new competition, and regulatory changes in their rating analysis (Jorion et al., 2009; Jung et al., 2013; and Carter, 2015). Because credit rating is used to determine the firm's future borrowing costs, to help assess the solvency position of the particular firm, and to comply with internal by-low restrictions, thus, it is no surprise that firms are likely to affect their credit ratings by manipulating earnings to increase the credit rating agencies confidence in the survival of the firm after the occurrence of a natural disaster. Prior literature (i.e. Kirschenheiter and Melumad, 2002; Schipper, 1989; and Turner and Guilding, 2011) defines earnings management as some misdeeds by managers to maximize the value of their firms or to achieve their targets (e.g. loss avoidance, earnings increase, earnings smoothness, meeting or beating analyst earnings forecasts, and preserving a desired credit rating) by using discretionary accounting or abnormal real operations.

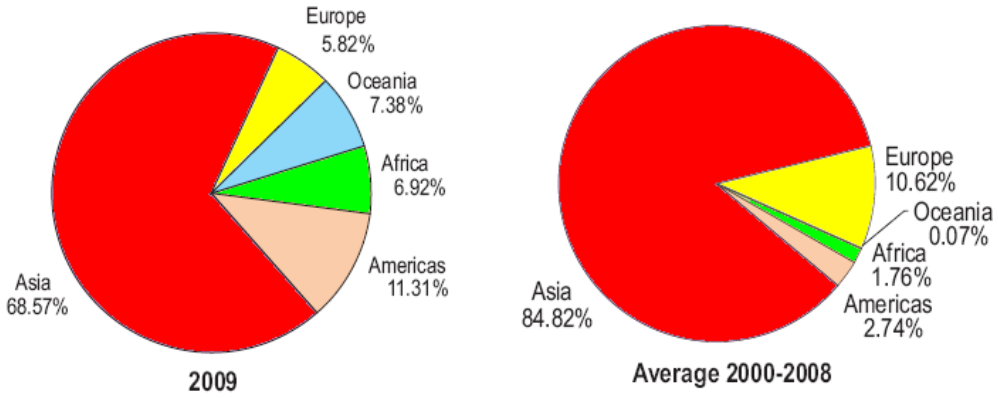
Importantly, the number of disasters has been increasing in every continent (Down to Earth, 2015). Hence shedding light on how firms manage earnings around natural disasters and the implications of such earnings management on credit ratings appears to be timely and important. Three facts are driving the choice of our research setting. First, Asia has faced more natural disasters than any other continents over the years (Figure 1.1). Second, the percentage of people killed by earthquakes in Asia has been greater than that in any other continent (Figure 1.2) (WordPress, 2010). Third, flooding is considered the most common natural disasters (Figure 1.3), it ranks in the top ten natural disasters with the highest death toll in the first half of 2017 (World Economic Forum, 2018a).

Figure 1.1: Number of natural disasters reported in different continents (1970-2014)



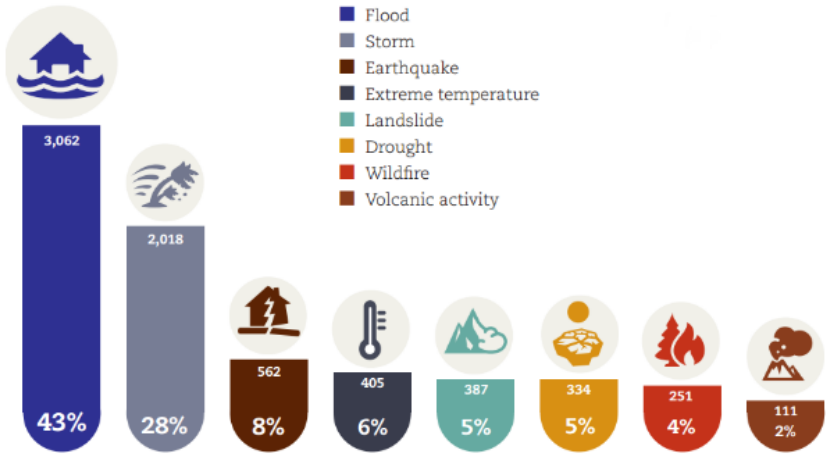
Source: Down to Earth, 2015

Figure 1.2: Percentage of people killed by earthquakes in different continents



Source: WordPress, 2010

Figure 1.3: Percentage of occurrences of natural disasters by disaster type (1995-2015)



Source: World Economic Forum, 2016

Natural disasters can cause significant negative impacts on a firm's tangible assets (e.g. inventory, buildings, factories and equipment), and intangible assets (e.g. image, creditworthiness on safety and survival, etc.), as well as human capital (World Economic Forum, 2015). Firms cannot fully avoid natural disasters risk and many organisations (i.e. World Economic Forum, 2015; The Global Risks Report, 2018; and World Economic Forum, 2018b) report that natural disasters are becoming more frequent and severe. This is also consistent with the document of World Economic Forum (2018a) that environmental issues are listed as one of the four key global risks and suggests that they may lead to serious disruption of business. Hence, firms have set plans to reduce disasters risk; however, they may still find it difficult to remain in business after the disaster. In this situation, it is very interesting to study whether managers have the incentive to engage in earnings management, as well as potential consequences of such behaviour.

The magnitude and location of the bad event determine whether a bad event becomes a disaster (Nelson, 2018). Small earthquakes occur all of the time with no adverse effect. Large earthquakes are considered a disaster if they affect humans adversely and damage infrastructure (i.e. collapse of buildings, and disruption of electrical power and water service). In contrast, a large earthquake in an unpopulated area will not result in a disaster if it does not have an effect on humans. In conclusion, bad events are considered as disasters when they impact large areas where humans live. According to Spiegel et al. (2007), during the period 1995-2004 Africa and Asia have experienced the largest-scale natural disasters. Therefore, it is interesting to study disasters that hit Asia, such as the 2004 tsunami and the 2011 flooding.

Our empirical studies are based in Asia, which we have discussed is the continent most prone to natural disasters. Specifically, we will focus on two different natural disasters: (1) the 2004 tsunami in the Indian Ocean, which is one of the deadliest natural disasters in recorded history that killed over 230,000 people in fourteen countries and rendered millions homeless (Sms Tsunami Warning, 2012); and (2) the 2011 flooding in Thailand, which caused disruptions to manufacturing supply chains affecting the regional automobile production, and also causing a global shortage of hard disk drives which lasted throughout 2012 (Centre for research on the Epidemiology of Disasters, 2012).

2 Research objectives and questions

Before investigating the formal empirical studies, Chapter 2 provides an extensive literature review on earnings quality and earnings management studies, with the overarching aim of understanding the conceptual connection between earnings management and earnings quality. Moreover, Chapter 2 aims

to systematically explore the motivations for earnings management, the trade-offs in alternative earnings management strategies (such as accruals earnings management (AEM), real earnings management (REM), and classification shifting), and to present the research designs which are commonly used in accruals and real earnings management studies. We also discuss a different categorization of the earnings management literature, namely determinants and consequences of earnings management, to lay the groundwork in earnings management practices for researchers.

While most of the prior studies on earnings management focused on market expectations, contractual arrangements, debt market and public scrutiny as determinants of earnings management, recent literature is concerned with exogenous shocks that affect the level of earnings management (Cohen et al., 2008; Carter, 2015; Aono and Guan, 2008; and Doyle et al., 2007). Our first objective in Chapter 3 is to extend the earnings management literature by investigating natural disasters and how they affect the incentives to manage earnings. On the one hand, natural disasters have a negative effect on the financial performance of firms, thus managers may need to re-assure investors and analysts about the firm's survival prospects or even attract more prospective investors by managing earnings upwards. On the other hand, managers may decide to underreport performance to reserve earnings for the future or to benefit from the government's aid, hence engaging in income-decreasing earnings management. Both situations are consistent with idea that natural disasters encourage managers to engage in opportunistic earnings management. The managers can select to engage in either AEM or REM or utilize both strategies (AEM and REM) as substitutes by trading-off the costs and benefits. The main cost of REM is that it affects both current and future

cash flows, whereas, the main cost of AEM are related to auditor and regulatory scrutiny, litigation risk, and the fact that accruals reverse in subsequent periods (Zang, 2012; Bozzolan et al., 2015; and Cohan et al., 2008). Moreover, if managers opt for accruals manipulation and the amount being managed falls short of the earnings target in the last quarter, there would be insufficient time to use real earnings management (Alhadab et al., 2016). Hence, the main objective of the first empirical study (Chapter 3) is to examine whether firms in countries that are hit by natural disasters are more willing to engage in accruals and real earnings management activities. As a secondary objective, we also investigate whether the severity of the natural disaster (measured as the country-level financial damage caused by the events) is related to the level of earnings management. Following prior literature (Trombetta and Imperatore, 2014), we expect that the loss of investors' confidence in the survival of the firm shortly after the natural disaster would be more (less) severe in countries with high (low) level of intensity of natural disaster and thus it could influence managers' incentives to manage earnings.

While the first empirical study focuses on how natural disasters are related to the use of earnings management strategies, the empirical study in Chapter 4 study examines the consequences of earnings management on credit ratings around natural disasters. As mentioned above, natural disasters negatively affect the financial performance of firms and are considered as one of the business risks that firms face and cannot always be adequately protected against (World Economic Forum, 2018a and 2018b). Indeed, Standard and Poor's (2015) indicates that natural disasters affect firms through credit rating downgrades. These situations could encourage managers to manipulate earnings to increase the credit rating agencies confidence in the survival of the

firm after the occurrence of a disaster. Therefore, it is important to look at the reaction of credit rating agencies to such earnings management efforts during serious natural disasters. As the firm's credit rating is a key factor in investment decisions, low credit ratings have significant cost implications for firms (i.e. cost of future borrowing and valuation of stocks). Therefore, we investigate whether firms are likely to affect their credit ratings by managing earnings during natural disasters in order to obtain a more favourable credit rating or to avoid a downgrade after the disasters.

On the one hand, credit rating agencies may want to protect their reputation when they recognize that firms are managing earnings during a natural disaster. In this case, credit rating agencies will penalize firms with managed earnings by lowering their credit rating. However, because credit rating agencies are not independent from the firms they rate, they might be motivated not to adjust for earnings management during disaster periods, resulting in higher than expected credit ratings. In other words, the research question is whether managers are able to influence credit rating during natural disasters by manipulating earnings.

We also consider whether the effects of earnings management on the deviations from expected credit rating is conditional upon the severity of the disaster. Similarly to our arguments above, we expect that the loss of investors' confidence in the survival of the firm shortly after the natural disaster would be more (less) severe in countries with high (low) level of intensity of natural disaster, thus affecting how earnings management relates to the deviations from expected credit rating.

As a final objective of the second empirical study, we consider whether the moderating role of a natural disaster in the relation between earning management and deviations from expected credit rating is different between

separating speculative grade and investment grade firms. Generally, speculative-grade (SG) firms need to manage earnings to have a higher level of credit ratings or upgrade from SG firms to investment-grade (IG) firms. This is because most investors (e.g. insurance firms, securities firms, banks, mutual funds, and private pensions) will not invest in non-IG firms due to self-imposed or regulation-based cutoffs. However, SG firms have many constraints (i.e. cash flow problems and high level of cumulative accruals management) in earnings management. Thus, credit rating agencies tend to detect earnings management in SG firms easily and they penalize SG firms for manipulating earnings during the disaster by lowering their credit ratings. While IG firms are likely to manage earnings to avoid downgrades to SG group, credit rating agencies are reluctant to adjust ratings in IG firms because of the low risk profile of IG firms (i.e. low bankruptcy risk). This leads to our final objective of investigating how credit rating agencies' response to earning management of SG firms differs from that of IG firms during natural disaster.

3 Overview of findings and contributions of the research

This study provides insights into the determinants and the debt market consequences of earnings management during natural disasters through two empirical studies presented in Chapter 3 and Chapter 4.

In Chapter 3 we provide evidence that firms actively manage earnings after the disasters by using both accruals and real earnings management to transmit a positive signal or avoid the loss of investors' confidence in the survival of the firms, which is aligned with the market incentive hypothesis. The market incentive hypothesis for earnings management suggests that firms whose

performance is suffering due to exogenous shocks, such as financial crises or – as in our setting - natural disasters, make adjustments to their policies (i.e. altering inventory accounting methods, changing estimates of bad debt, revising assumptions related to pension assets, changing credit terms and price discounts, and changing the product volume) to improve the look of their financial statements. We also document that the level of earnings management depends on the severity of the disaster.

Overall Chapter 3 contributes to the literature by providing useful insights into how natural disasters can affect reporting incentives and by providing evidence in favour of the market incentive hypothesis. More specifically, we improve on prior evidence (Byard et al., 2007) in two ways. First, we consider both accrual and real earnings management (hence allowing for the possibility that firms may choose one or the other strategy). Second, we employ a more robust methodological approach via the use of a differences-in-differences research design which assesses differences between the treatment and control groups before and after the disasters, hence strengthening causal inference (although we are aware that we cannot completely rule out that other potential omitted variables are affecting our results).

Our findings also extend prior literature on similar exogenous shocks, such as the financial crisis in Trombetta and Imperatore (2014), and its impact on earnings management. As extreme weather conditions are intensifying and catastrophic phenomena such as flooding become more common, understanding how managers react to natural disasters is of interest not only to investors and practitioners, but also to regulators in order to formulate appropriate policies.

In Chapter 4 we investigate how earnings management during a natural disaster is related to deviations from expected credit ratings. We document that credit rating agencies seem to be able to detect earnings management activities and penalize firms with earnings management by providing a lower credit rating during the disaster. This evidence is aligned with a reputation incentive story. We also document that the intensity of the disaster positively affects how the credit rating agencies adjust their credit ratings for earnings management. Finally, the results show that the consequences of earnings management on deviations from expected credit ratings affect mainly speculative-grade, rather than investment-grade, firms.

Our analyses in Chapter 4 contribute to the literature in several ways. Building on Carter (2015)'s findings on the impacts caused by internal factors (governance and internal controls), we examine the joint interaction among three important phenomena: earnings management, credit ratings, and natural disasters and investigate the impacts of the external factor (natural disasters, specifically the 2004 tsunami in the Indian Ocean and the 2011 flooding in Thailand) on earnings management towards credit ratings. Natural disasters are a very different type of exogenous shocks compared to regulation changes (SOX), as presented by Carter (2015). In addition, the analysis extends the scope of a previous study by Alissa et al. (2013) on the consequences of earnings management on deviations from expected credit rating by considering whether natural disasters play a moderating role. We also provide new empirical evidence that the difference in the timing of each disaster has affected the selection of earnings management techniques by the managers. Because the flooding in Thailand occurred at the beginning of the last quarter in 2011, firms in the flooding sample have more time to manipulate earnings by using

both real and accruals earnings management to affect deviations from the expected credit rating. In contrast, the tsunami occurred at the end of the last reporting quarter in 2004. Thus, firms in the tsunami sample have limited time to manage real activities. Our results may therefore benefit investors, regulators, and lenders who rely on credit ratings during events such as natural disasters to make decisions on investment, risk assessment, and lending.

4 Structure of the thesis

The rest of the thesis is organized as follows: Chapter 2 provides a review of earnings quality and earnings management. Chapter 3 presents the first empirical chapter which focuses on natural disasters as determinants of earnings management. Chapter 4 presents the second empirical chapter which focuses on the consequences of earnings management during natural disasters on deviations from expected credit rating. Chapter 5 provides the research's conclusions, limitations, and avenues for future research.

Chapter 2

A Review of Earnings Quality and Earnings Management

Abstract

The purpose of this literature review is to understand the theoretical underpinning of earnings management and how it relates to earnings quality. In addition, the review provides a thorough discussion of the most commonly used proxies of earnings management and examines research design choices in the earnings management research. Further, we discuss the determinants of earnings management as well as its consequences to provide a convenient reference tool for readers who are interested in studying earnings management practices.

Keywords: Earnings quality, earnings management, discretionary accruals, and abnormal real activities

1 Introduction

Prior literature has shown that investors fixate in reported earnings numbers for valuation and stewardship purposes and tend to ignore or underestimate the importance of other information (e.g. Sloan, 1996). This incentivizes managers to manipulate earnings and makes the evaluation of earnings quality important for both academics and practitioners.

Managerial engagement in earnings management can be driven by either information efficiency or opportunistic reasons. According to the efficient information hypothesis, managers apply discretion in estimation and judgment in order to represent the fundamental earnings performance in a faithful way (Francis et al., 2005; Choi et al., 2011; Christie and Zimmerman, 1994; and Bowen et al., 2008). However, under the opportunistic behavior hypothesis, managers may exploit this flexibility in accounting decisions to manipulate reported income according to their own incentives. In other words, they could engage in earnings management to misrepresent economic performance (Dechow, 1994; Schipper, 1989; Stolowy and Breton, 2004; and Kirschenheiter and Melumad, 2002).

Earnings management and earnings quality are the two sides of the same coin. When earnings management is low, the quality of earnings is high and vice versa (Dechow et al., 2010). The aim of this chapter is to review and allow a better understanding of the literature on the relation between earnings management and earnings quality, as well as the research design choices in the earnings management research.

Section 2 is concerned with explaining the notions of earnings quality and earnings management. We start by describing why earnings information is

critical, recognizing that high reported earnings quality is important in order to make accurate earnings forecast and estimate a stock's return potential as well as for stewardship purposes. Next, we present a clear definition of earnings quality and we discuss prior literature on this topic, shown the relationship between earnings quality and earnings management.

Section 3 discusses two types of earnings management (accruals and real earnings management). The discussion finds the fact that accruals and real earnings management have different costs and benefits, and that firms use them as substitutes. However, managers can also manage earnings by moving items within the income statement to increase core earnings or use special items. This strategy of managing earnings is called classification shifting and has been mostly overlooked by the literature.

Section 4 provides a detailed analysis of the models developed to measure earnings management which could be applied to improve financial reporting quality and to better protect investors in making decisions and verifying the reliability of the accounting information in financial reports. We discuss the three most common research designs for the study of accruals earnings management and the trade-off between the costs and benefits of each methodology. Next, we discuss the models developed to measure real earnings management including the comparison of costs and benefits of each model. Lastly, we briefly discuss other less explored methods (i.e. M-score, F-score, accounting ratio and unexplained audit fee model) to measure earnings management.

Section 5 provides a systematic classification of earnings management literature. Namely, we describe the two theoretical underpinnings for earnings management: the efficient information and the opportunistic behavior hypotheses. In addition, we discuss separately the incentives for earnings

management according to each theoretical framework. Better understanding managerial incentives for earnings managements is important for practitioners and regulators looking to undo the engaged portion of reported earnings when valuing the firm. Lastly, we discuss two patterns of earnings management (income minimization and income maximization).

Sections 6 and 7 present a different categorization of the earnings management literature, based on the determinants and constraints of earnings management (Section 6) or its consequences (Section 7). We classify the determinants and constraints on earnings management into two categories, namely, internal and external factors, and the consequences of earnings management into four categories, which include litigation propensity, market valuations, auditor opinions, and credit rating. Section 8 offers some conclusions and avenues for future research.

Firms with earnings management are of concern to various stakeholders. However, before looking for a solution, they need to understand the frequency, determinants and impact of earnings management, including what factors limit earnings management. This is the reason that we start this thesis with the review of earnings quality and earnings management literature before turning to the formal empirical studies in Chapter 3 and 4.

Chapter 2 is of interest to researchers studying the likelihood and extent of earnings management and/or developing a new model to detect earnings management behaviors of the firms. Furthermore, it can be helpful to investors' trying to improve their portfolio returns, auditors concerned about avoiding costly litigation, and analysts worried about building a reputation for accuracy. Lastly, it can help policy makers to formulate appropriate policies to detect earnings management and enhance investor protection.

2 Understanding earnings quality and earnings management

Dichev et al. (2013) report that chief financial officers (CFOs) are primarily responsible for the quality of earnings because they make the key decisions about how to apply accounting standards within their firms, and whether to use (or abuse) discretion in financial reporting. Earnings is an important input when evaluating management performance, setting efficient contracts, and making valuation/investment decisions about the firm. Thus, managers may decide to manage earnings to meet or beat certain performance and contracts thresholds or to achieve specific objectives. Prior literature (i.e. Dechow et al., 2010; Richardson et al., 2005; and Schipper and Vincent, 2003) suggests that earnings quality and earnings management are inversely related. This is consistent with the idea that strong earnings management leads to less clear earnings and vice versa.

Section 2 begins by analyzing why earnings are important to provide a basis for understanding the relationship between earnings management and earnings quality. Next, we present a definition of earnings quality and earnings quality components. Finally, we discuss how earnings management affects each of the components of earnings quality.

2.1 Importance of earnings

There are three reasons why earnings are highly important. First, earnings are an essential tool for shareholders to control management effectively as they provide a summary measure of a firm's performance and can be used to evaluate future cash flows (Ronen and Yaari, 2008). In line with this view, Schipper and Vincent (2003) suggest that earnings are considered as the most important summary performance indicator and Dewi (2015) documents that

profitability describes the firm's financial performance or management's responsibility with respect to the owner's interest. Furthermore, Burgstahler and Dichev (1997) indicate that equity investors, board of directors, and creditors use earnings benchmarks to reduce information-processing costs when evaluating firms' performance; while Dichev et al. (2013) extend the pool of interested stakeholders to employees, suppliers, customers, etc.

Second, earnings and other accounting numbers are often used to set efficient contracts (Ronen and Yaari, 2008; and Dichev et al., 2013). For example, bonus compensation contracts may dictate that the firm will not pay the bonus to the management or other employees if earnings are lower than a certain threshold. Debt contracts are another example, where the terms of the contract often include earnings-based covenants, such as restrictions to pay dividends to shareholders if earnings are lower compared to the prior year.

Third, earnings numbers contain essential information for making valuation decisions (Ronen and Yaari, 2008; Francis and Schipper, 1999; Ariff et al., 1997; and Ball and Brown, 1968). Based on Ohlson's model, market price is associated with earnings and other accounting data (Ohlson, 1995). Similarly, Ball and Brown (1968) document that accounting information such as earnings is useful in estimating the risks of security returns and expected value for investors. Thus, it is not surprising that investors mainly focus on earnings to predict future cash flows of firms and assess their risk when making an investment decision (Watrin and Ullmann, 2012). Callao et al. (2006), who study the comparative analysis of the value relevance of reported earnings and their components, provide evidence for the value relevance of net earnings numbers. Dichev et al. (2013) survey CFOs about earnings quality and find that 94.67% of

public firm CFOs think that earnings are important for investors in valuing the firm.

Conclusively, the quality of earnings is important for users of financial statements because high earnings quality ensures that earnings reflect current operating performance accurately, can be used to determine firm value, and are a good indicator of future operating performance (Ronen and Yaari, 2008; Burgstahler and Eames, 2006; Dechow et al., 2003; Jansen et al., 2012; Perotti and Wagenhofer, 2014; Schipper, 1989; and Dechow et al., 2010). In addition, earnings quality is important for regulators, whose role is to ensure that reported earnings are informative of the true underlying performance and economics of the business and safeguard investors (Dichev et al., 2013). Lastly, earnings quality is an area of interest for academics who examine a variety of issues, including the development of models to measure the quality of the reported earnings.

2.2 Definition of earnings quality and earnings quality measures

Ball and Shivakumar (2006) define earnings quality as the unbiasedness and sustainability of earnings. Dichev et al. (2013) suggest that the quality of earnings relates to reported earnings which are sustainable, repeatable, recurring, consistent, and reflecting long-term trends. Furthermore, the statement of financial accounting concepts No.1 (SFAC No1) documents the importance of earnings quality (Dechow et al., 2010). It mentions that high earnings quality is relevant to particular decisions because it provides information about a firm's financial performance, which is not directly observable. In other words, firms with high earnings quality have financial statements that reveal their real fundamental value. Dechow et al. (2010)

document that financial performance and the accounting system are among the factors affecting earnings quality.

Financial performance is one of the factors affecting quality of earnings because firms with weak performance are likely to engage in accounting gimmicks to improve their earnings. In other words, firms that are performing poorly have stronger incentives to manage earnings and such actions could reduce the quality of earnings (Doyle et al., 2007; and Dechow et al., 2010). On the other hand, firms with abnormal good performance (i.e. abnormal fast-growing firms) are associated with high earnings volatility, and hence they are considered to also have a low quality of earnings (Dichev et al., 2013). Not surprisingly, several papers select earnings properties (such as earnings smoothness, earnings variability, and earnings persistence) as earnings quality proxies (Esteban and Garcia, 2014; and Kirschenheiter and Melumad, 2002). We will describe earnings properties in more depth in subsection 2.2.1 about earnings quality measures.

The accounting measurement system determines the quality of a firm's earnings as well. Dechow (1994) and Dichev et al. (2013) suggest that generally accepted accounting principles (GAAP) play a prime role in improving the ability of earnings to signal the firm's performance. In the same vein, Schipper and Vincent (2003) report that standard setters view the quality of financial reporting standards as an indirect indicator of the quality of the reported earnings. Accounting standards set the flexibility in the choice of accounting treatments and managers can use this flexibility either to convey to investors their private information about future cash flows in line with the efficient information hypothesis or opportunistically to serve their own interest. Ewert et al. (2005) investigate whether tighter accounting standards reduce

earnings management and provide more relevant information to capital markets. They show, by relying on a rational expectations equilibrium model, that earnings quality increases with tighter standards in line with the opportunistic hypothesis. Therefore, firms with high quality of both financial performance and tighter accounting systems have higher quality of earnings.

In addition to the above, earnings quality also depends on changes in other characteristics of the firm, i.e. the business model of the firm, the environment in which the firm operates, its auditors, and other macro-economic conditions that we will describe in more depth in Section 6 when discussing the determinants of earnings management (Perotti and Wagenhofer, 2014; Zeff, 2014; Cormier et al., 2013; and Schipper and Vincent, 2003). Dechow et al. (2010) and Esteban and Garcia (2014) indicate that macro-economic factors (such as inflation, unemployment, a country's gross domestic product (GDP), public policies, environmental policies, and financial crisis) negatively influences earnings quality, and are associated with incentives for earnings management. For example, the managers may be motivated for earnings management during financial crises to show good performance and ensure that the firm can continue in the future or to justify laying off employees.

Prior researchers (i.e. Dechow et al., 2010; Kousenidis et al., 2013; Esteban and Garcia, 2014; and Mendes et al., 2012) have categorized earnings quality in various ways as shown in table 2.1.

Table 2.1: Classification of earnings quality

Classify by measures		**Classify by strategies**
Dechow et al. (2010)	*Kousenidiset et al. (2013); and Esteban and Garcia (2014)*	*Mendes et al. (2012)*
1. Properties of earnings - Earnings persistence - Earnings smoothing - Small profits and small loss avoidance - Timely loss recognition (Schipper and Vincent, 2003; Dechow and Dichev, 2002; Subramanyam and Wild, 1996; Dichev et al., 2013; Dechow et al., 2010; Esteban and Garcia, 2014; Richardson, 2003; Ball et al., 2003; Li, 2008; Dichev et al., 2013; Stolowy and Breton, 2004; Mendes et al., 2012; Tucker and Zarowin, 2006; Kirschenheiter and Melumad, 2002; Rountree et al., 2008; Milikan and Mukkti, 2015; Carter, 2015; Graham et al., 2005; Barth et al., 2008; Defond and Park, 1997; Bartov, 1993; Defond, 2010; Ball et al., 2000; Basu, 1997; and Price et al., 2011)	1. Accounting-based measures - Earnings persistence - Earnings variability - Earnings predictability - Earnings smoothing - Small profit (Subramanyam and Wild, 1996; Bath et al., 2008; Schipper and Vincent, 2003; Dichev et al., 2013; Dechow et al., 2010; Li, 2008; Esteban and Garcia, 2014; Dechow and Dichev, 2002; Price et al., 2011; Dichev and Tang., 2009; Das et al., 1998; and Affleck-Graves et al., 2002)	1. Aggressive policy (Dichev et al., 2010; Richardson, 2003; Mendes et al., 2012; and Dichev et al., 2013)
2. Investor responsiveness to earnings - Earnings response coefficient (R^2) (Schipper and Vincent, 2003; Dichev et al., 2013; Sloan, 1996; Xie, 2001; Liu and Thomus, 2000; Teoh and Wong, 1993; Cahan et al., 2009; Givoly and Hayn, 2000; Lev and Zarowin, 1999; and Darjezi et al., 2015)	2. Capital market-based measures - Value relevance - Timeliness of loss recognition (Francis et al., 2004; Schipper and Vincent, 2003; Sloan, 1996; Ball et al., 2003; Xie, 2001; Cahan et al., 2009; Ball et al., 2000; Kormendi and Lipe, 1987; and Chin, 2015)	2. Conservative policy (Penman and Zhang, 2002; Basu, 1997; Dichev et al., 2010; Dechow et al., 2010; Ball and Shivakumar, 2008; Defond, 2010; Ball et al., 2000; and Dichev et al., 2013)
3. Other indicators of earnings quality - Restatements - Internal control weaknesses - SEC accounting and auditing enforcement releases (Dechow et al., 1996; Dechow et al., 2010; Tang at el., 2015; Doyle et al., 2007; Klein, 2002; and Lin et al., 2016)		3. Earnings smoothing (Barth et al., 2008; Milikan and Mukkti, 2015; Stolowy and Breton, 2004; Schipper and Vincent, 2003; Mendes et al., 2012; Kirschenheiter and Melumad, 2002; Tucker and Zarowin, 2006; and Rountree et al., 2008)

We follow Dechow et al. (2010) and we classify the quality of earnings into three groups: properties of earnings, investor responsiveness to earnings, and other indicators of earnings equality.

2.2.1 Properties of earnings

The first group of measurements focuses on the characteristics or properties of earnings, which includes earnings persistence, earnings smoothing, earnings variability, earnings predictability, and timeliness of loss recognition.

Earnings persistence

Earnings persistence is correlated with stability and is observable over time. Earnings persistence is measured as the slope coefficient in a regression of stock returns on the changes in earnings or level of earnings (Schipper and Vincent, 2003). Subramanyam and Wild (1996) measure earnings persistence by using the coefficient from a regression of returns on earnings to study whether the relation between earnings and changes in security valuation is increasing in the persistence of the earnings. Their result shows an inverse relation between an entity's probability of termination and the informativeness of earnings. Dichev et al. (2013) suggest that high-persistence earnings are an accurate predictor of future long-run sustainable earnings. In addition, Dechow et al. (2010) document that more persistent earnings lead to higher firm and equity valuation (higher stock prices and market returns). Therefore, firms having higher earnings persistence are viewed as having higher earnings quality (Esteban and Garcia, 2014; Richardson, 2003; and Revsine et al., 1999).

Further, firms with higher readability of financial disclosures have more earnings persistence which allows investors to predict stock prices that more accurately reflect the persistence of earnings (Dechow et al., 2010). This is consistent with evidence in Li (2008) that annual report readability is positively associated with earnings persistence. These findings suggest that the annual reports of firms

with more persistent positive earnings are easier to read. In contrast, firms with more special items or accruals adjustments have lower persistence of earnings because special items may not be helpful for predicting future earnings (Dechow et al., 2010). Thus, those firms are considered to have low earnings quality.

Earnings smoothing

Earnings smoothing is a technique used to decrease the natural earning variability over time to produce a steady stream of income and make the firm appear less risky (Dichev et al., 2013; Stolowy and Breton, 2004; Schipper and Vincent, 2003; and Mendes et al., 2012). Dechow et al. (2010), who study the validity and usefulness of the determinants of earnings quality, document that earnings smoothing can improve the firm value. Firms with originally smoother earnings have less earnings volatility, and thus firm value is priced with a premium. This is consistent with the evidence by Tucker and Zarowin (2006) who show that changes in the current share price of firms with less earnings smoothing contain less information about their future earnings than do changes in the share price of firms that smooth earnings more. Kirschenheiter and Melumad (2002) point out that the managers wish to smooth earnings because reporting small earnings increases the inferred precision of the reported earnings. However, Rountree et al. (2008) find that income smoothing is not value creating if not supported by smoothed cash flows and is viewed by investors as opportunistic accounting manipulation.

Milikan and Mukkti (2015) suggest that earnings smoothing together with less volatility in stock prices will encourage investors to buy shares. Hence, it leads to higher market value. Moreover, Carter (2015) finds that smoother earnings will lead to less uncertainty about firms' creditworthiness and, thus, higher credit

ratings. Not surprisingly, firms with less volatile earnings will have higher credit ratings than other firms. This notion is further supported in a survey by Graham et al. (2005), in which approximately 42 percent of the respondents believe that smoother earnings enable firms to achieve better credit ratings. In summary, smaller variance in earnings implies earnings smoothing and, generally, higher earnings quality.

Barth et al. (2008) suggest three ways to measure earnings smoothness: the variability of the change in net income scaled by total assets (low variance indicates more income smoothing); the ratio of the variability of the change in net income to the variability of the change in operating cash flows (lower ratios imply more income smoothing); and the Spearman correlation between accruals and cash flows (negative correlations are evidence of income smoothing).

Schipper and Vincent (2003) argue that the researchers need to assess whether income is inherently smooth because of the business model and the reporting environment of a firm or, alternatively, if earnings smoothness has been caused by a deliberate management's choice. In the latter case, the researcher can use discretionary accruals, a measure described and discussed in detail in section 4.2 about discretionary accruals models, to assess artificially smoothed earnings. In several accounting studies (e.g. Defond and Park, 1997; Tucker and Zarowin, 2006; and Barth et al., 2008), firms with high discretionary accruals have been shown to artificially smooth earnings in order to increase firm value. As a result, these firms have lower earnings quality. This is consistent also with evidence in Jung et al. (2013) that firms near a broad rating boundary (plus and minus) have high discretionary accruals. Their findings imply that those firms are more likely to smooth earnings to increase the likelihood of a credit rating upgrades or decrease the likelihood of a credit rating

downgrades from broad ration category. Bartov (1993) provides another example of artificially smoothed earnings. His analysis shows that managers engage in earnings management by choosing the period during which long-lived assets and investments will be sold. In doing so, managers manipulate earnings smoothness by taking advantage of the principle of acquisition cost underlying the accounting valuation of assets[1].

Earnings variability

Earnings variability is measured by the standard deviation of earnings over time. It is measured as an inverse of earnings smoothing. Milikan and Mukkti (2015) suggest that a high degree of earnings variability, which is associated to fluctuation in share prices, will discourage investors to buy shares, which, in turn, leads to lower share market value. Similarly, Dechow and Dichev (2002) and Schipper and Vincent (2003) point out that firms with larger standard deviations of earnings have less earnings persistence, less earnings predictability and hence lower quality of earnings. Furthermore, Schipper and Vincent (2003) document that managers may introduce transitory components to decrease time-series variability because they believe investors prefer firms with small standard deviation of earnings. This is consistent with findings in Pincus and Rajgopal (2002) that firms are likely to reduce earnings volatility caused by oil price risk by hedging with derivatives instruments in the first three quarters, but then, primarily in the final quarter, managers' trade-off abnormal accruals and hedging with derivatives to report smooth earnings.

[1] Acquisition-cost principle implies that changes in the market value of an asset between acquisition and sale are reported in the period of the sale.

Most studies use the abnormal accruals approach to test for evidence whether earnings variability is a faithful representation to the reporting entity's business model and its economic environment. Firms with high abnormal accruals are assumed to manage earnings variability. Hence, they are considered to have low earnings quality.

Earnings predictability

Earnings predictability is an attribute of earnings and refers to the predictive ability of earnings. Firms with highly predictable earnings are considered to have higher-quality earnings because they increase the accuracy and value relevance of earnings forecasts (Esteban and Garcia, 2014; Dichev et al., 2013; and Price et al., 2011). According to Schipper and Vincent (2003), earnings predictability and earnings variability are negatively related. This is consistent with evidence in Dichev and Tang (2009), who investigate the link between earnings volatility and earnings predictability. They find that earnings with little reliable predictability have remarkably low persistence and high volatility. In other words, firms' earnings will have high predictive ability if they have low variability, and hence higher quality (Dechow et al., 2010). In contrast, Barth et al. (2008) argue that forecastable earnings may be not positively correlated with accounting quality (e.g. in case of using of accruals to report earnings with an artificially reduced variability).

Interestingly, Das et al. (1998) study whether the predictive accuracy of past information and the magnitude of the bias in analysts' earnings forecasts are related. They estimate the predictability measure by using the forecast error from time-series models. Their results show that analysts will issue less optimistic forecasts for high predictability firms than for low predictability firms. It can be inferred that high predictability firms have high earnings quality; thus,

analysts' earnings forecasts are more accurate predictions compared to forecasts for low predictability firms. Moreover, the evidence of Affleck-Graves et al. (2002) suggests that firms with relatively more predictable earnings have a lower cost of equity capital (i.e. lower bid-ask spreads) than comparable firms with less predictable earnings streams. In their study they measure earnings predictability by using a time series linear regression model. However, managers who wish to minimize their cost of equity capital may manage artificially earnings predictability, which in turn, signifies low earnings quality.

Timeliness of loss recognition

According to timeliness of loss recognition, firms with more timely recognition of losses have higher quality earnings because timely loss recognition can enhance contracting efficiency (Defond, 2010; and Ball et al., 2000). For example, timely loss recognition gives managers more incentives to undertake positive net present value (NPV) projects and abandon loss-making investments quickly, thereby increasing the efficiency of contracting (Ball et al., 2003). In addition, Chin (2015) finds that credit ratings of firms with earnings that exhibit more timely loss recognition predict default more quickly and accurately overall. Consequently, firms with higher accounting quality exhibit more timely loss recognition allowing investors and credit agencies to more accurately evaluate them.

Dechow et al. (2010) indicate that the reverse earnings-returns regression from Basu (1997) is the most frequently used measure of timely loss recognition and that it is based on the assumption of efficient markets. According to Basu (1997), the idea of conservative accounting system is that earnings reflects bad news more quickly than good news. This means that negative earnings changes (when bad news are incurred) will be less persistent and more likely to

reverse than positive earnings changes (when good news are incurred). This attribute of earnings is also known as accounting conservatism. Similarly, Dechow et al. (2010) suggest that earnings measured under a more conservative policy, which implies early expense recognition or delay in income recognition, are correlated with high earnings quality. This is consistent with the evidence provided by Ball and Shivakumar (2008). They find that IPO firms, which are required to increase the quality of their accounting quality due to the increased market scrutiny, report more conservatively. However, even though timely loss recognition is considered evidence of accounting quality, it is negatively related to earnings smoothing because large losses may be relatively rare in firms with earnings smoothing (Lang et al., 2003).

2.2.2 Investor responsiveness to earnings

The second group of measurements of earnings quality is the investor responsiveness to earnings, which comprises earnings response coefficient (ERC) and value relevance.

Earnings response coefficient

Information in earnings and information used by investors in their equity valuation decisions are correlated (Dechow et al., 2010). Therefore, it should not be surprising that some studies use various equity market attributes (e.g. volatility changes around earnings announcements, and long-window returns and volume) to infer earnings quality (Dichev et al., 2013).

Liu and Thomus (2000) indicate that the earnings response coefficient (coefficient estimate) or the R^2 from the returns earnings model can be used as a measure of investor responsiveness to earnings. Teoh and Wong (1993) examine whether auditor's reputation is correlated with credibility of the

earnings report by comparing how the earnings response coefficient (ERC) differs between Big Eight (now Big Four) and non-Big Eight audited firms. Their results indicate that the ERCs of non-Big Eight clients are statistically significantly lower than for Big Eight clients. This suggests that auditor's reputation is a proxy for auditor quality, where a high-quality audit is defined as one who brings about more credible earnings reports, resulting in higher-quality earnings. However, Dechow et al. (2010) document that declining ERCs may occur from changes in accounting methods. For example, more conservatism in accounting standards (e.g. increase in fair value accounting of asset impairments, and the recognition of pension liabilities) results in the recognition of more transitory losses in earnings as having low earnings quality, which in turn, lead to declining ERCs (Givoly and Hayn, 2000; and Lev and Zarowin, 1999).

Value relevance

Earnings quality plays a role for the value-relevance of accounting information. Value relevance can be measured by regressing stock prices or stock returns on earnings or cash flows metrics (Schipper and Vincent, 2003).

The earnings of firms with high earnings quality have a greater association with share prices and stock returns compared to the earnings of firms with low earnings quality (Dechow et al., 2010). In other words, firms with managed earnings have a low association between earnings and stock returns/share prices (Sloan, 1996; and Xie, 2001). This is consistent with the evidence of Chan et al. (2006) which shows that high (low)-quality earnings are associated with good (poor) future returns. Similarly, Darjezi et al. (2015), who investigate whether earnings quality is linked with stock returns, find that working capital accruals of high earnings quality firms can help to predict their future returns.

Interestingly, Cahan et al. (2009) document that not only the quality of earnings but also the quality of prices affects the value relevance of earnings. Moreover, the evidence of Kormendi and Lipe (1987) suggest that earnings quality is associated with the ability of earnings to reflect information about future benefits accruing to shareholders.

2.2.3 Other indicators of earnings quality

The third group of earnings quality measures focuses on the firm external and internal environment, and how it affects earnings quality. By external environment, we mean reference to accounting regulation and other regulatory actions (such as the Sarbanes-Oxley Act (SOX)), that can affect earnings quality. External indicators of earnings quality have advantages because an external party directly identifies earnings quality problems (e.g. the auditor in case of internal control weaknesses, and the SEC in case of accounting and auditing enforcement releases) (Dechow et al., 1996). Moreover, earnings quality is measured by using internal indicators as well (such as the management team in case of restatements and internal control weaknesses). At the same time the most important disadvantage of using external and internal indicators as proxies for earnings quality is that they include both intentional and unintentional misstatements.

Dechow et al. (2010) find that extreme accounting accruals firms tend to be subject to SEC enforcement releases and are considered to have lower-quality earnings than normal firms. Tang at el. (2015) find that smaller, younger, riskier, and financially weaker firms are likely to have material weaknesses in internal control, which signal the likelihood of unreliable financial reporting. According to regulatory requirements of Sarbanes-Oxley Act (SOX), managers and auditors provide an assessment regarding the effectiveness of internal control over

financial reporting (e.g. internal control quality). In other words, SOX asks firms to have more stringent internal controls. Hence, the firms' earnings are of higher quality after the regulatory requirements of SOX. This is consistent with evidence of Doyle et al. (2007) that internal control quality under section 404 of the SOX of 2002 and earnings persistence are positively associated. Firms with weak internal control (as proxied by disclosure of material weaknesses) have also lower earnings persistence, hence lower-quality earnings. In another study, Aono and Guan (2008) investigate the mitigating effect of SOX on cosmetic earnings management and find evidence of earnings management in the two-year period prior to the SOX, which however decrease in the period after the SOX. This finding means that SOX has a deterring impact on earnings management behavior.

Klein (2002), who investigates whether audit committee and board characteristics are related to earnings quality, indicates that boards structured to be more independent of the CEO are more effective in monitoring the firm financial accounting process, resulting in earnings of higher-quality. Moreover, Lin et al. (2016) find that better corporate governance has a positive impact on the possibility of earnings management to improving the transparency of financial reporting and informativeness of reported earnings.

2.2.4 Alternative classifications of earnings quality measures

Earnings quality measures may also be classified according to their reliance on accounting-based and market-based measures (Kousenidis et al., 2013; and Esteban and Garcia, 2014). Recent empirical research measures earnings quality based on accounting information by considering various earnings attributes, namely, earnings persistence, earnings variability, earnings predictability, earnings smoothing, and small profit, while, proxies for market-

based constructs are based on the relation between market data and accounting data (Francis et al., 2004). Capital market-based measures take prices or returns into consideration, by focusing on value relevance and timeliness of loss recognition.

Mendes et al. (2012) employ a different approach and classify earnings quality strategies into three groups, which are (1) aggressive policy, (2) conservative policy, and (3) earnings smoothing. The first two strategies serve the opposite purpose. Aggressive accounting strategies are used to boost income; whereas conservative accounting strategies aim to reduce income. Earnings measured under an aggressive policy recognize early revenues and/or delay expense recognition. Consequently, earnings for the current period would most likely be upward biased, in contrast to cash flow from operations. Operating cash flow that is less than net income or decreasing over time may indicate low quality earnings because firms that cannot generate enough cash have increased incentives to mask their poor performance. Thus, an aggressive policy is associated with lower quality of earnings (Dechow et al., 2010; and Richardson, 2003). On the other hand, earnings under a more conservative policy are associated with higher quality because this policy is often associated with a more timely loss recognition as discussed earlier.

As an example, suppose firm A and firm B have about the same level and type of cash flows and similar strategies regarding the use of property, plant, and equipment (PPE). However, firm B assumes that the useful life of its assets is 15 years while firm A assumes a useful life of 10 years. Firm B is using a longer useful life, which results in increased earnings as the depreciation expense is lower than in firm A. The underlying performance of both firms is the same, yet firm B’s earnings will appear higher. Firm B is said to employ a more aggressive

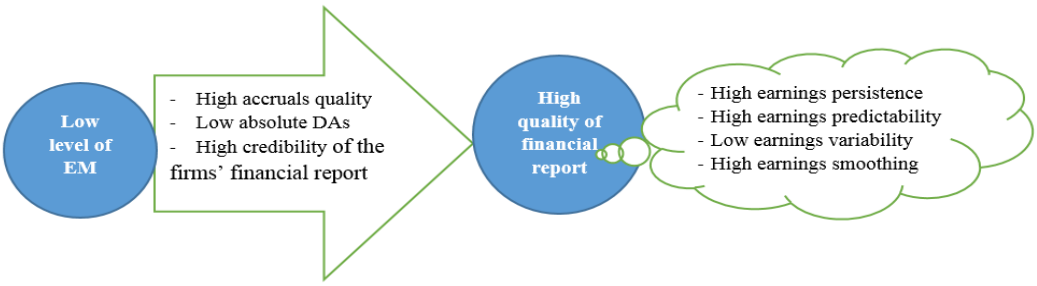
accounting strategy and similarly firm A is said to employ a more conservative accounting strategy. Based on prior literature, Firm A is considered to have higher earnings quality than firm B (Dechow et al., 2010; and Dichev et al., 2013).

Finally, income smoothing strategies aim to reduce long-term income volatility and, as such, they are associated with higher earnings quality. Hence, firms having higher earnings smoothing are viewed as having higher earnings quality because of enhanced market value and accuracy of analyst forecasts (Milikan and Mukkti, 2015; and Kirschenheiter and Melumad, 2002).

2.3 Relation between earnings quality and earnings management

Figure 2.1 graphically depicts the relation between earnings management and earnings quality (Barth et al., 2008; Dechow et al., 2010; Dichev et al., 2013; and Richardson et al., 2005).

Figure 2.1: The interrelation of earnings management and earnings quality



The quality of accounting accruals is one of the most commonly used measures of earnings management (Dichev et al., 2013). Dechow et al. (2010) divide accruals into two types, namely normal and abnormal accruals. Normal accruals, also known as non-discretionary accruals (NDAs), capture adjustments that reflect fundamental performance, whereas abnormal accruals or discretionary accruals (DAs) capture distortions induced by (the abuse of)

discretion in accounting choices. In other words, earnings components can be split into an innate portion that is beyond the control of the management, and a discretionary portion that can be influenced by management decisions (Dichev et al., 2013). Discretionary accruals contain intentional error and unintentional error that ultimately must reverse (Dechow et al., 2010). NDAs reflect the real economic fundamentals of a firm, while, DAs represent the managerial choices (i.e. accounting choices, implementation decisions, and managerial errors) (Mendes et al., 2012). Therefore, firms with high absolute discretionary accruals tend to have a high degree of earnings management which, in turn, implies low quality of earnings (Kousenidis et al., 2013).

Dechow et al. (2010) explain that firms reporting high accrual accounts tend to have high DAs. Hence, extreme accruals firms are considered to have low quality of earnings. Similarly, Schipper and Vincent (2003) and Francis et al. (2005) document that DAs and earnings quality have an inverse association. In other words, quality of reporting is positively influenced by quality of accruals. In addition, high-quality accrual accounting reduces the variance of earnings (Ball and Shivakumar, 2006) and results in better quality accounting information, with higher precision and less variation. This in turn, reduces the assessed variance of the firm's assets value, thus, the cost of capital (Lambert at al., 2007).

However, managers can manage earnings not only via accounting estimates and methods, but also through operational decisions, such as the delaying or cutting of research and development expenses (R&D), alterations in shipment schedules, and the expansion of credit terms (Roychowdhury, 2006; Cohen et al., 2008; and Bozzolan et al., 2015). Roychowdhury (2006) was the first to empirically study real activities manipulation, finding that firms manipulate earnings by changing their real decision by, for example, cutting R&D

expenses, changing price discounts, and overproducing to beat or meet benchmarks. In turns, these operational decisions have an effect on abnormal cash flow from operations, abnormal discretionary expenses and overproduction/ underproduction.

In conclusion, firms having higher degree of earnings management tend to have less persistent earnings, more restatement or misstatement, lower investor responsiveness to earnings, more special or non-recurring items, they appear to beat or meet benchmarks more often, and hence they are considered to have lower earnings quality (Dechow et al., 2011; and Dichev et al., 2013).

3 Types of earnings management

In general, the manipulation of the profit figures typically implies the manipulation of the accruals because management can exercise discretion in the reported accruals in line with current accounting standards (Watrin and Ullmann, 2012; and Leuz et al., 2003).

Previous studies find that accruals and cash flows are negatively correlated and that accrual accounting provides smoother earnings and a better measure of performance than cash flows (Dechow and Skinner, 2000; Dechow and Dichev, 2002; and Dechow, 1994). On the other hand, the accrual component of earnings contains more uncertain information than the cash flow component because accruals are the product of estimates, judgment, and allocations (such as depreciation methods, allowance for doubtful debt, and etc.). For instance, managers must estimate uncollectible accounts receivables or write down inventories. Firms can also change depreciation method for PPE (Ghosh and Olsen, 2009), however, as Sloan (1996) points out managers can manage current accruals more easily than non-current ones. Adjusting assumptions or

estimates lead to a decline in earnings quality. In other words, abnormal accruals or DAs represent a distortion to earnings quality (Kousenidis et al., 2013; and Dechow et al., 2010). In line with this argument, Burgstahler and Eames (2006) find that firms that meet certain earnings benchmarks have greater DAs than firms that miss the benchmarks.

However, managing accounting accruals is not the only method that managers can use to manipulate earnings. Earning can be managed also by changing the operating environment and business model of the firm, e.g. by extending a line of business or changing credit policies (Cohen et al., 2008; Roychowdhury, 2006; and Bozzolan et al., 2015).

Lastly, a third type of earnings management, classification shifting, is also used by managers despite prior literature heavily ignoring this option. Unlike accruals and real earnings management, classification shifting does not affect bottom line earnings as managers manage earnings by simply moving items within the income statement and thus altering the location between core earnings and special earnings items.

Table 2.2, below, summarizes the characteristics of the three different types of earnings management; while the following subsections discuss each type in more detail.

Table 2.2: Types of earnings management

	AEM	REM	Classification shifting
Nature	Relates to changes in estimates and accounting policies. Accruals depend on the judgement of the management team within the constraints of GAAP	Directly affects the real operating cash flow and activities of the firm. Managers can manage earnings by: 1. Premature revenue recognition by offering prices discounts, expanding credit terms, and sale of profitable assets 2. Cutting expenses (i.e. R&D and advertising expenses) 3. Overproducing/ Underproducing	Managers can manage earnings by moving items within the income statement to increase core earnings
Timing for managing earnings	After the end of the accounting period but within the confines of the accounting system	During the fiscal year	Fiscal year-end reporting
Benefits	Easy to do Does not affect cash flows	Not a GAAP violation Harder to detect	Net income remains unchanged
Constraints	Scrutiny by auditors and regulators and risk of litigation. The sum of the accruals must be zero over the life of the firm	More costly for firms Affects cash flows	Misstatement
Potential Models	Jones model (1991) Modified Jones model (1995) Dechow and Dichev model (2002) Modified Dechow and Dichev model (2002) Modified Jones with ROA model (2005) Performance-matched Jones model (2005)	Cash flow from operations model (2006) Discretionary expenses model (2006) Production cost model (2006)	-
Seminal papers	Healy (1985); Jones (1991); Dechow et al. (1995); Lo (2008); Bozzolan et al. (2015); Irani and Oesch (2016); Cohen and Zarowin (2010); Cohen et al. (2008); Healy and Wahlen (1999); Beyer et al. (2014); Sloan (1996); Teoh et al. (1998); Byard et al. (2007); Gul et al. (2003); and Haw et al. (2005)	Roychowdhury (2006); Cohen et al. (2008); Zang (2012); McVay (2006); Irani and Oesch (2016); Alissa et al. (2013); Alhadab et al. (2016); Cohen and Zarowin (2010); Bozzolan et al. (2015); Cohen et al. (2008); and Trombetta and Imperatore (2014)	Abernathy et al. (2014); McVay (2006); Riedl and Srinivasan (2010); Dechowet et al. (2010); Dichev et al. (2013); and Walker (2013)

3.1 Accruals earnings management

Accruals earnings management (AEM) relates to changes in estimates and accounting policies (Lo, 2008; Bozzolan et al., 2015; and Irani and Oesch, 2016). Accruals depend on the judgement of managers within the constraints of GAAP. Managerial judgement involves estimating figures for future economic events, such as the expected life and salvage values of long-term assets, deferred tax valuation allowance, loss from bad debts and asset impairments, obligations for pension benefits and other post-employment benefits. In addition, managers must make decisions about inventory valuation methods and an accounts receivable policy, which affects cost allocation and net revenues.

Accounts receivable, inventory, PPE and intangible assets, in particular, are captured with relatively low reliability (Ghosh and Olsen, 2009). Dechow et al. (2011) suggest that management may be optimistic about the value of credit sales, inventories, PPE and other assets. For example, accounts receivable involves the estimation of uncollectible accounts and managers are likely to manipulate earnings by premature revenue recognition and trade-loading. Inventories involve the allocation of costs (e.g. FIFO, LIFO, and weighted average) and writing-down decisions based on estimates of fair value. PPE and intangible assets involve choosing a depreciation/ an amortization schedule and writing-down decisions based on impairment. Therefore, managers may take advantage of how accounting standard can be applied in order to achieve specific targets.

Although, AEM is done easily, it can also be detected easily and the primary cost of AEM is its potential detection by auditors and regulators, reputation and the litigation risk (Bozzolan et al., 2015). Nonetheless, discretionary accruals do

not directly affect cash flows and should not have a negative impact on firm value (Cohen and Zarowin, 2010; and Irani and Oesch, 2016).

The motive for AEM can be either increased or decreased earnings according to the target at that time. However, note that accruals reverse over time affecting future earnings in the opposite direction (Lo, 2008; and Cohen et al., 2008). Dechow et al. (1995) point out that managing abnormal accruals is more complex than measuring abnormal stock returns because the sum of the accruals must be zero over the life of the firm. Consequently, if firms manage discretionary accruals, they will need to make additional assumptions about the timing of the accrual reversals. (Beyer et al., 2014). Consistent with this argument, Sloan (1996) provides evidence that the earnings of firms that have large accruals tend to decline over the subsequent three years, a finding he attributes to the reversal of the accounting accruals. Similarly, Gill et al. (2013) suggest that the more intense the practice of earnings manipulation, the greater the adverse effect on the ROA in subsequent periods. Moreover, the evidence of DuCharme et al. (2001) suggest that abnormal accruals in the preceding IPO year are significantly negatively related to subsequent performance. Because firms with AEM need to revise accruals in the following year, it is not surprising that those firms offer lower subsequent returns to investors.

Although, AEM has several constrains as mentioned earlier, many previous researchers find that managers are likely to engaged in AEM by using discretionary accruals for several reasons. For example, Teoh et al. (1998) find that seasoned equity issuers tend to manage income upward by altering discretionary accounting accruals, while Gul et al. (2003) indicate that managers of firms with high accounting-based compensation tend to use discretionary accruals to improve their compensation. Moreover, Haw et al.

(2005) find that managers use income-increasing accounting accruals to meet regulatory return on equity targets for stock rights offerings under the 1996-98 security regulations in China.

3.2 Real earnings management

Real earnings management (REM) directly affects the real operating cash flow and activities of the firm. However, it does not violate the GAAP as long as firms correctly account for the transaction. For instance, managers can change the operating environment by extending a line of business or a geographic region; moreover, they can change the business model by decreasing or increasing the accounts receivable turnover, offering greater price discounts, and decreasing or increasing the production volume (Alhadab et al., 2016; Cohen and Zarowin, 2010; Bozzolan et al., 2015; Cohen et al., 2008; and Roychowdhury, 2006).

According to previous research (Roychowdhury, 2006; Trombetta and Imperatore, 2014; Cohen et al., 2008; Zang, 2012; and Alissa et al., 2013), there are three types of real earnings management, namely, (1) abnormal cash flow from operations such as accelerating sales by offering price discounts, extending credit terms, selling profitable assets or repurchasing stock; (2) abnormal discretionary expenses such as cutting R&D expenses, cutting advertising and selling, general, and administrative (SG&A) expenses (including employee training, maintenance, travel, and etc.); and (3) abnormal production cost such by either overproducing or underproducing. Firms engaging in downward earnings management tend to have above-normal cash flow from operations, above-normal discretionary expenses, and below-normal production costs (Roychowdhury, 2006). Both manufacturing firms and non-manufacturing firms can extend their credit terms and offer price discounts to accelerate sales

or cut R&D to reduce expenses. However, production costs can be used to manage earnings mainly in manufacturing firms.

These actions are harder for auditors or investors to detect as such decisions are in the discretion of managers and boards of directors (Irani and Oesch, 2016). Consequently, there is no benchmark to use when evaluating such actions as cutting (increasing) R&D, reducing (increasing) advertising expenditure to manage earnings upward (downward), provide price discounts to temporarily increase income or increase the product volume more than necessary (build-ups in inventories) in order to lower the reported cost of goods sold and report higher income (Cohen and Zarowin, 2010).

However, manipulating real activities affects both current and future cash flows. AEM does not affect cash flows, while real earnings management activities have a direct effect on the cash flow and operating performance of firm (Cohen and Zarowin, 2010). Trombetta and Imperatore (2014) point out that cutting R&D expenses and increasing income by offering price discounts or extended credit terms can be easier and faster than overproducing during a financial crisis; at the same time, it is also likely to be more costly for firms (McVay, 2006; and Zang, 2012). For example, accelerating the sales by increasing price discounts or further extending credit terms will obviously result in lower cash flows in the current period and may lead customers to expect such discounts in the future (Irani and Oesch, 2016). Further, reducing advertising expenditure can manage earnings upwards in current period but may result in the loss of future income due to a loss in the value of the brand. This supports the argument by Chen et al. (2015) that a firm's real earnings management activities increase the firm's future cash flow uncertainty. This is also consistent

with the result by Tabassum et al. (2015) that firms manipulating real earnings management activities have worse financial performance in the future.

As mentioned above, REM has several constrains, but, many prior studies find that managers are likely to manipulate REM to report higher earnings, meet/ beat the expectations of analysts' forecasts, and achieve earnings goals. For example, Gunny (2010) reports that firms meeting earnings benchmarks are more likely to have engaged in REM by reducing R&D to increase income, reducing SG&A to increase income, and overproducing to decrease COGS expense. However, their results indicate that firms that engage in REM to meet earnings benchmarks have higher subsequent firm performance than firms that do not engage in REM and miss the earnings benchmarks. Similarly, Kim et al. (2013) find that managers are likely to engage in REM rather than accruals-based earnings management to affect the upcoming rating changes because of frequent discussion and communication with credit rating agencies and relatively less scrutiny and litigation risk on REM.

Costs and benefits of accruals and real earnings management

Inconsistent reporting choices tend to be signals of earnings management (Dichev et al., 2013). For example, firms with changes in business policy (such as extending credit terms, offering price discounts, cutting R&D, and increasing the product volume) are likely to manipulate earnings by using real earnings management, whereas, firms with changes in estimates and accounting policies (such as changing from FIFO to weighted-average inventory valuation methods, changing from accelerator to straight-line depreciation methods, and changing estimates of bad debt) are likely to engage in accruals earnings management.

As mentioned earlier, accruals and real earnings management have costs and benefits. The costs of REM are mainly related to the economic consequences of deviating from the optimal operations, whereas, the main costs of AEM are related to auditor and regulator' scrutiny and litigation risk (Zang, 2012). Investigating the behavior of younger executives who are faced with substantial incentives to engage in earnings management, Demers and Wang (2010) find that younger executives tend to choose the lesser potentially value-destroying action to meet the earnings threshold by managing accruals rather than undertaking real earnings management. The reason is that younger CEOs are more likely to be concerned with their career and reputation, relative to older CEOs.

However, previous empirical evidence shows that often managers prefer to engage in earnings management by making real economic decisions rather than accounting accruals, despite the fact that manipulating real activities may reduce the value of the firm (Defond, 2010). There are at least two reasons for this, the first of which is that AEM tends to draw more attention from the auditor or regulator than REM (Graham et al., 2005). Carter (2015) finds that managers prefer to use real earnings management rather than discretionary accruals to enhance or smooth earnings because of a lower degree of scrutiny, leading to receiving favorable credit ratings. Moreover, strong regulation (e.g. SOX) may trigger firms to switch from exercise discretionary accruals to real earnings-management techniques. This is consistent with evidence of Cohen et al. (2008) that earnings management using real activities increases following SOX, while, firms are less likely to manage earnings using accruals when compare to similar firms before SOX. This suggests that SOX is negatively associated with accruals earnings management, but it is positively associated with real earnings

management. Thus, the overall effect of SOX on the earnings management is ambiguous.

Secondly, managers are unlikely to rely on AEM alone because AEM cannot be done during the reporting period but only in the end. If managers decide to engage in AEM alone, in which the amount being managed fell short of the desired threshold, there would be insufficient time to manipulate real operations to meet or beat the earnings target (Alhadab et al., 2016).

Defond (2010) observes that few researchers have investigated both accruals and real based-on earnings management, which Zang (2012) found was an interesting place to start her study of the decision of managers to manage earnings sequentially. The REM decision is made during the fiscal year to meet certain earnings targets; on the other hand, the choice of AEM is made at the year-end or after the fiscal year end when managers have gathered sufficient information about the actual earnings performance and the expectations of the market. Moreover, she points out that, although a shock in REM can affect AEM, there is no feedback from AEM to REM because a shock to AEM occurs after the fiscal year end. This is consistent with evidence in Burgstahler and Eames (2006) that managers can manage earnings to achieve their target by using both real operating action, which is reflected in the cash flow from operations, and actions of a bookkeeping nature, which are reflected in discretionary accruals. Moreover, Cohen and Zarowin (2010) discover that firms use both AEM and REM around seasoned equity offering (SEO) and they rotate the two methods. They find that, after a SEO period, the effect of real earnings management activities on the subsequent operating performance is likely to be more severe than the effect of accruals earnings management. Lin and Shen (2015) document that firms may engage in accrual-based and real earnings

management to obtain more favorable credit ratings, to acquire funds with lower capital cost and to attract investment. This is consistent with the evidence of Alissa et al. (2013) that firms have an incentive to manage earnings upward (downward) by using accrual and real earnings management to affect deviations from their expected credit rating.

Interestingly, Irani and Oesch (2016) suggest that managers are likely to utilize both strategies (AEM and REM) as substitutes by trading-off the costs and benefits. Further, they illustrate that, when firms feel less scrutinized by financial analysts, managers make greater use of accruals-based earnings management and engage in less real operations manipulation. This implies that AEM is negatively correlated with analyst-level experience of following the companies. Alhadab et al. (2016) indicate that the regulatory environment further affects levels of real and accruals earnings management. More stringent regulation mitigates AEM but leads to a greater use of REM.

Classification shifting

According to Abernathy et al. (2014) and Walker (2013), managers can also manage earnings by moving items within the income statement to boost core earnings; however, in that case the net income remains unchanged. This strategy of managing earnings is called classification shifting.

One example of classification shifting is when managers present the classification of ordinary operating expenses as non-recurring to increase the core earnings. Another example is that managers may use special items to manage earnings. Special items are unusual or infrequent transactions, such as damage caused by natural disasters, gain from the sale of assets, and so on. Managers can use special items as an earnings management tool by the

deliberate misclassification of items in the profit and loss statement (McVay, 2006). Riedl and Srinivasan (2010) find that managers' presentation of special items within the financial statements reflects opportunistic motivations to bias perceptions of the firm's performance. Extraordinary items are accrual adjustments and are related to cash sales of a discontinued operation that reduce the persistence and sustainability of earnings. Thus, earnings free from special items or extraordinary items are considered to be of high quality and to have a low degree of earnings management (Dechow et al., 2010; and Dichev et al., 2013).

Prior studies identify that managers are likely to use special items to manipulate earnings upward or downward. For example, Fairfield et al. (2009) document that high-core profitable firms are more likely to use special items for earnings management under pressure to maintain high profitability by managing expenses down or revenue up. Similarly, managers can also decrease the total debt leverage through the accounting treatment of operation leases or special items to keep debt off its balance sheet and help firm appear less risky, which in turn, leads to higher credit ratings (Jorion et al., 2009). On the other hand, managers can use special items to manage their core earnings figures downward during bad news by showing excessive loss from crisis to be able to report higher earnings easier in the subsequent period. Dichev et al. (2013) document that extraordinary items, discontinued operations, and other comprehensive income (OCI) items are like red flags that point to potential earnings manipulation and lead to low-quality earnings. In contrast, high-quality earnings reflect consistent reporting choices over time followed by avoidance of transient items as much as possible.

This earnings management tool does not change GAAP net earnings; therefore, neither future accounting earnings for future cash flows are affected. Accordingly, managers might use classification shifting more than AEM in fiscal year-end reporting because AEM is more constrained by the year-end audit and has to reverse the earnings in the future period (Abernathy et al., 2014). At the same time, classification shifting could be one of the last earnings management strategies available to achieve earnings targets because REM must occur during the fiscal year and AEM occurs after the end of the accounting period but within the confines of a generally accepted accounting system, while classification shifting represents a flexible earnings management strategy, because it is used more in the fourth quarter and can be done outside the accounting system (McVay, 2006). Hence, firms constrained from using REM by poor financial conditions, higher scrutiny from institutional shareholders, lower industry market share and high net operating assets, and firms constrained from using AEM by the presence of a cash flow forecast tend to change their core reported earnings by using classification shifting (Walker, 2013). Lin et al. (2006) show that firms use different types of earnings management and downwards forecast guidance, to increase the probability of meeting or beating analysts' earnings forecasts, and that classification shifting is the earnings management method which leads to the greatest increases in this probability. In addition, they find that the likelihood of classification shifting is negatively associated with an unexpected amount of AEM. Therefore, if managers make the decision to use accruals manipulation, they will be less likely to use classification shifting.

4 Models developed to measure earnings management

This section presents the research designs which are most commonly used in accruals earnings management studies. We start by discussing the various models developed to measure accruals and real earnings management. Next, we compare the pros and cons of each model. Finally, we present briefly other methods (e.g. M-score, F-score, accounting ratios, and unexplained audit fee model) to measure earnings management.

4.1 Research designs for accruals earnings management studies

The research designs commonly used in accruals earnings management can be divided into three categories, namely, (1) aggregated discretionary accruals or total discretionary accruals; (2) specific discretionary accruals; and (3) the distribution of earnings after management. Note, however, that the third category can be used in real earnings management studies as well.

Most empirical researchers attempt to find incidents of DAs based on the relationship between the total accruals and hypothesized explanatory factors because this method can measure the magnitude of earnings management. Although, McNichols (2000) argues that the results of aggregated accruals models may present a misleading picture of earnings management behavior because it is unable to consider the growth of long-term earnings, many studies control for expected earnings growth by using the return on assets (ROA) as a control variable to solve disadvantage of aggregated accruals. Moreover, the aggregated discretionary accruals method uses changes in cash sales (revenues deduce the accounts receivable) and gross property, plant and equipment to control for non-discretionary accruals of current assets, current liabilities, and component of the depreciation expense, respectively. We will

describe aggregated discretionary accruals method in more depth in section 4.2 on discretionary accruals models.

As for the specific accruals, studies focus on a particular industry or homogeneous firms (i.e. banking, insurance, and property) and also require the knowledge of institutional arrangements to identify the DAs and NDAs behavior of accruals, such as loan loss provisions in the banking industry, loss of reserves of property and casualty insurers, tax expense, allowance for deferred tax assets, and allowance for bad debt. For example, commercial banks report larger deferred tax assets due to higher allowances for loan losses compared to other industries (e.g. manufacturing, trading, and services industry).

It is not surprising that several papers (e.g. McNichols, 2000; Marquardt and Wiedman, 2004; and Ahmed et al., 1999) apply specific accruals instead of aggregated accruals as this method makes strong predictions about the behavior of earnings in a closely targeted earnings number. On the other hand, as discussed in McNichols (2000) and Dechow et al. (2010) the main disadvantage of modeling specific accruals is that they can only be used within specialized industries which comes at the expense of generalizability.

Marquardt and Wiedman (2004) examine three earnings-management contexts - equity offerings, management buyouts, and firm avoiding earnings decreases - by considering the use of specific accruals and support the usefulness of examining individual accruals in specific contexts. They develop performance-matched measures to measure earnings management for specific accruals and to capture the unexpected component of accounts (such as account receivable, inventory, accounts payable, accrued liabilities, depreciation expense, and special items). Their results show that firms issuing equity are likely to manage earnings upward by accelerating revenue recognition. Moreover, they find that

unexpected account receivable for firms issuing equity are high, while, accounts receivable for the management buyouts are negative. For firms trying to avoid reporting earnings decreases, their results show that managers are more likely to use more transitory or special items. Similarly, Ahmed et al. (1999) use specific accruals to measure earnings management effects on bank loan loss provisions; they do not find evidence of earnings management via bank loan loss provisions.

Finally, with regards to the distribution of earnings after management, studies employ statistical properties of earnings to identify specified thresholds (e.g. zero earnings, preceding period's earnings, and analysts' earnings forecasts) and incidents where the reported amounts are just above or below these thresholds. Burgstahler and Dichev (1997) examine discontinuities around zero earnings to detect earnings management. Their result shows that managers engage in earnings management to avoid reporting losses as evidenced by unexpectedly low frequencies of small losses and unexpectedly high frequencies of small positive earnings. Further, Kerstein and Rai (2007) extend this approach by examining changes to the earnings distribution. They model shifts in the cumulative earnings distribution during the last quarter instead of the distribution of annual earnings examined in previous studies (i.e. Burgstahler and Dichev, 1997; Beaver et al., 2003; and Plummer and Mest, 2001). Because the last quarter provides a manager's last opportunity during the year to manipulate annual earnings, analyzing changes in the earnings distributions between the third and the last quarters can yield insights into how managers use this opportunity. Their results identify that a high proportion of firms with small cumulative profits or losses at the beginning of the last quarter

report small annual profits rather than small annual losses. Conclusively, firms tend to manage earnings upward to avoid reporting losses.

The distribution of earnings approach has two benefits, the first of which is that it avoids several econometric problems in the estimation of discretionary accruals such as measurement error in expected accruals, omitted variables, and model misspecification. Secondly, it is able to identify specific benchmarks such as loss avoidance, earnings increases, and meet or beat earnings target (Healy and Wahlen, 1999). However, the distribution of earnings approach has a disadvantage in that it does not measure the magnitude of the earnings management (McNichols, 2000).

Table 2.3 below provides an analysis of the pros and cons of each of the research designs of AEM (aggregated accruals, specific accruals, and the distribution of earnings after management).

Table 2.3: Benefits and costs for each research designs of AEM

Research designs	Benefits	Costs	Seminal papers
1. Aggregated accruals	- Can measure the magnitude of earnings management	- Unable to consider the growth of long-term earnings in models	Healy (1985); Dechow (1994); Jones (1991); Dechow et al. (1995); McNichols (2002); Dechow and Dichev (2002); Kothari et al. (2005); Daniel et al. (2008); Alhadab et al. (2016); Cohen et al. (2008); Byard et al. (2007); Choi et al. (2011); Healy and Wahlen (1999); and Cahan (1992)

Research designs	Benefits	Costs	Seminal papers
2. Specific accruals	- Strong predictions about the behavior of earnings in closely targeted management	- Cannot be applied to firms outside specific industries	McNichols (2000); Dechow et al. (2010); Ahmed et al. (1999); Marquardt and Wiedman (2004); and Ahmed et al. (1999)
3. Distribution of earnings after management	- Avoids econometric problems - Identifies specific benchmarks	- Does not measure the magnitude of earnings management	Burgstahler and Dichev (1997); Beaver et al. (2003); Plummer and Mest (2001); Kerstein and Rai (2007); and Healy and Wahlen (1999)

4.2 Discretionary accruals models

As discussed previously in subsection (4.1), aggregated accruals or total accruals is the most popular research design in top journals. Although this method does not consider the growth of long-term earnings in the original models, researchers these days control for growth by using ROA as a control variable. Numerous researchers have found that DAs are a good measure of AEM and that earnings are mainly misstated via the accrual component of earnings (Healy, 1985). In other words, DAs provide managers often with the opportunities to manage earnings, due to the flexibility of accounting regulations (Dechow, 1994; and Kousenidis et al., 2013).

Discretionary accruals are used to measure AEM in a large number of studies (e.g. Alhadab et al., 2016; Cohen et al., 2008; Byard et al., 2007; Choi et al., 2011; Healy and Wahlen, 1999; Cahan, 1992; Shuto, 2007, and Patten and Trompeter, 2003). For instance, Trombetta and Imperatore (2014) examine the relationship between financial crises and earnings management using

discretionary accruals. More interestingly, they study separately positive and negative accruals as a proxy for income-increasing and income-decreasing earnings management, respectively. Their results show that the relationship between earnings management and financial crises is non-monotonic, meaning that earnings management increases when the crisis is acute, whereas it decreases when the crisis is weak.

Examples of early studies on measuring DAs include Healy (1985) and DeAngelo (1986) (Stolowy and Breton, 2004). Healy (1985) assumes that the NDAs for the period are zero; thus, any non-zero value of total accruals is attributable to accounting discretion. DeAngelo (1986) assumes that NDAs follow a random walk, which means that the NDAs in the current period are assumed to be equal the NDAs in the prior period. Hence, any difference in the value of the total accruals between period t and t-1 is attributable to managerial discretion. In the '90s, many researchers, such as Jones (1991) and Dechow et al. (1995), have developed more elaborate models to estimate non-discretionary accruals (NDAs) which they then subtract from total accruals to get discretionary accruals (DAs), their measure for earnings management.

Direct estimation of abnormal accruals (DAs) by using accounting fundamentals

Jones (1991), as shown in equation (1), employs a linear regression-based expectation model and also includes the level of gross fixed assets and changes in revenue to control for variations in NDAs without assuming that the level of NDAs is constant, as Healy (1985) and DeAngelo (1986) do.

$$\Delta WC = b_0(1/TA_{t-1}) + b_1\Delta Sale + b_2 GrossPPE + e \qquad (1)$$

Changes in working capital (∆WC) are calculated as follows:

$$\Delta WC = (\Delta CA - \Delta CL - \Delta Cash + \Delta STD - Dep)/ TA_{t-1}$$

Subscripts from firm (i) and year (t) are omitted from all models for simplicity. Appendix 2.1 provides the definitions for the variables used throughout this study.

The Jones (1991) model uses changes in sales to control for NDAs of current assets and liabilities (ΔCA, ΔCL, ΔCash, and ΔSTD) and uses gross property, plant and equipment to control for NDAs component of the depreciation expense (Dep). In direct estimation approaches, DAs are estimated as the residuals from regression in equation (1). Therefore, as the magnitude of the absolute value of the residuals increases, so does the level of earnings management. Furthermore, some papers (e.g. Trombetta and Imperatore (2014)) separate earnings management (EM) into positive EM and negative EM to predict a specific direction for EM. Hence, as the magnitude of the residuals for the positive EM (negative EM) increases, so does income-increasing (income-decreasing) earnings management.

Dechow et al. (1995) questions the assumption in the Jones's model that revenues are NDAs and suggests that the model should deduce the accounts receivable from the revenue because firms may use the credit policy to boost revenues. Therefore, a Modified Jones model was developed in 1995 to avoid measurement error in the case discretion is exercised through account receivables. The adjusted model is described in equation (2).

$$\Delta WC = b_0(1/ TA_{t-1}) + b_1(\Delta Sale - \Delta AR) + b_2 GrossPPE + e \qquad (2)$$

Again, the residual in equation (2) represents the DAs measure of earnings management. Once again, higher earning management is captured by greater amounts of the absolute value of the residuals.

Dechow et al. (1995) compare the ability of alternative accrual-based models to detect earnings management and confirm that the Modified Jones's model is the most powerful test for earnings management as it generates the fewest type II errors, although power of the tests for earnings management of economically plausible magnitudes remain quite modest.

Direct estimation of accruals-to-cash relations

Dechow and Dichev (2002) develop a new model (DD model hereafter) by providing a direct link between cash flows and current accruals as shown in equation (3).

$$\Delta WC = b_0 + b_1 CFO_{t-1} + b_2 CFO_t + b_3 CFO_{t+1} + e \qquad (3)$$

This model measures the magnitude of measurement errors in accruals as one of the primary indications of the quality of earnings based on the relationship between the working capital accruals in the current period and the operating cash flows in the prior, current and future periods. While the original DD model measures earnings management as the standard deviation of the residuals for each company using rolling windows, more recently Dechow et al. (2011) use directly the residual from the cross-sectional estimation instead. Thus, as the magnitude of the absolute value of errors in the accruals increases, earning management increases and the quality of earnings decreases.

This model is widely used in long-horizon studies (i.e. cost of equity capital and investment efficiency) to assess the quality of historical earnings. Further, Schipper and Vincent (2003) document that the DD model avoids many of the problems associated with the accounting fundamentals approach. For example, the Jones and Modified Jones models need to posit accounting fundamentals (e.g. revenues/ revenues adjusted for account receivables and gross PPE) and

require sufficient cross-sectional data to estimate DAs. Moreover, they require assumptions about unmanaged accounting fundamentals. In contrast, the DD model provides a direct link between current accruals and cash flows that captures aspects of the cash-to-income relation and does not assume that the accounting fundamentals are not themselves manipulated. However, the DD model is limited to estimating the quality of future earnings in the current period (CFO_{t+1}). In addition, this model is not appropriate for studying that using short-horizon variables, such as the prediction of stock returns. Furthermore, the DD model does not separately consider abnormal accruals (DAs) and normal accruals (NDAs). Thus, it may too suffer from misspecification when used to estimate discretionary accruals (McNichols, 2002).

Combining models

McNichols (2002) points out the limitations of both the Jones model and the DD model. For example, the DD model does not separately consider DAs and NDAs, whereas, the Jones model separates DAs from NDAs. In contrast, the Jones model assumes that accruals react to the current change in revenue; however, future growth in revenue is not considered. This implies that growth may be a correlated omitted variable. Therefore, McNichols (2002) developed a new model (Modified DD model), shown in equation (4) by combining both models (the Jones and DD models). Including cash flows in the Jones models may reduce the extent to which the model omits variables and including the growth in revenue and PPE in the DD model may provide a useful specification check on the magnitude of the estimated errors in cash flows. Her finding suggests that the implications of both the DD and Jones models should be considered by the researchers to develop more powerful approaches to the estimation of earnings management. She proposes the following model:

$$\Delta WC = b_0 + b_1 CFO_{t-1} + b_2 CFO_t + b_3 CFO_{t+1} + b_4 \Delta Sale + b_5 GrossPPE + e \quad (4)$$

Consistent with the Jones and DD models, McNichols (2002) uses the residuals from the cross-sectional estimation as the proxy for AEM.

Kothari et al. (2005) also develop a new discretionary accruals model by introducing an additional independent variable, which is ROA, into the Jones or Modified Jones models to control for firm's performance. In other words, a new discretionary accruals model is developed to solve a major limitation of the Jones and Modified Jones models; that is that firm-years with extreme financial performance can bias those measures. The resulting models are called Jones with ROA and Modified Jones with ROA, respectively. In addition, Kothari et al. (2005) introduce a performance-matched discretionary accruals measure by matching the DAs estimate of the firms in the treatment group with the DAs of firms in the control group with the closest ROA[2] within the same industry and year. In other words, discretionary accruals for a given treated firm are adjusted by discretionary accruals of the control firm that has the nearest ROA. Their results suggest that matching based on ROA and using the Jones model results in a well specified and powerful model as it yields the lowest mean and median values among all other measures.

Kothari et al. (2005) estimate the performance-matched Jones model DA as the Jones model DA[3] for a firm-year minus the matched firm's Jones-model DA[4] for

[2] Return of assets calculated as net income divided by total assets.

[3] The Jones model DA is the residuals from annual cross-sectional industry regression model in equation (5)

[4] The matched firm's Jones-model DA is matching residual of each firm-year observation with residual of another firm from the same two-digit SIC code and year with the closest ROA in the current year.

same year and industry both calculated as shown in equation (5). Specifically, they include a constant term (b_0) in the estimation to better address the power of the test issues and use net PPE instead of gross PPE, as Jones (1991) and Dechow et al. (1995) do.

$$\Delta WC = b_0 + b_1(1/TA_{t-1}) + b_2(\Delta Sale) + b_3 NetPPE + e \qquad (5)$$

(Match residual of each firm-year observation with residual of another firm from the same two-digit SIC code and year with the closest return on assets in the current year)

Daniel et al. (2008) report that this method is a more reliable measurement of earnings management when using non-random samples of firms, as, for example, in the case of firms restating earnings, changing auditors, and issuing IPO/ SEO, whereas, the original Jones or Modified Jones models only examined random samples. Moreover, Stubben (2010) agrees that this model has the least misspecification among the accrual models.

Stubben (2010) goes on to create a very simple model to examine the ability of revenue and accruals models to capture a combination of revenue and expense manipulation. Moreover, she documents that conditioning on annual revenues is a limitation of the models; therefore, she splits revenues in the first three quarters and revenues in the fourth quarter because revenues in the last quarter are less likely to be collected in cash by the end the year. In addition, managers are more likely to manage the revenue via accounts receivable in the last quarter. As a result, she suggests the following model presented in equation (6)

$$\Delta AR = b_0 + b_1 \Delta AR_{1-3} + b_2 \Delta AR_4 + e \qquad (6)$$

The revenue model analyzes the relationship between revenue and accounts receivable based on the recognition of premature revenue (e.g. relaxed credit

requirement, sales discounts, and sales recognized before cash is collected). The evidence indicates that the revenue model is not only useful as a proxy for earnings management, but also for detecting discretion in revenue for growth firms.

Shi and Zhou (2013) suggest an alternative approach to resolve the limitations of the DD models (2002) in which it is difficult to capture the quality of future earnings in the current period (CFO_{t+1} in DD model). They developed the Modified Dechow and Dichew model with cash flow forecasts (CFF) by replacing realized next-period cash flows with forecasted future cash flows from financial analysts at year t for year t+1 (CFF_t^{t+1}). There model is described by the following equation (7).

$$\Delta WC = b_0 + b_1 CFO_{t-1} + b_2 CFO_t + b_3 CFF_t^{t+1} + e \qquad (7)$$

Table 2.4 summarizes the pros and cons of each of the discretionary accruals models discussed above. Overall, no measure of AEM is superior for all decision models because each of the models has benefits and limitations as shown in table 2.4.

Table 2.4: Comparison of discretionary accruals models

Model	Benefits	Limitations	Seminal papers
Jones (1991) $\Delta WC = b_0(1/TA_{t-1}) + b_1\Delta Sale + b_2 GrossPPE + e$	- Separately considers abnormal and normal accruals	- Does not consider credit revenue (accounts receivable including revenue) - Not well specified for growth firms because it does not consider future changes in revenue (growth firms) - Cannot examine non-random samples	Jones (1991)
Modified Jones (1995) $\Delta WC = b_0(1/TAt\text{-}1) + b_1(\Delta Sale - \Delta AR) + b_2 GrossPPE + e$	- Separately considers abnormal and normal accruals - Considers credit revenue (accounts receivable including revenue)	- Not well specified for growth firms because it does not consider future changes in revenue (growth firms) - Cannot examine non-random samples	Dechow et al. (1995)
Dechow and Dichev (2002) $\Delta WC = b_0 + b_1 CFO_{t-1} + b_2 CFO_t + b_3 CFO_{t+1} + e$	- Assesses the quality of historical earnings - Appropriate for studying that using long-horizon variables such as the cost of equity capital and investment efficiency Suitable for estimating the quality of earnings	- Does not separately consider abnormal and normal accruals - Difficult to estimate the quality of future earnings in the current period - Difficult to study that using short-horizon variables such as predicting stock returns Greater misspecification when used to estimate discretionary accruals	Dechow and Dichev (2002)

Model	Benefits	Limitations	Seminal papers
Modified Dechow and Dichev (2002) $\Delta WC = b_0 + b_1 CFO_{t-1} + b_2 CFO_t + b_3 CFO_{t+1} + b_4 \Delta Sale + b_5 GrossPPE + e$	- Separately considers abnormal and normal accruals - Assesses the quality of historical earnings - Appropriate for studying that using long-horizon variables such as the cost of equity capital and investment efficiency	- Difficult to estimate the quality of future earnings in the current period	McNichols (2002)
Performance-matched Jones (2005) $\Delta WC = b_0 + b_1(1/TA_{t-1}) + b_2(\Delta sale) + b_3 NetPPE + e$ less the same estimate for the firm from the same industry and year with the closest ROA	- Can examine non-random samples - Can apply in a sample with firm-years experiencing extreme financial performance	- Considers changes in total revenue rather than changes in cash revenue	Kothari et al. (2005)
Revenue and accrual model (2010) $\Delta AR = b_0 + b_1 \Delta AR_{1-3} + b_2 \Delta AR_4 + e$	- Well-specified tests of manipulation for growth firms - Splits last quarter revenue from first three quarters	- Not suitable to measure discretionary expenditure	Stubben (2010)
Modified Dechow and Dichew with cash flow forecast (2013) $\Delta WC = b_0 + b_1 CFO_{t-1} + b_2 CFO_t + b_3 CFF_t^{t+1} + e$	- Estimates the quality of future earnings in the current period (CFF_t^{t+1})	- Does not separately consider abnormal and normal accruals	Shi and Zhou (2013)

Balance sheet versus Income statement and cash flow approach for estimating NDAs

Non-discretionary accruals (NDAs) can be estimated using two approaches: balance sheet approach, and income statement and statement of cash flow approach.

As presented above, according to the balance sheet approach, total accruals are equal to the changes in working capital (∆WC) and calculated as follows:

$$\Delta WC = (\Delta CA - \Delta CL - \Delta Cash + \Delta STD - Dep)/ TA_{t-1}$$

Ball and Shivakumar (2008) document that using the balance sheet approach for firms transitioning from private to public status or firms entering IPO proceeds induce systematic biases in estimating accruals because managers tend to engage in acquisitions and divestitures transactions in IPO years and those transactions are affecting reported accruals in balance-sheet. Further, Hribar and Collins (2002) suggest that the error in the balance sheet approach of estimating accruals is related to firms' economic characteristics. Lo (2008) indicates that estimating accruals from cash flow statements compared with balance sheets are significantly different. Thus, some researchers estimate accruals *(ACCR)* measures based on the income statement and the statement of cash flow approach as follows:

$$ACCR = (\text{net income before extraordinary items (EBXI)} - \text{cash flow from operations})/ TA_{t-1}$$

It is hardly surprising that more and more researchers nowadays simply use the income statement and the statement of cash flow approach to estimate accruals as this approach can lead to a lower magnitude and frequency of measurement error (e.g. Cohen et al., 2008; Daniel et al., 2008; Irani and Oesch, 2016; Alhadab et al., 2016; and Jung et al., 2013).

4.3 Real earnings management models

Roychowdhury (2006) is the first to develop a statistical model to detect real earnings management by running the following cross-sectional regression (8) for every industry and year. He expected that a normal cash flow from operations *(CFO)* is a linear function of sales and change in sales as described in equation (8) below:

$$CFO = b_0(1/TA_{t-1}) + b_1 Sale_t + b_2 \Delta Sale_t + e \qquad (8)$$

Abnormal CFO is estimated as the residuals from regression in equation (8) and is a proxy for real earnings management.

Roychowdhury (2006) also developed a measure of abnormal discretionary expenses. Discretionary expenses can be both recurring or non-recurring costs that is not essential for the operation of a business such as R&D expenses, employee training, entertainment cost and maintenance. He started by assuming that normal discretionary expenses *(Disc)* are a function of lagged sales and estimated the normal level of discretionary expense as follows:

$$Disc = b_0(1/TA_{t-1}) + b_1 Sale_{t-1} + e \qquad (9)$$

The residual in equation (9) represents abnormal discretionary expenses.

Finally, production costs are defined as the sum of the cost of goods sold *(COGS)* and the change in inventory during the year. A normal COGS is expected to be a linear function of contemporaneous sales, as follows:

$$COGS = b_0(1/TA_{t-1}) + b_1 Sale_t + e \qquad (10)$$

Inventory growth is expected to be a change in inventory *(INV)* and is expressed as a linear function of lagged change in sales and current change in sales, as follows:

$$\Delta INV = b_0(1/TA_{t-1}) + b_1\Delta Sale_t + b_2\Delta Sales_{t-1} + e \qquad (11)$$

The normal level of production cost *(Prod)* is estimated using equation (10) and (11) as follows:

$$Prod = b_0(1/TA_{t-1}) + b_1 Sale_t + b_2\Delta Sale_t + b_3\Delta Sale_{t-1} + e \qquad (12)$$

The residual from the cross-sectional estimation of equation (12) is the proxy for abnormal production costs. As in other DA models, the residuals in each regression is indicative of the magnitude of earnings management.

Real earnings management (REM) proxy can be computed in several ways. According to Roychowdhury (2006), abnormal cash flow from operations[5], abnormal discretionary expenses, and abnormal level of production cost were estimated as the residuals from the regressions described by equations (8), (9), and (12), respectively. These are to this day the three most commonly used proxies for REM. Some studies compute REM proxy as a single aggregated measure of real earnings management activities. For example, Cohen et al. (2008) compute REM as the sum of the standardized variables of an abnormal cash flow from operations, abnormal discretionary expenses, and abnormal production costs. Alternatively, Zang (2012) computes single aggregated measure of REM by combining the level of abnormal cash flow from operations and the level of abnormal discretionary expenses**.** Bozzolan et al. (2015)

[5] Several papers (such as Bozzolan et al., 2015; Alhadab et al., 2016; and Irani and Oesch, 2016) suggest that abnormal cash flows from operations and abnormal discretionary expenses should be multiplied by minus one to allow coefficients in regressions of real and accruals earnings management proxies to have the same interpretation.

calculate REM by combining the abnormal discretionary expenses and abnormal production costs. In contrast, Irani and Oesch (2016) consider two aggregated measures of REM that are (1) the sum of abnormal cash flow from operations and abnormal discretionary expenses, and (2) the sum of abnormal level of production costs and abnormal discretionary expenses.

Roychowdhury (2006) in addition to the aforementioned measures he also replicates his results using the performance-matching technique advocated by Kothari et al. (2005). Every firm-year is matched to the firm-year in its industry that has the closest ROA in the last year as mentioned above. Performance-matched REM models (*CFO, Disc,* and *Prod* models) for a firm-year are the abnormal real activities (abnormal CFO, abnormal discretionary expenses, and abnormal production costs) of that firm-year in excess of the abnormal real activities for the matching firm-year stated as follows:

Performance-matched REM models = Abnormal real activities for REM models - Abnormal real activities for the matching firm

Finally, he uses the performance-matched cash flow from operations, discretionary expenses, and production costs to detect real earnings management. The results using the performance-matching technique are broadly similar to the unmatched ones.

4.4 Other methods to measure earnings management

There are other, less commonly used, methods to assess the quality of the firm's reported number such as M-score, F-score, and unexplained audit fee model (Richard et al., 2011).

Benish (1999) creates a mathematical model (M-score) to detect earnings manipulation behaviors of the firms that can distinguish manipulated from non-

manipulated reporting using a probit model. M-score model is based on the interrelations between the balance sheet, income statement and statement of cash flow as this model examines the relationship between earnings manipulation and eight financial ratios (i.e. the ratio of account receivables to sales, gross margin ratio, the ratio of assets quality in year t compared to year t-1, the ratio of sales growth, the ratio of depreciation in year t compared to year t-1, the ratio of sales, general and administrative expenses in year t compared to year t-1, leverage ratio, and the ratio of total accruals to total assets) as shown in equation (13).

$$M\text{-}score = -4.84 + (0.920xDSRI) + (0.528xGMI) + (0.404xAQI) + (0.892xSGI) + (0.115xDEPI) + (0.172xSGAI) + (0.327xLVG) + (4.679xTATA) \quad (13)$$

This model uses a benchmark of 2.22 to categorize firms. Specifically, an M-score less than 2.22 implies no sign of earnings manipulation; whereas, firms with M-score higher than the threshold (2.22) have a high probability of earnings management.

There are many prior studies (e.g. Beneish, 1999; Mahama, 2015; and Anh and Linh, 2016) that examine earnings management detection by using the M-score model. However, not that the M-score might be inappropriate for predicting or detecting earnings management in the banking industry because Benish, who created M-score model, excludes the banking industry from the sample used to test and develop M-score model.

Another scaled probability that can be used as a measure of the likelihood of misstatements is F-score, which is developed by Dechow et al. (2011). Dechow et al. (2011) built three models that can be used as a red flag to detecting earnings manipulation. Model 1 includes variables that are obtained from the primary financial statements (i.e. accruals quality, and firm performance), while,

model 2 adds off-balance-sheet (i.e. operating leases and expected return assumption on plan assets for defined benefit pension plans) and nonfinancial variables (i.e. abnormal reductions in the number of employees). Finally, model 3 adds a set of variables that relate to equity and debt market incentives for earnings management (e.g. market-adjusted stock return, and stock issuances). The output of F-score is a scaled logistic probability for each firm-year that represents the level of probability of earnings management; the higher the F-score the higher the probability of earnings management. However, Dechow et al. (2011) stresses a limitation of the F-score model, that the misstatements sample for the test and development of the F-score model were actually identified by the SEC. Although, the sample is unbiased, researchers should investigate the characteristics of high-F-score companies that are not identified by the SEC in future studies.

An alternative measured that has been used in the literature of earnings management is the unexplained audit fee model. This model assumes that external auditor's fee can provide information about the risk a firm faces, and suggests that a higher value of unexplained audit fee is an indication of earnings management (Gupta et al., 2012).

Lastly Jansen et al. (2012) use popular accounting ratios, ROA and profit margin, to diagnose earnings management. Their results show that abnormal change in firms' profit margin and asset turnover indicate greater likelihood of managing earnings. Dechow et al. (2011), as mentioned above, use nonfinancial measures (e.g. abnormal decline in the number of employees) for detecting misstatement. This is consistent with the wide-spread view that employee lay-offs are unlikely to correspond to a significant increase in earnings (Brazel et al., 2009). However, a decline in the number of employees

leads to a reduction in payroll costs. Therefore, managers may use this method to solve financial troubles of firms or to manage earnings upward in the short-term.

In summary, although there are many models and methods to measure earnings management, there is no universal agreement about which single measure of earnings management is the best.

5 Theoretical underpinning for earnings management

This section discusses the efficient information vs. opportunistic behavior hypotheses of earnings management. Then, we discuss the various incentives for earnings management and classify them by theoretical frameworks (Francis et al., 2003; Zang, 2012; Aerts and Zhang, 2014; Cohen et al., 2008; Healy and Wahlem, 1999; Mendes et al., 2012; Zamri et al., 2013; Roychowdhury, 2006; Leuz et al., 2003; Watts and Zimmerman, 1978; and Cahan, 1992). Finally, we discuss two patterns of earnings management, namely, income minimization and income maximization.

5.1 Efficient information hypothesis vs. Opportunistic behavior hypothesis

As mentioned in the previous section, GAAP permit several accounting choices and require several estimations to better report the underlying performance of the firm and communicate the its future prospects to the market, to communicate managers' inside information to investors, or to improve contracting efficiency. These objectives are important for firms for increasing their value (Christie and Zimmerman, 1994; Sun and Rath, 2008; Choi et al., 2011; and Bowen et al., 2008). In line with this, Francis et al. (2005) support the efficient information hypothesis according to which managers may use their discretionary accruals to reduce information uncertainty and improve earnings

as a signal of the firm's performance. This is consistent with evidence in Sun and Rath (2008) that managing earnings to create a smooth and growing earnings string over time is a signaling mechanism to convey inside information about firms' prospects to the investors and enhance investors' ability in predicting firm's performance as well. Similarly, the evidence in Ahmed et al. (1999) indicate that bank managers have incentives to use loan loss provisions to signal private information about future earnings for capital managing but not to manage earnings. In summary, these studies find the efficient perspective of earnings management, which occurs for the purpose of signaling.

In contrast to the efficient information hypothesis, the discretion allowed by GAAP may provide an opportunity for managers to take advantage of how accounting standards can be applied to meet their own targets or appear to meet the expectations of the capital market which is seen as being negative. As such, earnings can be opportunistically manipulated (Stolowy and Breton, 2004; Dechow, 1994; and Healy and Krishna, 1993). Several choices allowed by accounting standards threaten the quality of financial reporting, such as cookie jar reserves, write-offs of purchases in the process of R&D, big bath restructuring charges, and premature revenue recognition (Stolowy and Breton, 2004).

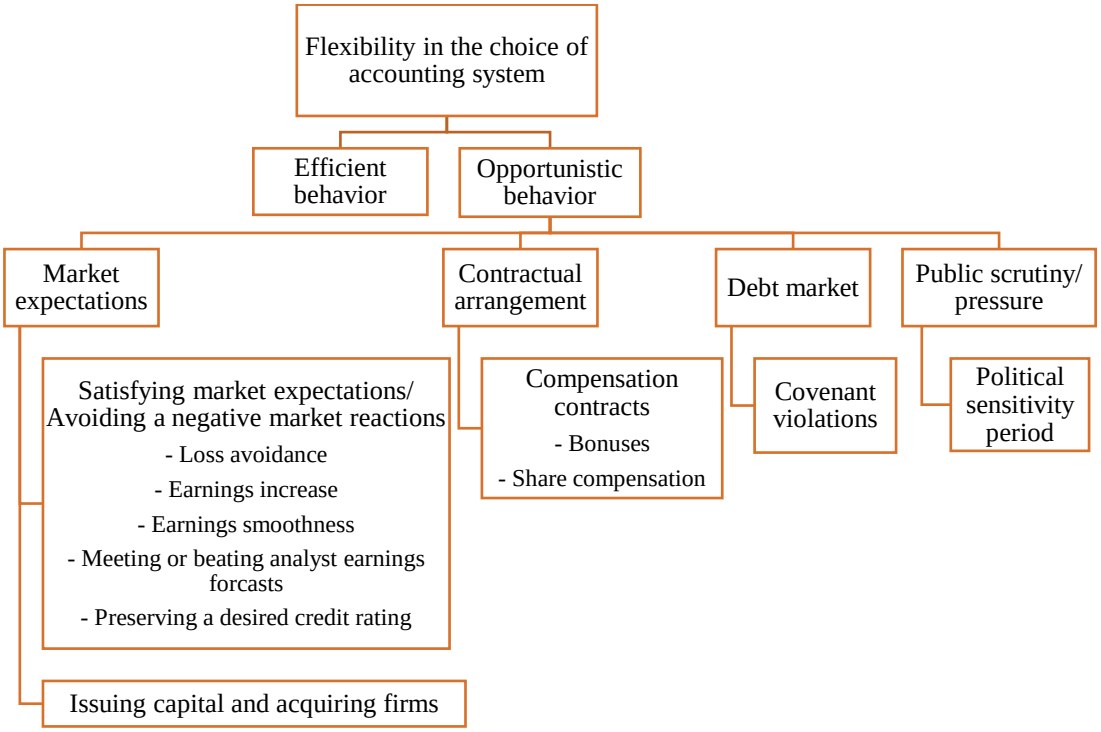
According to the opportunistic behavior hypothesis, managers use discretionary accounting or abnormal real operations to influence financial statements or to report operating results that are not consistent with the economic performance of the firm. Schipper (1989, 92) defined earnings management as "a purposeful intervention in the external financial reporting process, with the intent of obtaining some private gain." Kirschenheiter and Melumad (2002) describe earnings management as some misdeeds by management in order to maximize

the value of their firm by using their reporting discretion within the confines of acceptable accounting and legal requirements (e.g. changing accounting methods, changing estimates, manipulating accruals, liquidating LIFO inventories, selling assets, and retiring debt). Turner and Guilding (2011) state that earnings management is a process that occurs when management teams use judgment in financial reporting in order to achieve their target by either: (1) changing the structure of revenue and/ or expenditure (e.g. cut-off R&D expenses, cut-off employee training, and reduce credit terms); (2) changing accounting procedures (e.g. straight-line depreciation, declining balance method, and sum-of-the-years'-digits method); or (3) manipulating accruals (e.g. estimating depreciation lifecycles, estimating uncollectible accounts, and providing for bad debt expense and warranty costs). Interestingly, Healy (1985) finds evidence that managers are likely to manage earnings by making changes to accruals policies in response to incentives provided by their bonus contracts, while they tend to change accounting procedures during adoption or modification of their bonus plan. Further, evidence by Gul et al. (2003) suggest that managers of firms with high management ownership tend to use discretionary accruals to communicate value-relevant information; whereas, managers of firms with high non-equity compensation tend to use discretionary accruals opportunistically to manipulate earnings.

Figure 2.2 illustrates that according to the accounting standards which leave discretion for many primary purposes, managers can select particular accounting choices which can be made "efficiently", to maximize the value of the firm, or "opportunistically", to give the manager better benefits than other contracting party (Christie and Zimmennan, 1994). For example, Gounopoulos and Pham (2017), who investigate the impact of having a credit rating on

earnings management, find that managers in unrated firms are likely to exercise their accounting and operating discretion to mislead investors, whereas managers in rated firms generally manipulate earnings to increase their informativeness.

Figure 2.2: Overview of theoretical underpinning for earnings management



However, if firms have sufficient control over managers' accounting discretion (e.g. monitoring by the board of directors, audit committee, good control over financial report, and transparency of disclosures), then the managers will choose accounting choices to maximize the value of the firm. Consistent with this argument, Basel Committee on Banking Supervision (BCBS) (1999) shows that the effectiveness of internal controls can reduce operating risk and lead to an increase in quality of earnings.

5.2 Incentives for earnings management according to theoretical frameworks

According to Stolowy and Breton (2004), earnings management is mainly motivated by the desire to influence the possibility of transferring wealth (1)

between the firm and society (political costs), (2) between the firm and funds providers (cost of capital) [6], or (3) between the firm and managers (compensation plans) according to positive accounting theory. In the first two cases, companies benefit from the wealth transfer, but in the third case, managers are acting against the firm. Expanding the three motives identified in Stolowy and Breton (2004) this review classifies the incentive for earnings management into four groups, which are market expectations, contractual arrangement, debt market, and public scrutiny/pressure, by theoretical frameworks.

5.2.1 Market expectations

Earnings can be managed to avoid negative market reactions and satisfy market expectations about earnings. In general, managers are likely to avoid disproportionate adverse reactions. The results of market expectations studies suggest that managers tend to smooth earnings or engage in upward earnings management in response to capital market pressures. Firms may manage earnings upward to meet/beat the expectations of analysts' forecasts, achieve some essential threshold, and preserve a desired credit rating. Zang (2012) shows that firms failing to meet or beat analysts' earnings forecasts are more penalized than firms that meet the goal. Thus, it is not surprising that managers have strong incentives for earnings management to report positive earnings surprises relative to analysts' expectations, and to manipulate earnings at these thresholds (such as reporting a profit, reporting an increase in earnings, meeting analysts' forecasts, and achieving expected credit rating). In other words, managers are likely to manipulate earnings to obtain market rewards or

[6] For example, earnings management is practiced to encourage investors to buy a firm's stock or increase its market value.

avoid negative market reactions (Francis et al., 2003; Zang, 2012; Aerts and Zhang, 2014; Cohen et al., 2008; Burgstahler and Dichev, 1997; Degeorge et al., 1999; Herrmann et al., 2011; and Young, 1999).

Dichev et al. (2013) indicate that the importance of stock prices and outside pressure to hit earnings benchmarks affect earnings management around specific financing events such as season equity offering (SEO) and stock buybacks, while, Dechow et al. (2010) point out a positive relation between capital raising activities (e.g. a firm's initial public offering and SEOs) and earnings management. This is consistent also with finding in Teoh et al. (1998) and Erickson and Wang (1999) who find that managers are likely to manage earnings upward in SEO and merger periods to increase their stock prices as per the market incentive hypothesis.

Satisfying market expectations or Avoiding a negative market reaction (Loss avoidance, earnings increase, earnings smoothness, meeting or beating analyst earnings forecasts, and preserving a desired credit rating)

Previous research (i.e. Degeorge et al., 1999; and Dechow and Skinner, 2000) indicates that there is a hierarchy among earnings thresholds. Firstly, managers manage earnings upward to avoid losses in a year of poor performance. This is consistent with the document of Rezaee (2005) that managers can manipulate accounting practices under the existing rules-based accounting standards to hide the economic substance of their performance. For example, managers are likely to manage earnings through AEM by changing from the sum-of-the-years' digit depreciation method for PPE to the straight-line method, resulting in reduced depreciation expenses in the initial years, which in turn leads to an increase in earnings. Managers might decide to do this in order to attract security brokers and investment trusts (Zamri et al., 2013). Interestingly,

Dechow et al. (2010) document that managers are likely to avoid loss by managing earnings just enough to report a small profit. Small profits have been identified as an indication of earnings management and low-quality earnings in several other papers (Dechow et al., 2010; and Schipper and Vincent, 2003). Dechow et al. (2003) empirically test this assumption by comparing discretionary accruals of firms reporting a small profit to those of firms reporting a small loss. Their results suggest that discretionary accruals of the small profit group are the same as those of the small loss group. This implies that small profits cannot unconditionally be used as an indication of earnings management.

Next, for companies with positive profitability, the incentive is to report an increase in annual earnings which represents good news and leads to increases in the firm value. For that reason, managers tend to smooth earnings in order to maintain steady earnings growth. This is consistent with the evidence in Beaver et al. (2003) that public and mutual firms in the insurance industry manipulate loss reserves to smooth earnings or to avoid reporting losses in the future. Interestingly, Barth et al. (1999) document that consistent increases in earnings is important because firms with string of earnings increases relative to prior year or relative to the same quarter of the previous year receive a price premium or have higher valuations than firms which report an increase in earnings for the first time.

Finally, firms may manage earnings to meet analysts' earnings forecasts for continuous growth. According to the market expectation hypothesis, firms meeting or beating analysts' earnings forecasts have a higher return than companies that fail to meet the analysts target (Bartov et al., 2002; Brown and Caylor, 2005; and Zang, 2012). Similarly, when earnings level meets the

financial analysts or investors' expectation, the association of earnings with stock returns is greater (Ortega et al., 2003). In other words, meeting or beating analysts' earnings forecasts positively affects firm stock prices. Thus, managers have a strong motive to achieve analysts' forecast and avoid a negative market reaction by choosing an accounting method or changing real activities to manipulate earnings. This is consistent with evidence of Payne and Robb (2000) that managers have incentives to manage earnings to align with market expectations established by analysts' forecasts. Additionally, their results report that when the dispersion in analysts' forecasts is low, managers have greater incentives to increase income and vice versa. Interestingly, Burgstahler and Eames (2006) point out that managers have two ways to meet or slightly exceed analysts' forecasts and avoid a negative earnings surprise[7]: manage earnings upwards and forecasts downward. Similarly, Cotter at el. (2006) suggest that management guidance plays a significant role in leading analysts toward achievable earnings benchmarks.

Jiang (2008) shows that firms that beat (miss) earnings benchmarks are associated with a lower (higher) cost of debt (e.g. smaller (larger) yield spread) and tend to have better (worse) credit ratings. This is consistent with capital market effects that investors reward firms that meet or beat earnings targets, however, they penalize firms failing to meet such target (Barth et al., 1999; Francis et al., 2003; and An et al., 2014). Graham et al. (2005), Zhao (2002), Carter (2015), and Jung et al. (2013) identify that one of the main reasons for earnings manipulation is gaining a desirable rating. Specifically, managers have been shown to manipulate credit-rating through (1) income-increasing earnings management activities, (2) artificial smoothing of earnings, and (3) lower

[7] Negative earnings surprise is determined as realized earnings minus the earnings forecast.

reported leverage. This is consistent with findings of Hovakimian et al. (2009) that firms with above-target ratings are likely to make choices that increase their debt in order to meet or beat the target ratings in the future, whereas firms with below-target ratings are likely to make financing, pay out, and acquisition choices that decrease their debt to meet the target ratings in the current period. On the other hand, Eastman et al. (2017) find that firms with actual rating below their target rating have incentives to reach a target rating by using income-increasing earnings management, but, there is no evidence that firms with actual rating above their target rating engage in earnings management.

Issuing capital and acquiring firms

Dechow et al. (1996) state that a primary motivation for earnings manipulation is to encourage investors to buy an interest in a firm's stock as owners or in bonds as creditors, or to lower the cost of raising additional external financing. Dechow et al. (2011) suggest that managers are happy when stock prices are high because this reduces the cost of raising new equity. Evidence by Cohen and Zarowin (2010) show that managers manage earnings upward in anticipation of season equity offerings (SEO) to show good performance, and then, managers reverse earnings and show poor stock performance in a subsequent period. Similarly, Yoon and Miller (2002), who investigate earnings management of SEO in Korea, find that SEO firms are more likely to increase report earnings in the year immediately preceding and the year of SEOs if their relative performance is poor.

Prior studies (i.e. Louis, 2004; Dichev et al., 2013; and Erickson and Wang, 1999) identify that acquiring firms are likely to engage in income-increasing earnings management, which in turn, increase their stock prices prior to a stock merger to reduce the cost of buying the target. Moreover, Erickson and Wang

(1999) find that the relative size of the merge is positively related to the degree of income-increasing earnings management.

5.2.2 Contractual arrangement

The second incentive for earnings management is related to the management's compensation contracts. Earnings play a significant role in executives' employment status and compensation benefits (such as salary plus bonus, long-term incentive payouts, and restricted stock). Not surprisingly, the results of studies on compensation contracts and earnings management indicate that managers are likely to manage earnings upward to benefit from increased compensation (Healy and Wahlem, 1999; Mendes et al., 2012; Dechow et al., 2010; and Charoenwong and Jiraporn, 2009). This is consistent with the suggestion of Cohen et al. (2008) that managers with higher equity or bonus-based compensation are more sensitive to using their discretion to manipulate earning upwards.

Compensation contracts (Bonuses and share compensation)

According to the contractual arrangement incentive, managers are likely to manage earnings upward to increase their own compensation via higher bonuses and/ or share options (Healy and Wahlem, 1999; Healy, 1985; Cohen et al., 2008; Bergstresser and Philippon, 2006; Cheng and Warfield, 2005; Turner and Guilding, 2011; Zhang et al., 2008; and Shuto, 2007). Smith and Watts (1992) indicate that firms in high growth industries tend to employ stock-based rather than earnings-based compensation. Therefore, it is hardly surprising that managers attempt to increase stock prices to maximize bonus compensation. This is consistent with evidence by Cheng and Warfield (2005) that managers with high equity incentives are likely to sell shares in the future,

thus, they are motivated towards upward earnings management to increase the value of shares to be sold. Interestingly, Jiang et al. (2010), who investigate the association between (1) chief financial officer (CFO) equity incentives and earnings manipulation; and (2) chief executive officer (CEO) equity incentives and earnings manipulation, find that the magnitude of accruals and the likelihood of beating analyst forecasts are more sensitive to CFO equity incentives than to those of the CEO because CFOs' primary responsibility is financial reporting. Thus, it is not surprising that CFO can manage earnings easier than CEO to increase their compensation.

Bonus schemes create incentives for managers to choose accounting procedures or change accounting policy to maximize the value of their bonuses (Healy, 1985; Guidry et al., 1999; and Holthausen et al., 1995). Interestingly, Ghosh and Olsen (2009) find that the management team may smooth earnings in order to remain between the lower and upper bonus compensation boundaries and to maximize their benefits over time. In contrast, Burns and Kedia (2006) find that salary and bonus insignificantly affect the adoption of aggressive accounting practices, while, stock options are positively associated with stronger incentives to misreport. Similarly, Efendi et al. (2007) indicate that CEOs with a large amount of in-the-money stock options are more inclined to manipulate earnings. Another example of compensation driven earnings management is discussed in Turner and Guilding (2011) who show that unlike hotel owners, hotel operators tend to capitalize asset related expenditure in order to increase their management fee.

5.2.3 Debt market

The debt covenant hypothesis refers to the relationship between creditors and shareholders. Roychowdhury (2006) indicates that the level of leverage is

positively associated with the likelihood of management managing earnings to avoid violating a debt covenant, as stated by the financial distress theory. In other words, if firms present poor cash flows, managers attempt to loosen debt covenant restrictions by engaging in earnings management (Sweeney, 1994; and Leuz et al., 2003). This is consistent with argument in Defond and Jiambalvo (1994), who examine the impact of leverage on accrual manipulation, that leverage is an incentive for earnings management. On the other hand, other papers find that debt covenant may reduce earnings management (e.g. Zamri et al., 2013; and Ardison et al., 2012).

Covenant violations

As mentioned above, the empirical evidence on debt covenant hypothesis is mixed. On the one hand, the results of debt covenant studies find that managers may manage earnings upward to raise new debt on more favorable terms or satisfy financial covenants in existing debt contracts (Zamri et al., 2013; Roychowdhury, 2006; Defond and Jiambalvo, 1994; Costello and Wittenberg-Moerman, 2011; and Leuz et al., 2003). This is consistent with evidence by Sweeney (1994), who examines the relation between debt-covenant violations and accounting changes. He finds that determinants of managers' accounting responses are the accounting flexibility available to managers and the default costs imposed by lenders. Moreover, he finds that managers of firms with high debt-covenant violations are likely to manage earnings by making income-increasing accounting changes. Francis et al. (2005) find that credit ratings have a significant impact on cost of debt and financial performance. This is in line with findings by Dichev and Piotroski (2001) and Alissa et al. (2013) that credit rating downgrades lead to negative excess returns and violation of debt covenants. Hence, it is hardly surprising

that managers are motivated towards upward earnings management to reduce the effect of debt-covenant violations.

On the other hand, the evidence of Zamri et al. (2013), who analyze the relation between leverage and real earnings management, and Ardison et al. (2012), who examine the association between leverage ratio and accruals earnings management, support the view that the high monitoring of creditors may restrict managers' ability to manage earnings. In other words, leverage is negatively associated with earnings management. However, some papers, including Healy and Palepu (1990) and DeAngelo et al. (1994) find no evidence of an effect of debt constraints on earnings management.

5.2.4 Public scrutiny/ Pressure

The final incentive for earnings management concentrates on public scrutiny/pressure and it is labeled political-cost hypothesis. The political-cost hypothesis refers to the relationship between the company and the public authorities. According to the political-cost hypothesis, the incentives to manage earnings downward relate to some specific government policy or intervention. For example, if firms are investigated for monopoly-related violations, managers may try to apply several methods in order to report lower earnings (Cahan, 1992). Further, managers may attempt manipulate earnings downward to benefit from governmental help during the crisis (Jones, 1991; Byard et al., 2007; Hall, 1993; and Han and Wang, 1998).

Political sensitivity period

There are several studies that show how managers attempt to drive earnings downward during political sensitivity periods in order to increase the amount of relief granted and/ or increase the likelihood of obtaining such protection

(Cahan, 1992; Jones, 1991; and Watts and Zimmerman, 1978). For example, evidence supplied by Han and Wang (1998) indicate that oil refining firms reported more special items (e.g. write down the value of aging or added reserves for cleaning up oil fields) to reduce their quarterly reported earnings and delayed the announcement of a growth in earnings during the Gulf crisis in 1990 in order to restrain stock price increases, and, thus, political pressure. This is consistent with the argument that firms react to a regulatory threat. In addition, they find that LIFO firms manage inventory levels to report lower profits in the third and fourth quarters of 1990 by purchasing additional inventory. In contrast, no firms are observed to report negative special items (as noted above) for crude oil and natural gas in the same period.

Similarly, Byard et al. (2007) find that large petroleum refining firms attempt to report lower earnings in the immediate aftermath of the hurricanes Katrina and Rita, when oil prices increased rapidly, as a political-cost strategy when under investigation by a regulator that is concerned with price control. In the same vein, Hall and Stammerjohan (1997) find that managers have an incentive to report lower earnings by using discretionary non-working capital accruals during periods in which they face potentially large damage awards. Moreover, Jones (1991) find that firms seeking import relief use income-decreasing earnings management activities during the import-relief investigations. Cahan's (1992) results show that firms under investigation for monopoly-related violations exercised income-decreasing discretionary accruals in investigation years. Lastly, Konigsgruber and Windisch (2014) indicate that firms manage earnings downward when under investigation by a competition authority, while, Cho and Sachs (2012) find that firms in motor carriers' industry record significant abnormal income-decreasing accruals in order to lessen perception of

excessive profits and avoid deregulation. In summary, incentives for earnings management can be classified by theoretical frameworks as shown in table 2.5.

Table 2.5: Incentives to manage earnings

Incentives for earnings	Market expectations	Contractual arrangement	Debt market	Public scrutiny/ pressure
Stakeholders	Analysts and Investors	Management	Debtholders	Government
Pattern of earnings and hypothesis	Income maximization and Income minimization (only earnings smoothing) based on market expectation hypothesis	Income maximization based on management compensation hypothesis	Income maximization and Income minimization based on debt covenant hypothesis	Income minimization based on political cost hypothesis, and Income maximization based on market incentive hypothesis
Events	- Satisfying market expectations (loss avoidance, earnings increases, earnings smoothness, preserving a desired credit rating) (Francis et al., 2003; Young, 1999; Beaver et al., 2003; Carter, 2015; Barth et al., 1999; and Graham et al., 2005) - Avoiding a negative market reaction (meeting or beating analyst earnings forecasts) (Burgstahler and Eames, 2006; Amy, 2005; Zang, 2012; Brown and Pinello, 2007; Jiang, 2008; and Alissa et al., 2013) - Issuing capital and acquiring firms (Cohen and Zarowin, 2010; Rangan, 1998; Teoh et al., 1998; Erickson and Wang, 1999; and Louis, 2004)	- Compensation contracts (bonuses/ share compensation) (Healy and Wahlem, 1999; Healy, 1985; Zang, 2012; Dechow and Skinner, 2000; Cohen et al., 2008; Turner and Guilding, 2011; Mendes et al., 2012; Zhang et al., 2008; Cheng and Warfield, 2005; Ghosh and Olsen, 2009; Burns and Kedia, 2006; Efendi et al., 2007; and Charoenwong and Jiraporn, 2009)	- Covenant violations (Zamri et al., 2013; Roychowdhury, 2006; Defond and Jiambalvo, 1994; Sweeney, 1994; Dichev and Piotroski, 2001; Zamri et al., 2013; Ardison et al., 2012; DeAngelo et al., 1994; and Leuz et al., 2003)	- Political sensitivity period (Cahan, 1992; Jones, 1991; Watts and Zimmerman, 1978; Han and Wang, 1998; Byard et al., 2007; Chen et al., 2011; key, 1997; Cho and Sachs, 2012; Konigsgruber and Windisch, 2014; and Hall and Stammerjohan, 1997)

5.3 Patterns of earnings management

The discussion above about the theoretical underpinning for earnings management suggests that managers may manipulate earnings upward or downward depending on their specific incentives. Then, this sub-section presents separately the incentives for these two patterns: income minimization and income maximization in more depth.

There are two patterns of earnings management, namely, income minimization and income maximization. According to Irani and Oesch (2016), managers may be motivated to accelerate sales by using positive discretionary accruals. In contrast, managers may also use negative discretionary accruals to engage in earnings smoothing or make future earnings thresholds easier. Moreover, Roychowdhury (2006) indicates that managers can result to real earnings management such as cutting (increasing) R&D, employee training, maintenance, and marketing expenditures, extending (reducing) credit terms, offering (cutting) price discounts, and increasing (decreasing) product volume.

Healy (1985) provides a good example of the two patterns of earnings management that influence income-decreasing and income-increasing accounting policies. He focuses on the firm's accrual choice based on a bonus-plan hypothesis and discovers that managers not only consider the current performance but also the future performance of the firm. The evidence shows that managers choose income-decreasing accruals when either cash from operations is above the upper boundary or income is below the lower boundary of the top executives' bonus plans in order to make the future target easier to achieve; however, they select income-increasing accruals when these boundaries are not binding.

5.3.1 Income minimization & smoothing

Managers may opt for income minimization during periods of high profitability in order to avoid being scrutinized by politicians, during restructuring to clear the deck, or even during low performance in order to be able to report higher earnings easier in the future (Leuz et al., 2003; Kirschenheiter and Melumad, 2002; and Stolowy and Breton, 2004). More specifically, Kirschenheiter and Melumad (2002) demonstrate that, when firms encounter bad news, managers prefer to take a “Big Bath”, depending on the degree of available discretion or the ability, to under-report earnings by the maximum amount possible in the current period and report higher earnings in the future. In contrast, if the news is good, managers prefer to engage in earnings smoothing and the amount of smoothing depend on the level of cash flow and available discretion.

Generally, managers like to reserve income in periods of good performance which allows them to manage earnings upwards in periods of poor performance (Leuz et al., 2003). This is in line with the study of Turner and Guilding (2011), who indicate that if earnings before special items and income tax exceed a certain threshold, managers will have an incentive to reduce the profits in the current period to increase the reported earnings in subsequent accounting periods. Managers can achieve this by the accelerating recognition of expenditure or delaying recognition of future income. In addition, managers can manipulate real actions to reduce earnings (Roychowdhury, 2006). For example, managers can manage earnings downwards by increasing R&D and marketing expenditures, cutting price discounts, and decreasing product volume.

In some cases, however, firms that perform poorly may also be motivated to take a “Big Bath” in order to report higher earnings easier in the subsequent

periods. Stolowy and Breton (2004) note that Moore (1973) was the first to propose the “Big Bath” accounting hypothesis when he found that firms tend to manage earnings downward after a change in top management. Income-decreasing discretionary accounting decisions benefit new management because of the reduction in historical bases for future comparison. This is consistent with evidence of Pourciau (1993) that earnings are likely to be managed downward after non-routine executive changes. Similarly, Kousenidis et al. (2013) find that managers are more likely to take a “Big Bath” during a crisis by making huge provisions for advertising and R&D expenditure, showing excessive losses, or rapidly writing off capital assets and intangibles assets to report higher earnings in the next period. Walsh et al. (1991) finds a relationship between the size of growth in income-decreasing earnings and the amount of extraordinary items adjustment. Hence, it can be concluded that the greater the extraordinary items adjustment, the more the intensity of earnings management via Big Bath.

Summing up, income minimizing earnings management tends to be used in periods when pre-managed earnings are lower than expected, while the smoothing of earnings tends to happen in periods when pre-managed earnings are higher than expected. Both of them are associated with income minimization.

5.3.2 Income maximization

Managers may opt for income maximization to window-dress financial statements prior to offering public securities, or to avoid the loss of investors’ confidence in the survival of the firm after a crisis/ period of poor performance (market incentives hypothesis) (Cohen and Zarowin, 2010; Rangan, 1998; and Teoh et al., 1998). In addition, managers might also manipulate earnings

upward for their own benefit in order to increase their compensation and job security (stewardship hypothesis) (Healy and Wahlem, 1999; and Charoenwong and Jiraporn, 2009). Furthermore, many papers show that debt contracts are an incentive to manage earnings upward to boost financial performance both to satisfy financial covenants in existing debt contracts and to raise new debt on more favorable terms (debt covenant hypothesis) (Dechow et al., 2011; Leuz et al., 2003; and Roychowdhury, 2006). Interestingly, Daniel et al. (2008) show that prior dividend policy and the tightness of debt-related dividend constraints have a significant influence on upwards earnings management to meet a dividend threshold and avoid a cut in dividends.

Prior studies (e.g. Dechow et al., 2010; Dichev et al., 2013; Roychowdhury, 2006; and Cohen et al., 2008) document that managers can use discretionary accruals and real actions to boost earnings. For instance, the sales department could predict that the sales volume would drop in the future; managers could boost the sales volume by offering price discounts and extending credit terms. Alternatively, managers can manage earnings upwards by delaying the reporting of current costs such as bad debt expenditure or inventory write-offs, or delaying repaying long term liabilities, increasing estimates of live salvage value for fixed assets within an acceptable range, and reducing advertisement and R&D expenses. Interestingly, Jansen et al. (2012) study a new diagnostic for earnings manipulation upwards based on directional change in firms' profit margin and asset turnover ratio and find that firms with an increase in profit margin and a decrease in assets turnover tend to meet or beat analyst forecasts, have extreme earnings surprises, subsequently restate earnings downward, and experience lower year-ahead firm performance. For example, if managers manipulate earnings upward by understating bad debt expenses,

both net income relative to sales and the net realizable value of accounts receivable relative to sales will be overstated. Therefore, the increase in net income relative to sales will lead to an increase in profit margin (calculated by the ratio of net income to sales); whereas, the increase in net accounts receivable relative to sales will lead to a decrease in assets turnover (calculated by the ratio of sales to net operating assets).

In summary, there are three different methods to increase earnings by using accruals and real earnings management as mention above: namely, (1) expense manipulation by the delayed recognition of expenditure; (2) revenue manipulation by the accelerated recognition of future income; (3) margin manipulation by stabilizing the recognition of revenue (Dechow et al., 1995).

6 Other determinants and constraints of earnings management

After exploring the types, concept, and patterns of earnings management, we next turn to the investigation of other underlying determinants and constraints of earnings management. Kirschenheiter and Melumad (2002) suggest that the main reasons for earnings management are an internal demand related to optimal contracting and an external demand to boost the firm's stock price. Similarly, Dichev et al. (2013) indicate that outside and inside pressures in an attempt to influence stock price and avoid adverse compensation are primarily key for earnings misrepresentation. Therefore, this paper classifies factors on earnings management into two main categories, namely, internal factors and external factors as many prior literatures suggest (e.g. Latridis and Dimitras, 2013; Leuz and Schrand, 2009; and Kirschenheiter and Melumad, 2002).

6.1 Internal factors

Internal factors and constraints on earnings management include business model, human factor, firms' characteristics, governance and internal controls, and managerial compensation. However, we have discussed managerial compensation as an incentive based on management compensation hypothesis in detail before. Hence, this section will not cover the topic on managerial compensation.

Business model

Schipper and Vincent (2003) document that the business model is an important determinant of earnings management. Mazumder (2016), who studies the impact of ownership structure on earnings predictability, identifies that firms with incremental domestic institutional ownership are related to higher earnings predictability, while, firms with higher foreign institutional ownership are related to lower earnings predictability. In other words, firms with higher domestic institutional ownership are considered to have high earnings of quality. Matsumoto (2002) observes that firms with higher transient institutional ownership, greater reliance on implicit claims with their stockholders, high long-term growth, high risk of shareholder lawsuits, and higher value-relevant earnings, are more likely to manage earnings upward and/or guide forecasts downward in order to meet or beat expectations of the earnings announcement.

Human factor

The character of the manager, her credibility, attitude and work experience affect the likelihood of earnings management and can raise red flags about potential misrepresentation (Dichev et al., 2013). For example, Pham (2016) examines the relationship between CEOs' financial experience and earnings

management around IPOs. His findings identify that IPO firms with financial expert CEOs tend to manipulate earnings less through accruals earnings management than IPO firms with managerial expert CEOs. He attributes this finding to financial expert CEOs being more likely to be informative in financial reporting and able to use accounting to allow investors to properly gauge the fair value of the firm. Moreover, his findings suggest that CEOs' expertise (i.e. financial or managerial expert) impacts on the ability of IPO firms to remain viable for a longer period of time.

Firms characteristics

Dechow et al. (2010) document that performance, growth, risk, and size are four specific firm characteristics related to earnings management. According to Trombetta and Imperatore (2014), a company's return on assets (ROA), which is used to assess performance, represents potential determinants of earnings management. Firms with weak performance have stronger incentives to manage earnings (Dechow et al., 2010). Dichev et al. (2013) document that fast-growing firms and firms with a higher exposure to lawsuits show a greater dollar magnitude of earnings management. Thus, such action reduces the earnings quality. Further, Watts and Zimmerman (1986) find a positive relationship between size and earnings management, while, Dechow et al. (2010) suggest that firm size is inversely related to commonly used proxies for quality of earnings. This is similar to Byard et al. (2007), whose evidence suggests that large firms manage earnings in the immediate aftermath of disasters in line with the political cost hypothesis. In contrast, Kousenidis et al. (2013) argue that the financial reporting quality of big firms is higher than small firms because big firms need to disclose more information according to the

regulation of stock markets. Thus, big firms are less likely to be incentivized to manage earnings than small firms.

Governance and internal controls

Dichev et al. (2013) indicate that internal control procedures and the role of the board of directors (BODs) drive earnings quality. Internal control procedures are used as mechanisms to constrain a manager's opportunity or ability to manipulate earnings (Dechow et al., 2010). Firms with good internal controls can protect earnings quality and reduce earnings management (Schipper and Vincent, 2003). In other words, strong internal decisions would be associated with higher quality earnings. Hail and Leuz (2006) suggest that public firms engage in less earnings management than private firms because of stronger internal controls and the arm's length relationship with stakeholders. In addition, Prawitt et al. (2009) find that internal audit quality is associated with reduced level of earnings manipulation by using absolute abnormal accruals from the performance-adjusted modified Jones model and propensity to barely meet or beat versus barely miss analysts' earnings forecasts. In particular, the lower the internal audit quality, the higher the absolute abnormal accruals measure, and the less likely the firm is to barely miss analysts' earnings forecasts. This implies that better internal control procedures lead to a reduction in earnings management.

Dechow et al. (1996) document that weaknesses in firms' internal governance structures (e.g. CEO duality, board composed largely of insiders, and firms without an audit committee) are factors increasing the likelihood of earnings management. In contrast, Dechow et al. (2010) indicate that managerial turnover and more independent board are associated with less earnings management. This is consistent with evidence of Karamanou and Vafeas

(2005) that firms with more effective corporate governance are associated with higher earnings forecast accuracy and financial disclosure quality. Lastly, Ajinkya et al. (2005) report that firms with more outside directors and greater institutional ownership tend to be more specific and accurate. Hence, these firms are considered to have higher-quality earnings and manage earnings less.

6.2 External factors

External factors affecting earnings management include financial reporting practices, auditors, capital market incentives, regulation and potential regulatory scrutiny, and crises and the environment. However, we have discussed capital market incentives and regulation and potential regulatory scrutiny as an incentive based on the market expectation hypothesis and political cost hypothesis, respectively in detail before. Therefore, we will discuss only three external factors on earnings management remaining in this sub-section.

Financial reporting practices

According to Schipper and Vincent (2003), accounting recognition rules, which preclude the recoding of many economic assets and liabilities, and difficulties in reliably measuring assets and liabilities at their economic values affect reported earnings. For example, managers must report the recognition of impairment losses on fixed assets and purchased goodwill based on estimates. In addition, they indicate that the quality of earnings increases with the decreasing incidence of estimation used by managers. This is consistent with interview evidence reported in Dichev et al. (2013) that the quality of earnings is positively correlated with the quality of assumptions underlying the estimates on the balance sheet. If the quality of assumptions is high, then earnings are of high quality, while, the degree of earnings management is low. Dichev et al. (2013)

argue that accounting for merger and acquisition can help managers engage in income-increasing earnings management through a goodwill account whereby they can boost up future earnings. Similarly, Louis (2004) suggests that acquiring firms are likely to manipulate earnings upwards before the merger announcements to reduce the cost of acquiring target firms. Interestingly, Bartov (1993) finds that managers take advantage of the acquisition-cost principle to manage earnings through the timing of income recognition from disposal of long-lived assets and investments, as changes in the market value of an asset between acquisition and sale are recognized in the period of the sale. Dechow et al. (2011) indicate that managers can perform financial statement window-dressing by using off-balance-sheet activities such as pension obligations and related plan assets for defined benefit plans, and operating leases. For example, managers can adjust the expected return on plan assets and so reduce/increase future reported pension expense. In addition, managers may use the accounting for operating leases to record lower expenses early on in the life of the lease and so increase income in the current period. These can provide important signals about the likelihood of managers intentionally manipulating earnings. This is consistent with argument in Dechow et al. (2010) that accounting method choices on the average lead to lower-quality earnings because managers are likely to make opportunistic choices rather than efficient choices.

According to Dechow et al. (2010), financial statement classification and interim reporting are likely to result in higher incentives to manage earnings. McVay (2006) indicates that financial statement classification is another strategy for managing earnings because managers opportunistically use discretion over classifications in the profit and loss statement to meet targets. This is consistent

with the suggestion of Matsumoto (2002) that the accruals at fiscal year-end may differ from those at interim quarters because auditors may increase their scrutiny. Accordingly, managers are more likely to report extraordinary items or use classification shifting technique in the fourth quarter to meet analyst forecasts or avoid negative earnings surprises. Similarly, Brown and Pinello (2007) find that managers are likely to reduce the likelihood of income-increasing earnings management but increase the magnitude of downward expectations management in annual reporting when compare to similar firms in interim reporting. While, Zang (2012) indicates that managers tend to manipulate transactions more in the last quarter of the fiscal year because, by then, they have sufficient information about the level of earnings management needed.

Auditors

Schipper and Vincent (2003) document that earnings quality depends on the quality of the auditors. Auditors are important actors in detecting and mitigating level of accruals earnings management; however, it may lead firms to engage in a higher level of real-based earning management (Alhadab et al., 2016). Bonner et al. (1998) show that Big 6 firms (now Big 4) are of higher quality than firms with non-Big 6 auditors by considering the litigation rate which reflects quality differences between the two types of auditor. In other words, Big 4 firms are less likely to be litigation targets than other audit firms, thus, they are of higher quality. Similarly, Dechow et al. (2010) and Pornupatham (2007) find that firms that use Big 4 auditors have significantly lower discretionary accruals than firms that use other accounting firms.

Auditor industry expertise and hours spent auditing are proxies for auditor effectiveness, which are positively correlated with earnings quality, but, are

negatively correlated with earnings management. Further, Dechow et al. (1996) point out that independence and quality of the outside auditor affect earnings management. Therefore, several empirical studies select audit quality as the control variable to measure earnings management (i.e. Alhadab et al., 2016; Cohen et al., 2008; Burgstahler et al., 2006; Lennox and Pittman, 2011; and Lang and Maffett, 2011).

Interestingly, Dechow et al. (2010) argue that the relation between audit fees and earnings quality is mixed. The evidence of Frankel et al. (2002) suggest that audit fees are negatively related to earnings management indicators because audit fees are predicted to be positively associated with audit expertise, and hence with detection earnings management ability. On the other hand, audit fees are also predicted to be negatively associated with auditor independence, and hence the audit quality could be impaired (Dechow et al., 2010).

Firms with changes in auditor tend to manage earnings more easily and are associated with lower-quality financial reports because new auditors need some time to understand the nature of their businesses (Johnson et al., 2002; Stanley and DeZoort, 2007; and Okolie, 2014). This is consistent with evidence of Davis et al. (2009) that firms with short (2-3 years) auditor tenure tend to report higher levels of discretionary accruals to meet or beat analysts' earnings forecasts due to a lack of client-specific knowledge. While, firms with long (13-15 years) auditor tenure are likely to report higher levels of discretionary accruals due to impairment of auditor's independence (over-familiarity). On the other hand, Johnson et al. (2002) finds no evidence of reduced earnings quality for long (nine or more years) auditor tenure.

Crises and the environment

Many researchers (i.e. Kousenidis et al., 2013; Trombetta and Imperatore, 2014; and Iatridis and Dimitras, 2013) have examined the impact of economic downturn (like financial crisis or economic crisis) on earnings management. On the one hand, the crisis has negative effects on earnings quality of firms. For example, Trombetta and Imperatore (2014) point out that financial distress, economic downturn and other crises are determinants of accounting discretion decisions. Their results indicate that the accounting quality during periods of financial distress is affected by accounting choices and earnings management. In addition, they also find a U-shaped relationship between earnings management and macro-economic factors. This means that a highly intense crisis level greatly affects earnings management activities, while a low-crisis level affects earnings management activities less. In other words, earnings management activities may be non-monotonic and may vary according to the intensity of the crisis. Moreover, Cohen et al. (2008) find that firms have high levels of discretionary accruals in a period surrounding the corporate accounting scandals of Enron and WorldCom. Similarly, Esteban and Garcia (2014) finds that financial crisis influences accounting choices to manage earnings. In other words, a crisis negatively influences earnings quality or earnings quality deteriorated due to the crisis. In the same vein, Choi et al. (2011) suggest that the crisis may have negative effects on firms' earnings quality because it leads to a significant decline in the information value of discretionary earnings. Interestingly, Byard et al. (2007) investigate the relationship between weather catastrophes and managers' accounting choices. Their results indicate that managers of large petroleum refining firms choose income-decreasing accruals in the aftermath of hurricanes hit as suggested by the political cost hypothesis.

On the other hand, some papers find that earnings manipulation has decreased significantly during crises. For example, Filip and Raffournier (2014), who examine the impact of the financial crisis in 2008 and 2009 on earnings management, find that earnings management has decreased significantly in the financial crisis years compared with the prior years. This is consistent with evidence reported by Kousenidis et al. (2013), who study the effect of the European debt crisis on earnings quality in five countries (Spain, Greece, Ireland, Italy and Portugal). They find that the quality of earnings in the crisis period is better than in the pre-crisis period. They attribute this finding to the increased need of firms for external financing to resolve their liquidity problems.

7 The consequences of earnings management

McNichols and Stubben (2008) document that firms under SEC investigation for accounting irregularities, are sued by their shareholders for improper accounting, and restate their financial statements as a consequence of earnings management. Rezaee (2005) indicates that penalties for even unsuccessful earnings management are very severe. For example, four top executives of HBO & Company managed earnings from 1997 through March 1999 by backdating contracts that gave the customers an option to back out in order to exceed analysts' quarterly earnings expectations. However, the firm's auditor discovered the fraud when a customer canceled a purchase but the money stayed on the books as revenues. When auditors revealed the managers' actions, the share prices fell by almost 50% in one day.

In this section, we classify the consequences of earnings management into four categories, which include litigation propensity, market valuations, auditor opinions, and credit rating.

7.1 Litigation propensity

Dechow et al. (2010) document that restatements increase the likelihood of litigation. Moreover, they show that litigation risk is higher for firms with low quality of earnings or firms with high incentives for earnings management (i.e. firms applying aggressive revenue recognition policy and aggressive expense deferral policy, firms avoiding reporting losses or refraining from earnings decrease, firms using subsidiary disposal, and negative special items). This is consistent with the findings of DuCharme et al. (2004), who study the relationship between earnings management, stock issues, and shareholder lawsuits, and document that firms manipulating earnings upward around stock offers render themselves vulnerable to litigation.

Gong et al. (2008) indicate that DAs tend to represent misstatements outside the boundaries of GAAP and find a positive relation between consequences of misstatement (such as restated financial reporting and misunderstanding about the financial statements by users) and litigation propensity. In addition, Dechow et al. (2011) indicate that misstating firms have a significant negative effect immediately, in the correction year. For example, firms may experience a decline in investors' confidence and be sued by their shareholders after misstatements are detected.

Interestingly, Lennox and Li (2014) examine whether the litigation experiences of audit firms in the recent past affect subsequent financial reporting quality by assuming a rational learning framework. They find a positive association between an auditor's experience of litigation and future financial reporting quality, while, auditor's experience of litigation is negatively associated with future misstatement.

Summarizing, litigation of the firm and/or the firm's auditors can be an important consequence of earnings management; and litigation of the auditor is further positively related to future financial reporting quality.

7.2 Market valuations

Dechow et al. (1996) argue that managers manage earnings to enjoy lower costs of external financing, however, firms are penalized with significant increase in their costs of capital once the earnings management is revealed (i.e. a significant decline in the median number of analysts following, low sales, a decline in share prices, and bankruptcy). Similarly, Dechow et al. (2010) document that once firms with extreme earnings management are discovered, they incur substantial losses in market value because of reputational penalties or credibility decline, which subsequently lead to low sales, negative stock returns, and high contracting and financing costs.

Earnings manipulation is associated with an increase in the cost of capital when the earnings management is detected because investors revise downward their estimates of firm value and their beliefs about both the firms' future economic prospects and the credibility of the firms' financial disclosures. Thus, this causes the price of a stock to decline and leads to an increase in the bid-ask spread to protect against information asymmetry problems. This informational risk arises from the possibility of trading with someone better informed about the true stock prices than investors themselves. In other words, the investors earn a bid-ask spread to compensate for the increased risk of losing to informed traders (Dechow et al., 1996). This is consistent with evidence by Bhattacharya et al. (2003) that an increase in overall earnings opacity, which includes earnings aggressiveness, loss avoidance, and artificially earnings smoothing, is related

to an economically significant increase in the cost of equity and an economically significant decrease in trading in the stock market.

Evidence of Gill et al. (2013) suggests that earnings management has an effect on a firms' performance and the value of the firm. Chan et al. (2006) find a negative association between AEM and future stock returns, while, Cupertino et al. (2016) examine consequence for future returns of REM and find that REM has a negative impact on future ROA. Interestingly, Kim et al. (2011) suggest that the consequence of income-decreasing manipulation for the purpose of tax evasion is directly related to the risk of a collapse of the shares' price of the firm because the hoarding and accumulation of bad news for extended periods lead to lack of investors' confidence after the discovery of the earnings manipulation.

7.3 Audit opinions

Unqualified audit opinion means that the financial statements are free of misstatement; whereas, qualified audit opinions infer a low financial reporting quality. Research shows that audit opinions depend on the severity of earnings misstatements (Dechow et al. 2010). Similarly, Pornupatham (2007) suggests that firms with differing types of auditors' opinions have differing levels of earnings management. This is consistent with evidence in Koumanakos (2008) that audit reports with remarkable qualified opinions contain substantially manipulated published earnings, which in turn is associated with higher probabilities of bankruptcy for these firms. This means that auditors do report detected earnings management to the public via auditors' opinions. Dechow et al. (2010) further find that the resignation of an auditor is another indicator of poor earning quality.

Chen et al. (2013) examine the effect of qualified audit opinions on private debt contracts and find that decreases in loan size and increases in the requirement of collateral from the borrower are associated with qualified audit opinions. This suggests that the lenders consider financial covenants following a qualified audit opinion of the borrower's financial report. In other words, firms with qualified audit opinions are likely to have more covenant violations in debt contracts than firms with unqualified audit opinions. Francis and Krishnan (1999) identify that high-accrual firms have a higher tendency to get modified audit opinions than low-accrual firms.

Interestingly, Omid (2015), who investigates the relationship between AEM, REM and qualified audit opinion, finds that discretionary accruals is positively related to auditor's decision to issue a qualified opinion. This evidence is consistent also with the findings of Francis and Krishnan (1999), Bartov et al. (2001); Abolverdi and Kheradmand (2017); Herbohn and Ragunathan (2008); and Butler et al. (2004). In contrast, the result Omid (2015) suggests that there is no significant relation between auditor's decision to issue a qualified opinion and abnormal production costs. This is consistent with our earlier discussion that costs of AEM are associated with auditor and regulator' scrutiny, while, REM are harder for auditors to detect because managers use business judgment to make the decision. Not surprisingly, qualified opinions are associated with AEM but are not associated with REM.

7.4 Credit rating

Dechow et al. (2010) suggest that firms with higher quality accruals have a lower ratio of interest expense to interest-bearing outstanding debt and, hence a higher S&P issuer credit rating than firms with lower quality accruals. This is consistent with evidence in Ashbaugh-Skaife et al. (2006) that credit ratings are

positively related to accruals quality. In other words, a firm's accruals quality is a significant factor for the level of credit rating. Ashbaugh-Skaife et al. (2006) find that credit rating and transparency of firms' financial reporting are positively related. They measure the transparency of firms' financial reporting using the quality of firms' working capital accruals based on the work of Dechow and Dichev (2002) and find that it positively affects a firm's credit rating. Odders-White and Ready (2006) indicate that low credit ratings are associated with lower market liquidity in equity markets, while, firms with a high credit rating have high liquidity, which typically increases firm value (Lennox and Pittman, 2011). This is consistent with the evidence of Fang et al. (2009) that firms with better liquidity have typically a good performance as measured by the firm market-to-book ratio. In summary, credit rating agencies take into account earnings quality and earnings management in their rating decisions.

8 Conclusions and avenues for future research

Earnings management and earnings quality are inversely related. Managers make particular accounting choices "efficiently", to maximize the value of the firm, or "opportunistically", to ensure that the manager meets his/her objective and not those of the other contracting parties. Managers make changes in estimates and accounting policies to engage in accruals earnings management or make changes in business policies to manipulate earnings using real activities. Moreover, managers can also manage earnings by moving items to different categories within the income statement to increase core earnings. In addition, managers can opt for income maximization or income minimization when firms encounter bad or good news depending on their specific incentives. Academic researchers develop various models for detecting accruals and real earnings management. However, there is no universal conclusion about a

single best measure of earnings management. Therefore, developing a better model to measure earnings management activity is a topic that will keep attracting academician's attention in the future. Prior research work has also tested predictions for numerous factors and consequences of earnings management. Still, there are opportunities for expanding this stream of literature by examining more rare exogenous shocks, such as natural disasters.

Appendix 2.1: Abbreviations and variables used in the chapter

AEM	Accruals earnings management
REM	Real earnings management
EM	Earnings management
DAs	Abnormal accruals or Discretionary accruals
NDAs	Normal accruals or Non-discretionary accruals
∆WC	Changes in working capital = (∆CA - ∆CL - ∆Cash + ∆STD - Dep)/ TA_{t-1}
∆CA	Changes in current assets
∆CL	Changes in current liabilities
∆Cash	Changes in cash equivalents
∆STD	Changes in debt included in current liabilities
Dep	Depreciation and amortization expenses
TA	Total assets
∆Sales	Changes in revenues scaled by total assets at t-1
GrossPPE	Gross property, plant, and equipment in year t scaled by total assets at t-1
NetPPE	Net property, plant, and equipment in year t scaled by total assets at t-1
∆AR	Changes in account receivables scaled by total assets at t-1
COGS	Cost of goods sold scaled by total assets at t-1
∆INV	Changes in inventory scaled by total assets at t-1
ΔAR_{1-3}	Change in accounts receivable in the first three quarters
ΔAR_4	Change in accounts receivable in the fourth quarter
DD	Dechow and Dichev model following Dechow and Dichev (2002)
Modified DD	Modified Dechow and Dichev model following McNichols (2002)
Performance match	Performance-matched Jones model following Kothari et al. (2005)

CFO	Cash flow from operations model following Roychowdhury (2006)
Disc	Discretionary expenses model following Roychowdhury (2006)
Prod	Production costs model following Roychowdhury (2006)
ACCR	ACCR = net income before extraordinary items (EBXI) - cash flow from operation/TA_{t-1}
ROA	A company's return on assets
DSRI	Account receivables to sales
GMI	Gross margin ratio
AQI	The ratio of assets quality in year t compared to year t-1
SGI	The ratio of sales growth
DEPI	The ratio of depreciation in year t compared to year t-1
SGAI	The ratio of sales, general and administrative expenses in year t compared to year t-1
LVG	Leverage ratio
TATA	The ratio of total accruals to total assets

Chapter 3

Natural Disasters as Determinants of Earnings Management

Abstract

The goal of this study is to examine the level of earnings management occurring in a country hit by a natural disaster. In particular, we explore whether and how real and accruals-based earnings management strategies change around disaster events. Additionally, we test whether the severity of the disaster is related to the level of earnings management by comparing two different disasters, the 2004 tsunami in the Indian Ocean and the 2011 flood in Thailand. We base our study on a final sample of 4,006 firm-year observations over the period 2001-2006 to test the effect of a tsunami and 5,786 firm-year observations over the period 2008-2013 to test the effect of a flooding. We use a differences-in-differences (diff-in-diff) approach to assess differences between our treatment group and a control group of geographically and institutionally similar firms that were not affected by either the tsunami or the flooding. Collectively, our results support the view that (1) firms actively manage earnings after the disaster by using accruals and real earnings management; and (2) the level of earnings management is conditional on the severity of the disaster.

Keywords: Accrual earnings management, real earnings management, and natural disasters

1 Introduction

The aim of this study is to examine the level of earnings management occurring in a country hit by a natural disaster and to explore whether and how real and accruals-based earnings management strategies change around disaster events. There are at least two reasons why natural disasters could affect firms' levels of earnings management. First, according to Hall and Stammerjohan (1997), regulatory concerns could encourage managers to manage earnings downwards. Firms suffering significant losses due to natural disasters may manage earnings during these periods of heightened pressure to benefit from the government's help or lower the political costs of the firm. Second, because of a significant loss of investor confidence in the survival of the firm after the disaster, managers may also have a strong incentive to manage earnings upwards by taking advantage of certain accounting choices (i.e. manipulating accruals, changing accounting methods, and changing estimate) or by manipulating real activities (i.e. changing research and development (R&D) expense, changing product volume, changing credit term or trade discount, and selling assets). In this case firms would respond to heightened level of market pressure by engaging in earnings management to convey information about firm's ability to survive and future earnings prospects. Hence, both theoretical arguments suggest that the occurrence of natural disasters may be associated with earnings management, but they each predict a different direction for this association.

In this chapter, we study the effect of two different disasters on earnings management: the 2004 Indian Ocean disaster and the 2011 flood in Thailand. We use a differences-in-differences approach to assess differences between two groups (*treated*, i.e. firms affected by the disaster and *controlled*, i.e. a

group of geographically and institutionally similar firms) before and after the disasters.

Consistent with the market incentives hypothesis, we find an increase in accruals earnings management (AEM) and real earnings management (REM) after the disasters, although results are conditional on the model used to measure earnings management. Our evidence suggests that firms are likely to manipulate accounting numbers to attract prospective investors or re-assure investors and analysts about the firm's survival prospects.

In additional tests, we consider the trend in earnings management separately for the years following the disaster to examine how fast firms manage earnings. We show that firms start to engage in both accrual and real earnings management in the first year after the disasters occurs *(+1y)*. However, there is no evidence that firms manage earnings by using accrual and real-based earnings management during the period hit by natural disasters *(y_0)* (tsunami and flooding occur in 2004 and 2011, respectively). Furthermore, we run an additional analysis by separating the sample into two groups, (high vs. low leverage), to examine whether firms having more leverage are more inclined to re-assure investors and analysts about the firm's survival prospects. The results show that firms with high leverage are likely to manage earnings during disasters to attract prospective investors or re-assure investors and analysts about the firm's survival prospects as suggested by the market incentive hypothesis, whereas, there is no evidence that firms with low leverage manipulate earnings over the tsunami and flooding periods.

Lastly, we compare the two different disasters to provide new evidence into whether the level of earnings management is conditional on the intensity of the disaster. We measure the intensity of the disasters by comparing the costs of

the tsunami and flooding, therefore assuming that the damages and losses from a natural disaster is proportionate to the intensity of that disaster. According to Economist (2011) and The World Bank (2011), the actual financial damage from tsunami 2004 was relatively smaller than the financial damage from the 2011 flooding. Consistent with this observation, we find that the magnitude of the coefficients of interest for the tsunami sample is statistically different from the magnitude of the coefficients of interest in the flooding group, both for accruals and real earnings management. In particular, firms exposed to the tsunami show smaller earnings management than firms exposed to the flooding. Thus, the evidence indicates that the level of earnings management is conditional on the intensity of the disaster.

This research contributes to the earnings management literature by looking into an additional incentive for firm to manage earnings, i.e. natural disasters, and thus complements prior studies (Healy, 1985; Francis et al., 2003; Young, 1999; Daniel et al., 2008; Burgstahler et al., 2006; Watts and Zimmerman, 1978; Chen et al., 2011; and Hall and Stammerjohan, 1997) that have instead focused on market expectations (loss avoidance, earnings increase, and meeting or beating analyst earnings forecasts), contractual arrangement (bonus, share compensation, dividend thresholds, and debt market), and public scrutiny. In this way, our research contributes to the literature by providing useful insight into how natural disasters can affect reporting incentives.

Further, our analysis expands prior literature on the effect of other exogenous shocks of a similar type (e.g. financial crisis as in Trombetta and Imperatore, 2014) on earnings management, as well as a prior study by Byard et al. (2007) on the impact of natural disasters on earnings management by incorporating real earnings management as an alternative manipulation activity. In addition,

our study offers a more robust methodological approach than Byard et al. (2007) by using the diff-in-diff design to assess differences between our treatment and control groups before and after the disasters. Conclusively, our findings give a more reliable picture of whether and how natural disasters affect both accrual-based and real earnings management.

Our results also have implications for investors and practitioners to verify the reliability of the accounting information during disasters for stewardship and valuation purposes (such as to predict future cash flows, stock prices, and to assess risk of firms for more accuracy). Further, regulators may benefit from a better understanding of how natural disasters shape reporting incentives to formulate appropriate policies to safeguard investors.

The rest of the paper is organized as follows. Section 2 reviews the relate literature and presents our hypotheses. Section 3 discusses the empirical setting, data, and empirical methodology. Section 4 provides an overview of the empirical evidence and sensitivity analyses. Section 5 concludes the study.

2 Prior literature and hypotheses development

While there are plenty of studies investigating the incentives that management has to manipulate earnings, little research has investigated how earnings are managed around external shocks such as natural disasters. One notable exception is the paper by Byard et al. (2007), who look at the impact of hurricanes on earnings management. The evidence in their study shows that oil firms reduce their earnings as a political-cost strategy when oil prices increase rapidly after hurricanes hit.

In the occurrence of a natural disaster (like a flood, earthquake, or tsunami), firms may suffer from the loss of their inventory or factories, or their employees

may be unable to reach the workplace. These situations have a negative effect on the financial performance of firms. This study argues that natural disasters encourage managers to engage in opportunistic earnings management. The underlying argument is that during a disaster firms are more likely to experience a significant decrease in earnings performance. In addition, almost all firms during a disaster experience not only a significant decline in their stock price performance but also a significant loss of investor confidence in the survival of the firm. During these exceptional events, managers need to re-assure investors and analysts about the firm's survival prospects or to attract more prospective investors. The market incentive hypothesis for earnings management suggests that firms whose performance is suffering due to exogenous shocks, such as financial crises or natural disasters, will make adjustments to their policies (i.e. altering inventory accounting methods, changing estimates of bad debt, revising assumptions related to pension assets, changing credit terms and price discounts, and changing the product volume) to improve the look of their financial statements. Consistent with this hypothesis, Graham et al. (2005) provide evidence that when the overall economy is down, CEOs are likely to boost earnings and delay the reversal of these actions until the economy recovers.

On the other hand, it is possible that managers tend to underreport performance to reserve earnings for the future or avoid political scrutiny. This is known as the political cost hypothesis. The political cost hypothesis predicts that firms suffering from a natural disaster will engage in (income-decreasing) earnings management to benefit from the government's help or to be subject to lower taxation. Kousenidis et al. (2013) document that firms may engage in "big bath" practices to boost losses during a period of crisis while "putting away" income

for future reporting periods. Repair lost property expense and devaluation of inventory due to the disaster are some of the special items known as transitory expenses that managers can use to show excessive loss from a natural disaster or make huge provisions associated with the big bath scenario. Hence, firms may manage their earnings figures downward during natural disaster periods and upward in subsequent periods. In the same vein, Choi et al. (2011) investigate the effects of the Asian financial crisis of 1997-1998 on the value relevance of discretionary accruals (DA). As mentioned in the Chapter 2, earnings quality plays a role for the value-relevance of accounting information. Low earnings management usually has a greater association with share prices and stock returns than high earnings management. The evidence in Choi et al. (2011) study suggests that during the Asian financial crisis, while the value relevance of DA had significantly decreased, the value relevance of non-discretionary accruals did not significantly change. Moreover, they find that the value relevance of DA reverted back to a pre-crisis level in the post-crisis period. Overall, their results suggest that managers engaged in income-decreasing earnings management during the Asian financial crisis of 1997-1998. Similarly, Byard et al. (2007) find that large petroleum refining firms respond to periods of heightened political cost sensitivity because of unusual product price increases by recording significant abnormal income-decreasing accruals immediately after hurricanes hit.

Within the discretion allowed by the accounting standards, earnings management occurs when the management uses judgment in financial reporting in order to achieve their target, such as avoiding loss, increasing earnings, smoothing earnings and meeting or beating analysts' forecast (Francis et al., 2003; Zang, 2012; Cohen et al., 2008; Ghosh and Olsen, 2009;

Aerts and Zhang, 2014; Burgstahler and Eames, 2006; Matsumoto, 2002; Alissa et al., 2013; and Chand et al., 2013). Moreover, managers can also make real changes to their business models, for example by changing the credit policy for the accounts receivables and offering price discounts to boost revenues (Zang, 2012; Roychowdhury, 2006; and Cohen et al., 2008). In other words, companies can manage earnings mainly in two ways: (1) by manipulating their accounting accruals; and (2) by changing their real decisions/expenses. According to the accounting literature (Alhadab et al., 2016; Trombetta and Imperatore, 2014; Bozzolan et al., 2015; Roychowdhury, 2006; and Cohen et al., 2008), both real and accruals-based earnings management have costs and benefits.

Real earnings management is more costly to shareholders than accruals earnings management because it has a direct effect on the cash flow and operating performance of firms. However, it is harder to detect for auditors or investors than accruals manipulation. For example, managers may engage in real earnings management activities after the natural disaster by eliminating or postponing positive NPV projects to save cash and keep liquidity levels high. While it is difficult for outsiders to assess and identify real earnings management, it still undermines the firm's ability to earn income in the future.

Accruals earnings management does not directly affect cash flow, but it can be detected more easily by auditors and investors, increasing litigation and reputation risk. In addition, if managers select accruals manipulation and the amount being managed falls short of the earnings target in the last quarter, there would be insufficient time to use real earnings management. Lastly, all accruals reverse in subsequent periods.

Various studies (Zang, 2012; Cohen et al., 2008; and Irani and Oesch, 2016) document that there is a trade-off between accruals and real earnings management due to the different sets of costs and benefits associated with these two strategies, in other words, they are substitute (Bozzolan et al., 2015). The main objective of this research is to empirically investigate the hypothesis that firms in countries that are hit by natural disasters are more willing to undertake both earnings manipulation activities. This leads to the first set of hypotheses[8]:

H1a: Firms exhibit evidence of accruals earnings management after a natural disaster.

H1b: Firms exhibit evidence of real earnings management after a natural disaster.

While the first set of hypotheses focuses on earnings management after the disaster, our second hypothesis is concerned with whether the increase in the level of earnings management, if any, is higher for firms that were more seriously affected by a disaster. More specifically, we expect that the loss of investors' confidence in the survival of the firm shortly after the disaster would be more (less) severe in countries with high (low) level of intensity of disaster and thus it could influence managers' incentives to manipulate earnings.

Consistent with this argument, Trombetta and Imperatore (2014) document that the intensity of the crisis plays a role for the level of earnings management. Specifically, in their study, earnings management increases when the intensity of the financial crisis is severe, but it decreases when the financial crisis is low. Building upon the preceding arguments, we formulate the second hypothesis as follows:

[8] As we have discussed above, whether natural disasters result in income-increasing or income-decreasing earnings management remains an empirical issue.

H2: The level of earnings management is conditional on the severity of the disaster.

3 Research design and methodology

3.1 Empirical setting

We employ two different disasters, the 2004 tsunami in the Indian Ocean and the 2011 flood in Thailand, to test our hypotheses.

On Boxing Day 2004, an unusually strong earthquake resulted in a disastrous tsunami in the Indian Ocean, with repercussion in both Indonesia and Thailand. Banda Aceh in Indonesia was the most seriously affected area because it was near the epicentre, buildings were physically destroyed, and the infrastructure was badly damaged. In contrast, the south of Thailand was hit by a series of tsunamis, and although the magnitude of the severest tsunami was smaller than in Indonesia, the damage and losses were much worse (The Guardian, 2014; and The Guardian, 2009).

The second disaster refers to the flooding that occurred in Thailand in the last quarter of 2011. The floods started in September and spread through the provinces of northern, north eastern, and central Thailand. By mid-October, the capital of Thailand, Bangkok, was inundated. Flood disaster zones included sixty-five of Thailand's seventy-seven provinces and the flood affected more than 13.4 million people. The manufacturing industry was badly damaged. The flooding caused disruptions to manufacturing supply chains affecting the regional automobile production, and also causing a global shortage of hard disk drives which lasted throughout 2012 (Centre for research on the Epidemiology of Disasters, 2012).

There are mainly three differences between the tsunami in 2004 and the flooding in 2011: the length of each disaster period, the timing of each disaster, and the level of the damages and losses. First of all, a tsunami consists of a series of waves happening between 10 minutes to 2 hours, while the floods lasted for a period of 2-3 months. Generally, floods have more long-lasting effects than a tsunami. Second, the tsunami occurred at the end of the last reporting quarter for most firms, but the flooding occurred at the beginning of the last quarter. Thus, firms in the flooding sample have more time to manage earnings in the immediate aftermath of the disaster compared to firms in the tsunami sample. Lastly, the Economist (2011) documents that the Indian Ocean tsunami resulted in losses of about 14 billion dollars, more than 70% of which represent damages and losses incurred by the private sector. On the other hand, the total economic losses from the flooding in Thailand were estimated by The World Bank (2011) to be around 45 billion dollars. We exploit these two different events to investigate the effect of natural disasters on the level of earnings management.

3.2 Sample and data

Our overall dataset includes listed firms from four countries, namely, Indonesia, Thailand, Korea and Philippines.

We make use of two treatment samples: (1) firms in Indonesia and Thailand over the period 2001-2006, as the countries hit by the 2004 tsunami; and (2) firms in Thailand over the period 2008-2013[9], hit by the 2011 flooding. We further divide the two samples into sub-periods. The first sub-period covers the

[9] We also use year 2000 and 2007 in cases where the estimated model uses a lagged variable and use year 2007 and 2014 in cases where the estimated model uses a future variable.

three years before the disasters occurred (2001-2003 and 2008-2010) while the second sub-period cover the three years after the disasters occurred (2004-2006 and 2011-2013). The year (0) is defined as the fiscal year during which each disaster occurred.

It is worth to note that we include firms suffering direct and indirect damages from the disaster because of inter-industry relationships or production chains. Hence, we take into account the system-wide impact of flow losses incurred through supply chains. For example, the tourism industry in Thailand was directly affected by the tsunami because touristic destinations were the mostly affected areas (ThaiWebsites.com, 2005). Example of industries that were affected indirectly are food and petroleum industries. To test the effect of the tsunami on earnings management, we classify as treated all firms in Indonesia and Thailand. To test the effect of the flooding we classify as treated all firms in Thailand. Control firms are chosen from countries which were not hit by natural disasters but are in East Asia and belong to the same cluster identified by Leuz et al. (2003)[10] of treated countries. We select Korea and Philippines as control group for the tsunami disaster, whereas, three countries, Indonesia, Korea and Philippines, are chosen as control group for the flooding disaster.

[10] Leuz et al. (2003) classified 31 countries base on aggregate earnings management score. Indonesia, Thailand, Korea and Philippines are in the third cluster which indicates the low quality of legal enforcement.

Table 3.1: Sample selection and distribution

Panel A: Distribution of observations

Year	Frequency	Percent	Cumulated percent
2001	527	13.16	13.16
2002	628	15.68	28.83
2003	673	16.80	45.63
2004	699	17.45	63.08
2005	734	18.32	81.40
2006	745	18.60	100.00
Total (Tsunami)	4,006	100.00	
2008	783	13.53	13.53
2009	874	15.11	28.64
2010	919	15.88	44.52
2011	986	17.04	61.56
2012	1,055	18.23	79.80
2013	1,169	20.20	100.00
Total (Flooding)	5,786	100.00	

Panel B: Breakdown of observations by country and year

	Country				
	Treated group		Control group		
Year	Indonesia	Thailand	Philippines	Korea	Total
2001	159	151	54	163	527
2002	173	200	59	196	628
2003	168	229	60	216	673
2004	171	240	58	230	699
2005	178	249	58	249	734
2006	188	246	58	253	745
Total (Tsunami)	1,037	1,315	347	1,307	4,006

	Treated group	Control group			
Year	Thailand	Indonesia	Philippines	Korea	Total
2008	231	204	62	286	783
2009	249	237	73	315	874
2010	259	267	74	319	919
2011	287	284	76	339	986
2012	310	301	86	358	1,055
2013	326	304	94	445	1,169
Total (Flooding)	1,662	1,597	465	2,062	5,786

All financial firms are excluded from the sample due to differences in their financial reporting. We restrict the sample to all non-financial firms with all

required data available on Bloomberg. Moreover, we consider only firms with fiscal year end in December[11] in our analysis.

The final samples have 4,006 firm-year observations over the period 2001-2006 and 5,786 firm-year observations over the period 2008-2013. Table 3.1 illustrates the distribution of the observations over the period (Panel A) and the breakdown by country and year (Panel B). As shown in Table 3.1 (Panel B), Philippines has a small sample size when compared with the other countries (Indonesia, Thailand, and Korea). However, the set of control samples is identified by selecting firms located in East Asian countries that were not hit by natural disaster, and under the same institutional cluster as the treated group as classified by Leuz et al. (2003). During the tsunami and flooding periods, Philippines, located in East Asia, was not hit by either natural disaster and is in the same third cluster, which includes countries with low quality of legal enforcement, such as Indonesia, Thailand, and Korea.

3.3 Research models

This study uses a differences-in-differences approach to assess differences between the two groups (i.e. *treated* and *controlled*) before and after the disasters. The treatment group is identified by a dummy variable (*treated*) that takes the value of 1 if the firm is from a country affected by the natural disaster and zero otherwise. We also include in our models another dummy variable (*disaster*) which takes the value of 1 for all fiscal year ends after each disaster, and zero otherwise. The *disaster* takes the value of 1 in 2004-2006 for the tsunami tests, while, *disaster* takes the value of 1 in 2011-2013 for the flooding

[11] Tsunami and flooding occurred in the last quarter. So, we consider only firms with fiscal year end in December to convenient for compare two events.

tests. Finally, we interact the *treated* and *disaster* dummies to assess the effects of each disaster on earnings management.

To test hypothesis H1a and H1b on whether natural disaster affects the accruals earnings management and real earnings management, respectively, we run regressions with robust standard errors clustered at industry level[12] and year fixed effects, as follows:

$$EM_{i,t} = f_{i,t}\,(b_0 + b_1 treated + b_2 disaster + b_3 treated*disaster + b_4 control\ variables + e) \quad (1)$$

A detailed description of our earnings management and control variables is provided in section 3.4. Appendix 3.1 also provides the definitions for the variables used throughout this study. b_3 is our coefficient of interest as it assesses the difference between treatment and control firms before and after the disaster. If significant, it would indicate that managers of treated firms are more or less likely to manage earnings after the disasters than the managers of control firms. If the coefficient b_3 is negative, it indicates that firms face greater political pressure to manage their earnings downward in the period immediately after the impact of tsunami or flooding in support of the political cost hypothesis. However, if the coefficient b_3 is positive, it indicates that firms face greater market pressure to manage their earnings upward in the aftermath of disaster as per the market incentives hypothesis.

For our second hypothesis, H2, we want to test whether the level of earnings management is conditional on the severity of the disaster. To do this, we consider the absolute value of EM as the proxy for earnings management over the disaster period and test whether the interaction coefficients are statistically different from each other. In particular, if our expectation that the severity of the

[12] We also cluster standard errors at the firm level. The results (not tabulated) remain qualitatively similar to those reported in Table 3.7.

disaster affects positively earning managements holds true, then we expect that the coefficient of interest in the tsunami group to be statistically smaller than the coefficient in the flooding group.

3.4 Variables measurement

3.4.1 Earnings management variables

We estimate AEM and REM using four models and we scale all variables by lagged total assets *(TA_{t-1})* to mitigate the effect of heteroskedasticity as suggested by Daniel et al. (2008). For the tsunami disaster, we consider Indonesia, Thailand, Philippines and Korea during the period 2001-2006. For the flooding, we consider the sample located in the same four countries, but during the period 2008-2013. We employ industry and year fixed effects to run the earnings management models. All the models are summarized in Table 3.2. Subscripts for firm (i) and year (t) are omitted from all models for simplicity.

Table 3.2: Accruals and real earnings management models

AEM model	REM model
Modified Dechow and Dichev model $ACCR = b_0 + b_1CFO_{t-1} + b_2CFO_t + b_3CFO_{t+1} + b_4\Delta sale + b_5GrossPPE + e$	Cash flow from operations model $CFO = b_0 + b_1(1/TA_{t-1}) + b_2Sales + b_3\Delta Sales + e$
Performance-matched Jones model $ACCR = b_0 + b_1(1/TA_{t-1}) + b_2(\Delta sale) + b_3NetPPE + e$ match residual of each firm-year observation with residual of another firm from the same two-digit SIC code and year with the closest return on assets[13] in the current year	Discretionary expenses model $Disc = b_0 + b_1(1/TA_{t-1}) + b_2Sales_{t-1} + e$

Table 3.2 provides accruals and real earnings management models. This study estimates earnings management using residuals and the absolute value of the residual from the annual cross-sectional industry regression of AEM (column 1) and REM (column 2) models. Industry-year with less than 10 observations are eliminated from the sample.

[13] Return of assets calculated as net income divided by total assets.

We measure AEM using the modified Dechow and Dichev model, and the performance-matched Jones model, following McNichols (2002) and Kothari et al. (2005), respectively. As mentioned in Chapter 2, the modified Dechow and Dichev model reduces our exposure to omitted correlated variables problems and provides a useful specification check on the magnitude of the estimated errors, while the performance-matched Jones model can examine non-random samples of firms.

We estimate total accrual *(ACCR)* based on the income statement and the statement of cash flow approach as suggested by Hribar and Collins (2002) who show that the error in a balance sheet approach of estimating accruals is related to firm's economic characteristics. At the same time, Alhadab et al. (2016) suggest that the income statement and the statement of cash flow approach can lead to a lower magnitude and frequency of measurement error.

$$ACCR = [\text{net income before extraordinary items (EBXI)} - \text{cash flow from operation}] / TA_{t-1}$$

We measure REM following Roychowdhury (2006) and Cohen et al. (2008), using the cash flow from operations and discretionary expenses models. We have not included production cost model in our analysis because overproduction or underproduction can only be applied to manufacturing firms.

We use residuals and the absolute value of the residuals from annual cross-sectional industry regressions based on each of the models presented in Table 3.2 as earnings management proxies to study potential change in the direction and in the magnitude of earnings management, respectively. We follow previous research (Burgstahler et al., 2006; Cohen et al., 2008; and Alhadab et al., 2016) in excluding firms in 2-digit SIC code industry-year groups with less

than 10 observations[14]. This approach controls for changes in economic conditions that influence total accruals, abnormal cash flow from operations, and abnormal discretionary expenses across different industry groups. However, we note that we examine two types of earnings management (AEM for H1a and REM for H1b) and use two variants for each: (1) signed earnings management variables to look at the direction (upwards or downwards), and (2) the absolute earnings management to study potential changes in the magnitude of earnings management (high or low). While real earnings management should be considered in terms of its signed values, we use the absolute value of REM for consistency purposes to show "evidence" of earnings management. However, absolute real earnings management is hard to interpret the coefficient of absolute REM. As highlighted in Zang (2012) and Roychowdhury (2006), real earnings management impacts abnormal cash flows in different directions. Thus, to address this issue we also use the absolute value of abnormal discretionary expenses and abnormal cash flows from operations, to investigate whether there is evidence of real earnings management as stated in H1b.

3.4.2 Controls variables

Following Dechow et al. (2010) we consider several firm specific characteristics that relate to earnings management. First, in order to control for firm performance, we follow Trombetta and Imperatore (2014) and include a company's return on assets (*ROA*). Second, we follow Burgstahler et al. (2006) who use firm growth (*Growth*) to control for growth opportunities. Trombetta and Imperatore (2014) document that crisis tends to be correlated to sales growth. Thus, we computed firm growth as the percentage of yearly growth in sales.

[14] The SIC code industry category is obtained from Thomson Reuters.

Next, following previous studies (Cohen et al., 2008), we control for risk by using leverage (*Lev*) measured as the percentage of long-term liabilities to total assets. Following Watts and Zimmerman (1978) we also use firm size to account for political costs, as Byard et al. (2007) find that large firms manage earnings downwards in the immediate aftermath of disasters. We control for the possible impact of a size (*Size*) by including the natural logarithm of the firm's total assets in the model. Finally, we control for audit quality (*Big4*), captured by a dummy variable that equals 1 if the firm's auditor is one of the big 4 audit firms (i.e. PricewaterhouseCoopers, Deloitte Touche Tohmatsu, Ernst and Young, and KPMG) and zero otherwise. Alhadab et al. (2016) demonstrate that higher quality auditors are important in detecting and mitigating level of accruals earnings management and may lead firms to engage in a higher level of real-based earning management. All of these variables are based on information obtained from Bloomberg. All continuous non-log transformed variables are winsorized at 1%.

4 Results

4.1 Descriptive statistics and correlations

We begin with descriptive statistics for the two main time periods, 2001-2006 and 2008-2013 in the various earnings management metrics. Table 3.3 presents sample descriptive statistics for accruals earnings management (Panel A), real earnings management (Panel B), and other variables (Panel C). Abnormal cash flows from operations and abnormal discretionary expenses are multiplied by minus one to allow real and accruals earnings management proxies to have the same interpretation.

Table 3.3: Descriptive statistics

Panel A: Descriptive statistics for accruals earnings management

Description	Samples	mean	SD	median	min	max	P25	P75
Tsunami (Data in 2001-2006)								
Actual total accruals (ACCR)	4,006	-0.032	0.120	-0.037	-0.432	0.486	-0.086	0.014
Accruals earnings management								
AEM_Modified DD	4,006	0.000	0.131	0.006	-0.575	0.535	-0.050	0.060
AEM_Performance Match	4,006	-0.002	0.202	0.000	-0.977	0.927	-0.081	0.079
Absolute accruals earnings management								
AbsAEM _Modified DD	4,006	0.089	0.116	0.055	0.001	0.907	0.026	0.104
AbsAEM _Performance Match	4,006	0.131	0.187	0.079	0.001	1.496	0.035	0.153
Flooding (Data in 2008-2013)								
Actual total accruals (ACCR)	5,786	-0.021	0.119	-0.024	-0.432	0.486	-0.075	0.022
Accruals earnings management								
AEM _Modified DD	5,786	0.002	0.124	0.002	-0.550	0.579	-0.036	0.042
AEM _Performance Match	5,786	-0.002	0.228	0.000	-0.977	0.927	-0.083	0.081
Absolute accruals earnings management								
AbsAEM _Modified DD	5,786	0.093	0.136	0.054	0.001	0.907	0.024	0.102
AbsAEM _Performance Match	5,786	0.148	0.225	0.082	0.001	1.496	0.035	0.167

Panel B: Descriptive statistics for real earnings management

Description	Samples	mean	SD	median	min	max	P25	P75
Tsunami (Data in 2001-2006)								
Real earnings management								
REM_CFO	4,006	-0.041	0.153	0.036	-0.642	0.607	-0.025	0.107
REM_Disc	4,006	-0.071	0.160	0.043	-0.427	0.748	-0.007	0.121
Absolute real earnings management								
AbsREM_CFO	4,006	0.111	0.135	0.070	0.001	1.008	0.031	0.140
AbsREM _Disc	4,006	0.118	0.147	0.067	0.001	0.930	0.029	0.149
Flooding (Data in 2008-2013)								
Real earnings management								
REM_CFO	5,786	-0.033	0.166	0.030	-0.642	0.607	-0.038	0.107
REM_Disc	5,786	-0.087	0.165	0.053	-0.427	0.748	0.008	0.138
Absolute real earnings management								
AbsREM _CFO	5,786	0.121	0.153	0.077	0.001	1.008	0.033	0.150
AbsREM _Disc	5,786	0.127	0.161	0.070	0.001	0.930	0.031	0.156

Panel C: Descriptive statistics for other variables

Description	Samples	mean	SD	median	min	max	P25	P75
Tsunami (Data in 2001-2006)								
ROA	4,006	0.068	0.105	0.061	-0.279	0.505	0.014	0.113
Growth (%)	4,006	0.138	0.332	0.076	-0.786	1.794	-0.008	0.216
Lev (%)	4,006	12.602	16.197	6.223	0.000	76.459	0.043	19.499
Size	4,006	4.766	1.858	4.640	0.464	9.841	3.448	5.898
Big-4	4,006	0.371	0.483	0.000	0.000	1.000	0.000	1.000
Flooding (Data in 2008-2013)								
ROA	5,786	0.047	0.111	0.040	-0.406	0.474	0.005	0.091
Growth (%)	5,786	0.099	0.345	0.056	-0.786	1.794	-0.042	0.201
Lev (%)	5,786	9.639	13.065	4.231	0.000	76.459	0.024	14.850
Size	5,786	5.394	1.868	5.269	0.464	9.841	4.114	6.579
Big-4	5,786	0.373	0.484	0.000	0.000	1.000	0.000	1.000

This table shows sample descriptive statistics for AEM (Panel A), REM (Panel B), and other variables (Panel C). We use the first period (2001-2006), which is the period to test the effect of the tsunami in 2004 on earnings management, and the second period (2008-2013), which is the period to test the effects of the 2011 flooding on earnings management. The final sample is 4,006 and 5,786 frim-year observations over the period 2001-2006 and 2008-2013, respectively. To avoid the influence of outliers all continuous financial data are winsorized at 1% and 99%. All variables are otherwise calculated as described in appendix 3.1.

As can be seen in Table 3.3 Panel A, the mean accruals earnings management are close to zero (between -0.002 to 0.002). Interestingly, mean discretionary accruals in the modified Dechow and Dichev model *(Modified DD)* are positive (between 0.000 to 0.002), whereas, mean discretionary accruals in performance-matched Jones model *(Performance Match)* are approximately -0.002. In Panel B, for both tsunami and flooding samples, the mean real earnings management in all models **(***CFO* and *Disc**)*** is negative value between **-**0**.**033 to **-**0**.**087. This means that, at the descriptive level, firms appear to manage earnings both upward and downward by using discretionary accruals and changing real decision.

The other main variable of interest is the absolute value of discretionary accruals *(AbsAEM),* the absolute value of abnormal cash flow from operations and the absolute value of abnormal discretionary expense *(AbsREM)*. We use

the absolute value to study potential changes in the magnitude of earnings management. We find that the mean absolute of discretionary accruals and real earnings management in all models for the flooding sample have greater magnitude than for the tsunami sample. For example, the mean of absolute *Performance Match* and *CFO* for the flooding sample are 0.148 and 0.121, respectively, whereas, the mean of absolute *Performance Match* and *CFO* for the tsunami sample are 0.131 and 0.111, respectively.

Panel C presents descriptive statistics for our control variables. The tsunami sample firms have a ROA of 0.07, a 13.80% annual growth in sales, 12.60% of long-term liabilities to total assets, a size of 4.77, and a Big-4 of 0.37. The respective numbers for the flooding sample are 0.05, 9.90%, 9.64%, 5.39, and 0.37.

In Table 3.4, we present the estimates for earnings management by country over the period 2001-2006 and 2008-2013 to test the effects of the tsunami in 2004 and flooding in 2011 on earnings management, respectively. Columns (4-5) show the country-means for our AEM variables, while, columns (6-7) show the means for the REM variables.

Table 3.4: Estimates for earnings management by country

			AEM		REM	
Country	Freq	Percent	Modified DD	Performance Match	CFO	Disc
Tsunami (Data in 2001-2006)						
Indonesia (treated)	1,037	25.89%	-0.007	-0.005	-0.033	-0.077
Korea (control)	1,307	32.63%	0.002	0.000	-0.039	-0.068
Philippines (control)	347	8.66%	-0.037	0.011	-0.033	-0.112
Thailand (treated)	1,315	32.83%	0.014	-0.003	-0.051	-0.058
All Countries	4,006	100.00%	0.000	-0.002	-0.041	-0.071
Flooding (Data in 2008-2013)						
Indonesia (control)	1,597	27.60%	0.007	-0.005	-0.030	-0.092
Korea (control)	2,062	35.64%	-0.003	0.003	-0.020	-0.090
Philippines (control)	465	8.04%	0.001	-0.005	-0.055	-0.111
Thailand (treated)	1,662	28.72%	0.002	-0.006	-0.045	-0.073
All Countries	5,786	100.00%	0.002	-0.002	-0.033	-0.087

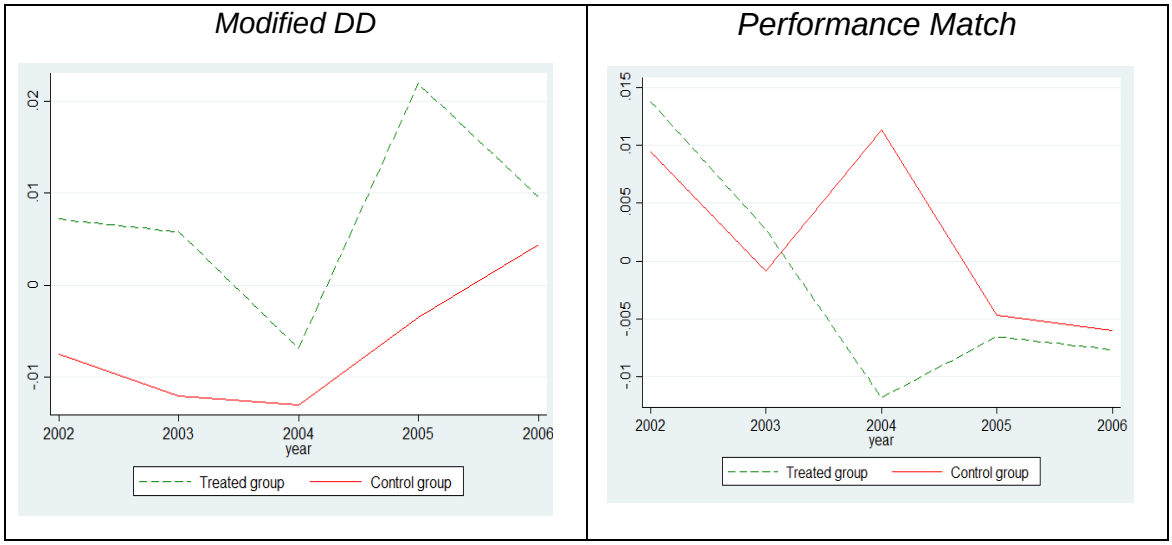
Table 3.4 reports the estimates for earnings management by using residuals from the annual cross-sectional industry regression of each model shown in Table 3.2. Industry-year with less than 10 observations are eliminated from the sample. *CFO* and *Disc* variables are multiplied by minus one to allow real and accruals earnings management proxies to have the same interpretation. Columns (4-5) show means of AEM, while, columns (6-7) show means of REM. We use the first period (2001-2006) and the second period (2008-2013), which are the period to test the effect of the tsunami in 2004 and the flooding in 2011 on earnings management, respectively. The final sample is 4,006 and 5,786 frim-year observations over the period 2001-2006 and 2008-2013, respectively.

Figure 3.1 reports in graphs, separately for the treated and control groups, the yearly evolution of our earnings management measures *(Modified DD, Performance Match, CFO* and *Disc)* from two years before until two years after the disasters occurred. Panel A provides time-series plots of AEM for firm-years in the treatment and control groups, whereas, panel B shows time-series plots of REM for firm-years in treatment group and control group.

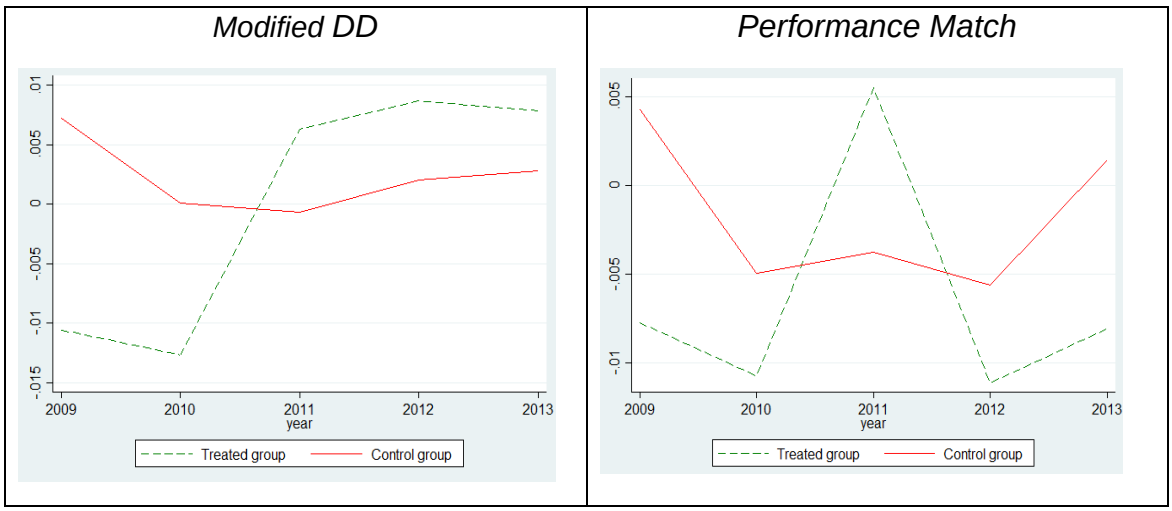
Figure 3.1: Comparing trends between treatment and control groups

Panel A: Accruals earnings management

Tsunami (Data in 2001-2006)

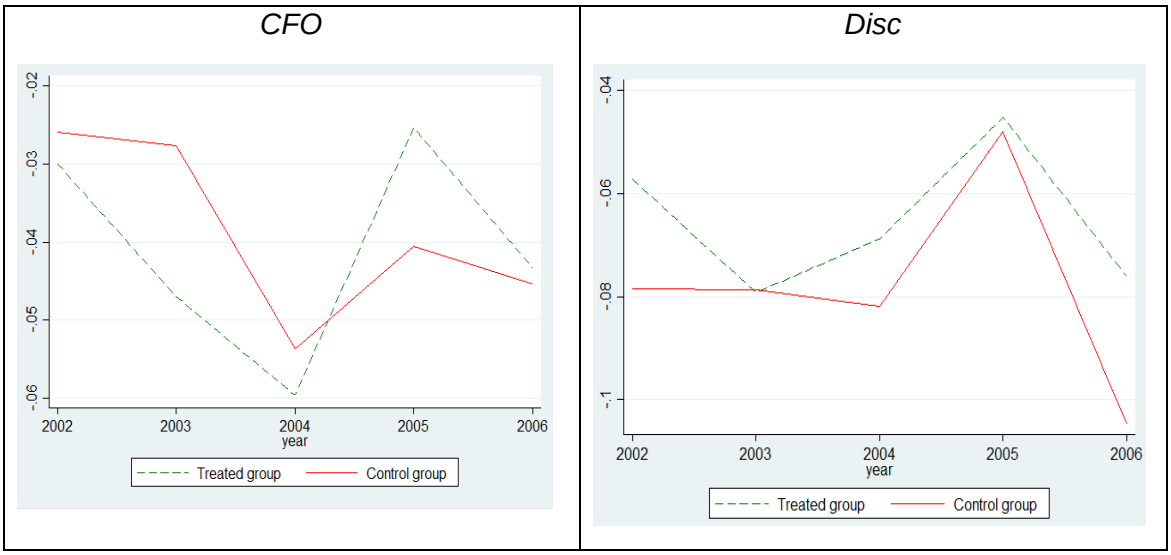


Flooding (Data in 2008-2013)



Panel B: Real earnings management

Tsunami (Data in 2001-2006)



Flooding (Data in 2008-2013)

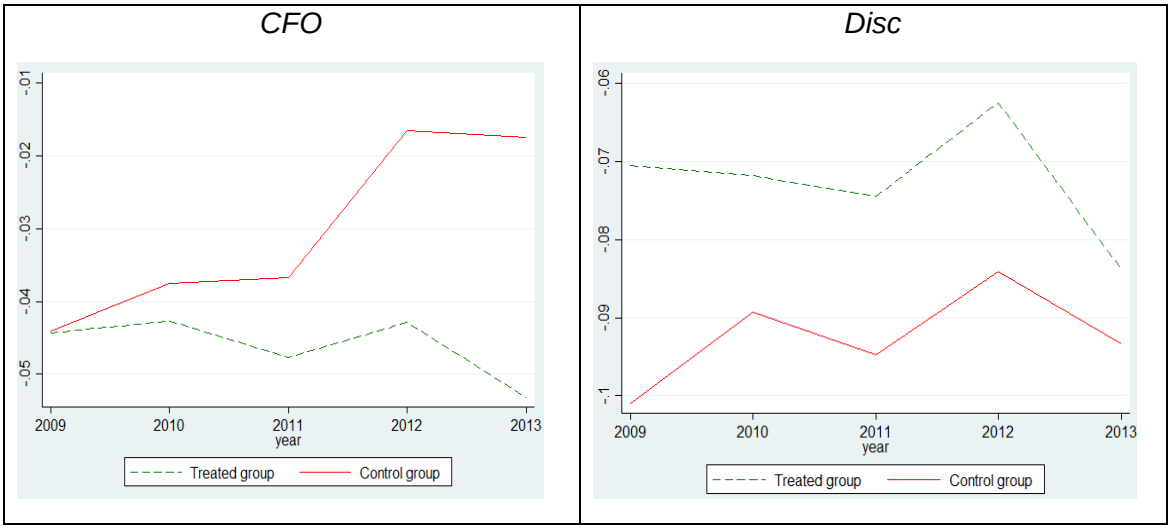


Figure 3.1 presents the graphs of yearly mean *Modified DD, Performance Match, CFO*, and *Disc* variables for the event years, two years before and two years after the disaster occurred for each group (*treated* and *controlled* groups) in Panel A and Panel B, respectively. $Year_0$ (i.e. the fiscal year during which each disaster occurred) is respectively 2004 for the tsunami and 2011 for the flooding.

The graphs above illustrate that all variables (except *Disc*) for the treatment group (green dot) after the tsunami occurred show a sharp decrease in 2004 *(y_0)* which is subsequently reversed. For the flooding sample, AEM in the treatment group (green dot) increase in 2011 *(y_0)*, while, REM only increase in the first year after flooding occurred *(+1y)* or in 2012.

Next, we compare the means between treatment group and control group before and after two disasters (tsunami and flooding) for both AEM (Panel A) and REM (Panel B), as shown in Table 3.5.

Table 3.5: Comparing differences between the two groups (treated and controlled) before and after the disasters

Panel A: Comparing differences of accruals earnings management

Group	Tsunami			Flooding		
	Before disaster	After disaster	Difference	Before disaster	After disaster	Difference
Modified DD						
Treated	0.000	0.008	0.008	-0.005	0.008	0.013**
Controlled	-0.009	-0.004	0.005	0.001	0.002	0.001
Difference	-0.009	**0.012****	**0.003*****	0.006	0.006	**0.012***
Performance Match						
Treated	0.001	-0.009	-0.010	-0.007	-0.005	0.002
Controlled	0.005	0.000	-0.005	0.001	-0.002	-0.003
Difference	-0.004	-0.009	**-0.005**	-0.008	-0.003	**0.005**

Panel B: Comparing differences of real earnings management

Group	Tsunami			Flooding		
	Before disaster	After disaster	Difference	Before disaster	After disaster	Difference
CFO						
Treated	-0.044	-0.043	0.001	-0.042	-0.048	-0.006
Controlled	-0.027	-0.046	-0.019***	-0.034	-0.023	0.011**
Difference	**-0.017*****	0.003	**0.020****	-0.008	**-0.025*****	**-0.017**
Disc						
Treated	-0.069	-0.063	0.006	-0.072	-0.074	-0.002
Controlled	-0.076	-0.078	-0.002	-0.096	-0.091	0.005
Difference	0.007	**0.015****	**0.008*****	**0.024*****	**0.017*****	**-0.007**

Table 3.5 presents comparing univariate differences between the two groups (*treated* and *controlled*) before and after two disasters (tsunami and flooding) by AEM (Panel A) and REM (Panel B).

The "Difference" in the last column is the mean of residual earnings management after disasters minus the corresponding mean before the disasters; whereas, "Difference" in the last row is the

mean of residual earnings management in treated group minus that of the control group. The main coefficient of interest is reported in bold. Differences are tested using t-tests. The differences shown in red colour are statistically significant at less than 10 percent level. All variables are otherwise calculated as described in appendix 3.1. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

There are three points to discuss. We start by looking at the difference (column-wise) between the mean of four variables *(Modified DD, Performance Match, CFO* and *Disc)* after and before disasters. In the flooding sample, we find that only the magnitude of *Modified DD* variable for the treatment group increases from **-**0.005 in the pre**-**flooding to 0**.**008 in the post**-**flooding and the increment of 0.013 is significant at the 5% level (t **=** 2.12). However, there is no evidence that the magnitude of all variables for the treatment group are statistically different from before and after the tsunami occurred. In the control group, we find statistically differences from before and after the tsunami and flooding occurred in only CFO variable which are -0.019 and 0.011 at 1% and 5% level (t = -3.19 and 2.21), respectively.

Second, we consider the difference (row-wise) between the mean of four variables *(Modified DD, Performance Match, CFO* and *Disc)* in the treatment group minus the control group. We find that after the tsunami occurred, the magnitude of *Modified DD* and *Disc* variables for the treatment group are significantly higher than for the control group which are 0.012 and 0.015 both at 5% level (t = 1.97 and 2.21). However, before the tsunami occurred, the magnitude of *CFO* variable in the treatment group are significantly lower than the control group which are -0.017 at 1% level (t = -2.62). In the flooding sample, the magnitude of *CFO* and *Disc* variables for the treatment group after flooding occurred is statistically different from the control group, whereas, before the flooding occurred, only the magnitude of *Disc* variable for the

treatment group are significantly higher than the control group which are 0.024 at 1% level (t = 3.64).

Third, the main coefficient of interest is the diff-in-diff between the two groups (*treatment* and *control*) and two periods (before and after the disasters), which is reported in bold. As presented in Table 3.5, the average coefficients of the treatment group for the tsunami sample is significantly higher than the control group in three out of four variables, the *Modified DD,* the *CFO* and the *Disc*, which are 0.003, 0.020, and 0.008, respectively. In the flooding sample, the diff-in-diff is only significant when we measure abnormal accruals based on the modified Dechow and Dichev model, 0.012 at 10% (t = 1.78). Despite our univariate results being somewhat weak, the analysis in Table 3.5 corroborates our earlier evidence and the predictions in H1a and H1b on the impact of the natural disasters on accruals and real based-earnings management.

The correlation among discretionary accruals variables (*Modified DD* and *Performance Match)*, abnormal real earnings management variables *(CFO* and *Disc*), and control variables during the disasters is reported in Table 3.6. This table presents Spearman correlation (above the diagonal) and Pearson correlation (below the diagonal) for the entire sample of 4,006 firm-years over the period 2001-2006 to test the effect of the tsunami in 2004 on earnings management (Panel A) and 5,786 firm-years over the period 2008-2013 to test the effect of the flooding in 2011 on earnings management (Panel B).

In both Panels, the correlation coefficients between the two discretionary accrual measures (*Modified DD* and *Performance Match*) are positive and statistically significant at 1 % confidence level. In the tsunami sample as shown in Panel A, both Spearman and Pearson correlation show a significant positive

correlation between *Performance Match* and *CFO* variables. This high positive correlation can be explained by firms engaging in accruals and real earnings management at the same time. This is consistent with prior researches (i.e. Burgstahler and Eames, 2006; Cohen and Zarowin, 2010; Alissa et al., 2013; and Lin and Shen, 2015) showing that managers can manipulate earnings to achieve the target by using both REM and AEM, because REM occurs during the fiscal year, while AEM occurs after the end of the accounting period but within the confines of a generally accepted accounting system. Hence, if managers decide to manipulate real operations, in which the amount being managed fell short of the desired threshold, there would be sufficient time to engage in accruals earnings management to meet or beat the target. Moreover, consistent with past research (Cohen et al., 2008; and Zang, 2012), the correlation coefficient between *CFO* and *Disc* variables as reported in both Spearman and Pearson correlation are negative and statistically significant, suggesting that firms are likely to substitute.

In addition, we find that accruals and real earnings management are significantly and positively associated with profitability, and growth, whereas, they are negative associated with leverage. Furthermore, as reported in both Spearman and Pearson correlation, we also find a negative association between accruals earnings management *(Performance Match)* and audit quality (*Big-4*), while, we also find a positive association between real earnings management *(CFO)* and audit quality (*Big-4*). This is consistent with the evidence in Alhadab et al. (2016) that high quality auditors are important in detecting and mitigating level of accruals based earnings management but may lead firms to manage in a higher level of real earning management.

In general, correlations in Panel B are consistent with correlations in Panel A and prior researches. In the flooding sample, both Spearman and Pearson correlation show a significant positive correlation at less than 5% level between *CFO* variable and two discretionary accruals variables (*Modified DD* and *Performance Match*). Moreover, the correlation coefficient between *Modified DD* and *Performance Match* variables is positive and statistically significant at 1% level. On the other hand, the correlation coefficients between (1) *Modified DD* and *Disc* variables, and between (2) two REM variables (*CFO* and *Disc*) are negative and statistically significant. Further, we find that accruals and real earnings management are both significantly and positively associated with profitability and growth, whereas, they are negatively associated with leverage. Finally, we do not find an association between discretionary accruals variables *(Modified DD* and *Performance Match)* and audit quality (*Big-4*), but, find a positive association at 1% confidence level between *CFO* and audit quality (*Big-4*) for Spearman correlation. These findings support that firms with higher quality auditors may prefer real earnings management activity to avoid detection.

Table 3.6: Pearson and spearman correlation

Panel A: Tsunami (Data in 2001-2006)

Spearman correlation / Pearson correlation	Modified DD	Performance Match	CFO	Disc	ROA	Growth	Lev	Size	Big-4
Modified DD		0.190***	-0.007	-0.017	0.221***	0.054***	-0.073***	0.004	0.024
		(0.000)	(0.652)	(0.272)	(0.000)	(0.001)	(0.000)	(0.781)	(0.126)
Performance Match	0.180***		0.251***	0.018	0.000	-0.039**	0.016	0.002	-0.032**
	(0.000)		(0.000)	(0.259)	(0.986)	(0.014)	(0.301)	(0.895)	(0.042)
CFO	0.006	0.272***		-0.104***	0.366***	0.059***	-0.072***	0.072***	0.130***
	(0.698)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Disc	-0.017	-0.016	-0.065***		0.101***	0.151***	-0.039**	-0.044***	0.020
	(0.276)	(0.314)	(0.000)		(0.000)	(0.000)	(0.014)	(0.005)	(0.196)
ROA	0.227***	-0.002	0.331***	0.068***		0.423***	-0.043***	0.132***	0.144***
	(0.000)	(0.906)	(0.000)	(0.000)		(0.000)	(0.006)	(0.000)	(0.000)
Growth	0.024	-0.035**	-0.030*	0.146***	0.386***		-0.002	0.065***	0.027*
	(0.134)	(0.028)	(0.056)	(0.000)	(0.000)		(0.912)	(0.000)	(0.091)
Lev	-0.079***	0.040**	-0.052***	-0.025	-0.086***	-0.060***		0.369***	0.018
	(0.000)	(0.012)	(0.001)	(0.116)	(0.000)	(0.000)		(0.000)	(0.263)
Size	0.010	0.015	0.056***	-0.056***	0.132***	-0.012	0.221***		0.233***
	(0.528)	(0.333)	(0.000)	(0.000)	(0.000)	(0.452)	(0.000)		(0.000)
Big-4	0.019	-0.027*	0.092***	0.012	0.121***	0.073***	-0.017	0.234***	
	(0.229)	(0.089)	(0.000)	(0.431)	(0.000)	(0.000)	(0.272)	(0.000)	

Panel B: Flooding (Data in 2008-2013)

Pearson correlation / Spearman correlation	Modified DD	Performance Match	CFO	Disc	ROA	Growth	Lev	Size	Big-4
Modified DD		0.228***	0.029**	-0.039***	0.189***	0.011	-0.011	0.035***	0.007
		(0.000)	(0.028)	(0.003)	(0.000)	(0.423)	(0.419)	(0.007)	(0.610)
Performance Match	0.230***		0.235***	0.001	0.007	0.010	0.018	0.008	-0.010
	(0.000)		(0.000)	(0.973)	(0.612)	(0.462)	(0.164)	(0.538)	(0.463)
CFO	0.048***	0.215***		-0.115***	0.312***	0.017	-0.065***	0.001	0.083***
	(0.000)	(0.000)		(0.000)	(0.000)	(0.206)	(0.000)	(0.946)	(0.000)
Disc	-0.052***	-0.020	-0.087***		0.146***	0.146***	-0.010	0.026*	0.036***
	(0.000)	(0.130)	(0.000)		(0.000)	(0.000)	(0.461)	(0.050)	(0.006)
ROA	0.177***	0.022	0.272***	0.153***		0.426***	-0.025*	0.107***	0.123***
	(0.000)	(0.102)	(0.000)	(0.000)		(0.000)	(0.061)	(0.000)	(0.000)
Growth	0.033**	0.024*	-0.033**	0.162***	0.390***		0.022*	0.039***	0.039***
	(0.013)	(0.072)	(0.011)	(0.000)	(0.000)		(0.090)	(0.003)	(0.003)
LEV	-0.024*	0.013	-0.013	0.017	-0.067***	-0.031**			0.036***
	(0.066)	(0.337)	(0.311)	(0.200)	(0.000)	(0.020)			(0.007)
Size	0.026*	0.000	0.015	0.045***	0.123***	0.020	0.320***		
	(0.051)	(0.999)	(0.248)	(0.001)	(0.000)	(0.139)	(0.000)		
Big-4	-0.002	-0.012	0.063***	0.015	0.126***	0.025*	0.015	0.270***	
	(0.892)	(0.361)	(0.000)	(0.263)	(0.000)	(0.055)	(0.249)	(0.000)	

This table presents Spearman correlation (above the diagonal) and Pearson correlation (below the diagonal) for the entire sample of 4,006 firm-years over the period 2001-2006 and 5,786 firm-years over the period 2008-2013 to test the effect of the tsunami in 2004 on earnings management (Panel A) and flooding in 2011 on earnings management (Panel B), respectively. Variables used in our primary analyses are reports. The correlations of *CFO* and *Disc* variables are multiplied by minus one to allow real and accruals earnings management proxies to have the same interpretation. Standard errors are reported in parentheses. All variables are otherwise calculated as described in appendix 3.1. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

4.2 Multivariate analyses

Table 3.7 presents the estimation results for equation (1). Our first hypotheses (H1a and H1b) is tested looking at the b_3 coefficient, which captures the impact of the natural disasters on accruals and real based-earnings management, and base on our first hypotheses it should be statistically significant.

Table 3.7: Natural disaster as determinants of accruals and real earnings management

$$EM_{i,t} = f_{i,t}\,(b_0 + b_1 treated + b_2 disaster + b_3 treated*disaster + b_4 control\ variables + e) \quad (1)$$

Panel A: Continuous earnings management variable

	Tsunami				**Flooding**			
	AEM		**REM**		**AEM**		**REM**	
	Modified DD	**Performance Match**	**CFO**	**Disc**	**Modified DD**	**Performance Match**	**CFO**	**Disc**
treated	**-0.020*** **	-0.017	-0.008	**0.032*** **	-0.005	-0.008	**-0.014** **	**0.022*** **
	(0.006)	(0.011)	(0.008)	**(0.008)**	(0.006)	(0.010)	**(0.007)**	**(0.007)**
disaster	0.012	0.013	0.003	**0.033*** **	0.000	-0.015	0.009	**0.015** **
	(0.008)	(0.014)	(0.010)	**(0.010)**	(0.006)	(0.012)	(0.008)	**(0.008)**
treated* disaster	**0.015** **	-0.003	**0.017***	0.006	**0.012***	0.007	-0.008	-0.003
	(0.007)	(0.013)	**(0.009)**	(0.009)	**(0.007)**	(0.013)	(0.009)	(0.009)
ROA	**0.598*** **	**0.154*** **	**-0.376*** **	-0.013	**0.330*** **	**-0.102*** **	**-0.544*** **	**-0.106*** **
	(0.017)	**(0.031)**	**(0.022)**	(0.022)	**(0.017)**	**(0.031)**	**(0.021)**	**(0.021)**
Growth	**-0.062*** **	**-0.058*** **	**0.062*** **	**-0.061*** **	**-0.036*** **	**-0.018***	**0.087*** **	**-0.066*** **
	(0.006)	**(0.011)**	**(0.007)**	**(0.008)**	**(0.006)**	**(0.010)**	**(0.007)**	**(0.007)**
Lev	0.000	**-0.000** **	**-0.001*** **	**-0.000** **	-0.000	-0.000	-0.000	-0.000
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	(0.000)	(0.000)	(0.000)	(0.000)
Size	**-0.004*** **	**-0.005** **	-0.002	**-0.004** **	-0.001	**-0.003***	0.000	**-0.003** **
	(0.001)	**(0.002)**	(0.002)	**(0.002)**	(0.001)	**(0.002)**	(0.001)	**(0.001)**
Big-4	-0.001	-0.008	**-0.014*** **	-0.005	0.000	**-0.012***	**-0.009** **	0.004
	(0.004)	(0.007)	**(0.005)**	(0.005)	(0.004)	**(0.007)**	**(0.004)**	(0.004)
Constant	0.002	0.019	**-0.023** **	**-0.104*** **	0.010	0.003	0.006	**-0.066*** **
	(0.008)	(0.015)	**(0.011)**	**(0.011)**	(0.007)	(0.013)	(0.009)	**(0.009)**
Fixed effects	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y
Adjust R^2	0.256	0.014	0.092	0.033	0.065	0.005	0.120	0.040
n. of observ.	4,006	4,006	4,006	4,006	5,786	5,786	5,786	5,786

Panel B: Absolute earnings management

	Tsunami				Flooding			
	AbsAEM		AbsREM		AbsAEM		AbsREM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treated	-0.003	0.000	0.008	**-0.027*** **	0.002	**-0.023** **	0.002	**-0.032*** **
	(0.006)	(0.009)	(0.005)	**(0.006)**	(0.006)	**(0.009)**	(0.005)	**(0.006)**
disaster	**-0.041*** **	**-0.026** **	-0.002	**0.023*** **	-0.002	0.008	**-0.011** **	-0.004
	(0.008)	**(0.012)**	(0.007)	**(0.008)**	(0.006)	(0.011)	**(0.006)**	(0.006)
treated* disaster	-0.003	-0.013	-0.003	**-0.016** **	-0.002	**0.025** **	**0.013** **	**0.014** **
	(0.007)	(0.011)	(0.007)	**(0.008)**	(0.007)	**(0.012)**	**(0.006)**	**(0.007)**
ROA	**-0.106*** **	**-0.060** *	**0.246*** **	0.032	-0.026	-0.004	**0.256*** **	**0.090*** **
	(0.019)	**(0.031)**	**(0.018)**	(0.020)	(0.017)	(0.029)	**(0.015)**	**(0.017)**
Growth	**0.053*** **	**0.062*** **	**0.049*** **	**0.059*** **	**0.058*** **	**0.109*** **	**0.049*** **	**0.059*** **
	(0.006)	**(0.010)**	**(0.006)**	**(0.006)**	**(0.006)**	**(0.010)**	**(0.005)**	**(0.006)**
Lev	**0.000*** **	0.000	**-0.000*** **	0.000	**0.000*** **	0.000	0.000	-0.000
	(0.000)	(0.000)	**(0.000)**	(0.000)	**(0.000)**	(0.000)	(0.000)	(0.000)
Size	**-0.012*** **	**-0.017*** **	**-0.012*** **	**-0.012*** **	**-0.010*** **	**-0.018*** **	**-0.014*** **	**-0.007*** **
	(0.001)	**(0.002)**	**(0.001)**	**(0.001)**	**(0.001)**	**(0.002)**	**(0.001)**	**(0.001)**
Big-4	-0.003	-0.004	0.004	**0.008** **	**-0.006** *	-0.004	0.002	0.001
	(0.004)	(0.006)	(0.004)	**(0.004)**	**(0.004)**	(0.006)	(0.003)	(0.004)
Constant	**0.167*** **	**0.228*** **	**0.141*** **	**0.172*** **	**0.148*** **	**0.235*** **	**0.172*** **	**0.166*** **
	(0.008)	**(0.014)**	**(0.008)**	**(0.009)**	**(0.007)**	**(0.012)**	**(0.006)**	**(0.007)**
Fixed effects	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y
Adjust R^2	0.074	0.039	0.144	0.057	0.041	0.047	0.140	0.049
n. of observ.	4,006	4,006	4,006	4,006	5,786	5,786	5,786	5,786

Table 3.7 presents the result from an OLS regressions with accruals and real earnings management proxies as equation (1) and (in parentheses) robust standard errors. The final sample includes 4,006 and 5,786 firm-year observations over the period 2001-2006 and 2008-2013 to test the effect of the tsunami and flooding, respectively. In Panel A, the dependent variable is the regression residual from EM models (*Modified DD*, *Performance Match, CFO* and *Disc* variables), while in Panel B, the dependent variable is the regression of absolute of the residual from EM models. Both panels have the main independent variable of interest, which is (*treated*disaster*).

Columns (1-2) and (5-6) report the results from regressions of AEM proxies on tsunami and flooding, respectively; while, columns (3-4) and (7-8) report the results from regressions of REM proxies on tsunami and flooding, respectively. The coefficients shown in bold are statistically significant at less than 10 percent level. The table also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 3.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

In Panel A, the dependent variable is the regression residual from accruals earnings management models (*Modified DD* and *Performance Match* variables) and real earnings management models (*CFO* and *Disc* variables).

In the tsunami sample, the coefficient b_3 *(treated*disaster)* is positive (0.015) and highly significant ($p < 0.05$) when accruals are measured based on the modified Dechow and Dichev model as shown in column (1). Further, the coefficient b_3 *(treated*disaster)* is positive (0.017) and highly significant ($p < 0.10$) where *CFO* variable is the dependent variable as reported in column (3). In the flooding sample, we find a positive coefficient of 0.012 ($p < 0.10$) on b_3 *(treated*disaster)* in the discretionary accruals regression in modified Dechow and Dichev model as shown in column (5), while, the coefficient b_3 *(treated*disaster)* in REM models (*CFO* and *Disc* variables) is not significant. Therefore, the increase in accruals and real earnings management after the disasters suggest that treated firms tend to manage earnings upwards after the disaster than the control firms, in order to transmit a positive signal or avoid the loss of investors' confidence in the survival of the firms. This is consistent with the market incentives hypothesis of earnings management.

In addition, Panel A shows that the coefficient b_2 (*disaster*) is significantly positive only for the *Disc* variable for firms in the tsunami and flooding samples. This means that firms exhibit evidence of real earnings management after a natural disaster. The coefficient b_1 (*treated*) is significant when discretionary accruals (*Modified DD*) and abnormal real earning management *(Disc)* are measured for tsunami samples and when real earning management *(CFO* and *Disc)* are measured for flooding samples. This suggests that treated firms exhibit evidence of earnings management.

Further, we find that the coefficient *(Size)* is negative and significant when discretionary accruals and abnormal real earning management are measured for the tsunami and flooding samples. For example, we find negative and significant correlations for discretionary accruals variable (*Performance Match*) and REM variable (*Disc*) for the flooding sample as shown in columns (6 and 8) on Panel A in Table 3.7. This means that large firms are less likely to be motivated to manipulate earnings than small firms because of the need to disclose more information according to regulations of stock market (Kousenidis et al., 2013). However, we find that the coefficient *(Lev)* for the tsunami sample is negative and significant for both discretionary accruals variable (*Performance Match*) and REM variables *(CFO* and *Disc*). This implies that earnings management is lower for firms that have higher leverage. In contrast, there is no evidence that the coefficient *(Lev)* for the flooding sample is significantly associated with the level of accruals and real earnings management.

Interestingly, we find that the coefficient audit quality *(Big-4)* and earnings management measured for tsunami and flooding samples are negative and highly significant as shown in columns (3, 6, and 7) for Panel A in Table 3.7. This suggests that firms that use big 4 auditors tend to manage earnings downwards after the disaster.

Next, we run a sensitivity analysis considering the absolute value of earnings management as our dependent variable. Results are reported in Table 3.7 Panel B. As mentioned above, our first hypotheses do not predict any specific direction for EM. Therefore, we use the absolute value, which is the alternative dependent variable, to measure the magnitude of earnings management (rather than the signed). This panel, the main independent variable of interest is the

same as in Panel A, the coefficient b_3 *(treated*disaster)*, which we use to assess the effects of each disaster on the level of earnings management.

Consistent with the preliminary analysis as reported in Panel A, we find a positive trend in the level of accruals and real earnings management for flooding sample. For example, the coefficient b_3 *(treated*disaster)* in the discretionary accruals and REM regression (*Performance Match*, *CFO,* and *Disc* variables) are positive (0.025, 0.013, and 0.014, respectively) and highly significant ($p < 0.05$, $p < 0.05$, and $p < 0.05$, respectively) as shown in columns (6-8) in Panel B in Table 3.7. This indicates that the level of accruals and real earnings management increased over the flooding sample.

On the other hand, we find a negative trend on b_3 *(treated*disaster)* in the level of real earnings management *(Disc* variable*)* for tsunami sample (-0.016, $p < 0.05$). This suggests that the level of real earnings management decreased over the tsunami sample. From the analysis of the results in Panel B taking into account the results in Panel A, we find that firms engagement in real earnings management decreased over the tsunami sample, while firms engagement in accruals and real earnings management increased over the flooding sample. Consistent with our conjecture, the occurrence of natural disaster is associated with the level of earnings management [15].

Moreover, we find that in Panel B of Table 3.7, the coefficient b_1 (*treated*) is significantly negative for *Disc* variable for firms in the tsunami sample and for *Performance Match* and *Disc* variables for firms in the flooding sample. This

[15] We also run an additional analysis by deleting the year of the disaster from the sample. Thus, the disaster variable takes the value of 1 in 2005-2006 for the tsunami tests, while, disaster takes the value of 1 in 2012-2013 for the flooding tests. The additional results (not tabulated) remain qualitatively similar to those reported in the main result in Table 3.7. We also include market-to-book ratio as a control variable and the results again (not tabulated) remain unchanged.

suggests that treated firms exhibit evidence of earnings management. The coefficient b_2 (*disaster*) is significant when discretionary accruals (*Modified DD* and *Performance Match*) and abnormal real earning management *(Disc)* are measured for tsunami samples and when abnormal real earning management *(CFO)* is measured for flooding samples. This means that firms exhibit evidence of earnings management after a natural disaster.

Further, we find that the coefficient *(Growth)* is positive and significant in all regressions for the tsunami and flooding samples as shown in Panel B. It can be inferred that earnings management is higher for firms that have higher growth opportunities. The coefficient *(Size)* is negative and significant correlations for all earnings management variables as shown in Panel B of Table 3.7. This means that large firms are less likely to be motivated to manipulate earnings than small firms because of the need to disclose more information according to regulation of stock market (Kousenidis et al., 2013).

Interestingly, we note that the coefficient audit quality *(Big-4)* and real earnings management measured for tsunami sample is positive and highly significant as shown in column (4), however, the coefficient audit quality *(Big-4)* and accruals earnings management measured for flooding sample is negative and highly significant as shown in column (5). This is consistent with the document by Alhadab et al. (2016) that high quality auditors are important in detecting and mitigating the level of accrual-based earnings management but may lead firms to engage in more real earning management.

We test the second hypothesis by running two separate regressions, one each for tsunami and flooding setting as equation (1) and shown before in Table 3.7

(Panel B). We then test whether the interaction *(treated*disaster)* coefficients across the two regressions are statistically different from each other.

Table 3.8 compares the coefficients on *(treated*disaster)* in flooding and tsunami group across to regression in equation (1). The difference is the coefficient on *(treated*disaster)* in flooding group minus coefficient on *(treated*disaster)* in tsunami group. The evidence in Table 3.8 shows that the level of earnings management is conditional on the severity of the disaster if coefficient of interest in flooding group shows greater statistically magnitude than the coefficient of interest in tsunami group.

We find that the coefficient of interest in the flooding setting is statistically different from tsunami group as shown in red colour in Table 3.8. These results support the conjecture because firms in the flooding group present greater magnitude of the coefficients in the models for the absolute EM than firms in the tsunami group. We can imply that the more intense the disaster, the higher the level of earnings management. This is consistent with the H2 that the level of earnings management is conditional on the severity of the disaster[16].

[16] In addition, we consider how different industries have been affected by the disaster. We separate the overall sample in two groups (high impact vs low impact industries). The high impact industries group includes manufacturing and service industries, while the low impact industries group includes the rest of industries. We use the absolute value of the residuals regressions as earnings management proxy to test H2. Consistent with the analysis reported in Table 3.8, our additional results (not tabulated) suggest that the increase in the level of earnings management is higher for the high impact industries group, as they were more seriously affected by the disaster. We find no evidence that the intensity of the disaster has affected the level of earnings management for the low impact group.

Table 3.8: Comparing the coefficient across the two samples

	AbsAEM		AbsREM	
	Modified DD	Performance Match	CFO	Disc
*treated*disaster* in flooding group	-0.002	**0.025****	**0.013****	**0.014****
*treated*disaster* in tsunami group	-0.003	-0.013	-0.003	**-0.016****
Difference	0.001	**0.038***	**0.016****	**0.030*****
P-value	0.561	0.069	0.025	0.003

Table 3.8 compares the coefficients on *(treated*disaster)* from regression (1) below of the flooding and tsunami group.

$$EM_{i,t} = f_{i,t}(b_0 + b_1 treated + b_2 disaster + b_3 treated*disaster + b_4 control\ variables + e) \quad (1)$$

Four different measures of earnings management are used for the comparison, the *Modified DD,* the *Performance Match,* the *CFO*, and the *Disc* variable as shown in Panel B in Table 3.7. Differences are tested using t-tests. The coefficients shown in bold are statistically significant at less than 10 percent level. All variables are otherwise calculated as described in appendix 3.1. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

Overall these results provide support for our set of hypotheses that firms exhibit evidence of accruals and real earnings management after natural disasters; and further, that they manage earnings more as the severity of the disaster increases.

4.3 Additional tests and analysis

4.3.1 Additional test for the trend in earnings management

We test our first set of hypotheses considering the trend in earnings management in each year following the disaster to examine how fast firms engage in earnings management. We create year dummies for the period after disaster to examine the time-series profiles of signed accruals and real earnings management.

$$EM_{i,t} = f_{i,t}(b_0 + b_1 treated + b_2 disastery_0 + b_3 disastery_1 + b_4 disastery_2 + b_5 treated*disastery_0 + b_6 treated*disastery_1 + b_7 treated*disastery_2 + b_8 control\ variables + e) \quad (2)$$

We base our conclusion about H1a and H1b on the statistical significance of coefficients of *treated*disastery*$_0$, *treated*disastery*$_1$, and *treated*disastery*$_2$, which are b_5, b_6 and b_7 in equation (2). The *disastery*$_0$ is a dummy variable taking the value of 1 for the fiscal year during which the disaster occurred (2004 for the tsunami sample and 2011 for the flooding sample), and zero otherwise. The *disastery*$_1$ takes the value of 1 for the first year after the disaster (2005 for the tsunami sample and 2012 for the flooding sample), and *disastery*$_2$ takes the value of one for the second year after the disaster (2006 for the tsunami sample and 2013 for the flooding sample). The *treated* is as previously defined.

Table 3.9 reports the OLS coefficient estimated using equation (2). The dependent variables are the regression residuals from accruals and real earnings management models (*Modified DD, Performance Match, CFO,* and *Disc* variables), while the main independent variables of interest are the coefficient b_5, b_6 and b_7 *(treated*disastery*$_0$, *treated*disastery*$_1$, and *treated*disastery*$_2$*)* in equation (2) which are used to assess the effects of disasters on earnings management in each year following the disasters.

Table 3.9: The trend in earnings management in each year following the disaster

$$EM_{i,t} = f_{i,t}(b_0 + b_1 treated + b_2 disastery_0 + b_3 disastery_1 + b_4 disastery_2 + b_5 treated*disastery_0 + b_6 treated*disastery_1 + b_7 treated*disastery_2 + b_8 control\ variables + e) \quad (2)$$

Continuous earnings management variable

	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treated	**-0.020*** **	-0.017	-0.008	**0.032*** **	-0.005	-0.008	**-0.014** **	**0.022*** **
	(0.006)	(0.011)	(0.008)	**(0.008)**	(0.006)	(0.010)	**(0.007)**	**(0.007)**
$disastery_0$	-0.004	**0.027***	**-0.019***	0.007	0.003	-0.008	**-0.015***	0.012
	(0.009)	**(0.016)**	**(0.011)**	(0.012)	(0.007)	(0.012)	**(0.008)**	(0.008)
$disastery_1$	0.006	0.010	-0.005	**0.043*** **	-0.003	-0.014	0.01	**0.014***
	(0.009)	(0.016)	(0.011)	**(0.012)**	(0.007)	(0.012)	(0.008)	**(0.008)**
$disastery_2$	0.013	0.010	-0.009	-0.014	-0.003	-0.009	0.006	0.003
	(0.009)	(0.016)	(0.011)	(0.011)	(0.007)	(0.012)	(0.008)	(0.008)
$treated*disastery_0$	0.006	-0.017	0.007	0.010	0.009	0.019	0.006	0.000
	(0.010)	(0.018)	(0.013)	(0.013)	(0.010)	(0.019)	(0.012)	(0.013)
$treated*disastery_1$	**0.026*** **	0.000	**0.031** **	-0.011	**0.024** **	0.004	-0.011	0.003
	(0.010)	(0.018)	**(0.013)**	(0.013)	**(0.010)**	(0.018)	(0.012)	(0.012)
$treated*disastery_2$	0.012	0.006	0.014	0.018	0.004	-0.000	-0.017	-0.010
	(0.010)	(0.018)	(0.013)	(0.013)	(0.010)	(0.018)	(0.012)	(0.012)
ROA	**0.598*** **	**0.155*** **	**-0.376*** **	-0.012	**0.330*** **	**-0.102*** **	**-0.544*** **	**-0.106*** **
	(0.017)	**(0.031)**	**(0.022)**	(0.022)	**(0.017)**	**(0.031)**	**(0.021)**	**(0.021)**
Growth	**-0.062*** **	**-0.058*** **	**0.063*** **	**-0.061*** **	**-0.037*** **	**-0.018***	**-0.087*** **	**0.066*** **
	(0.006)	**(0.011)**	**(0.008)**	**(0.008)**	**(0.006)**	**(0.010)**	**(0.007)**	**(0.007)**
Lev	0.000	**0.000** **	**0.001*** **	**-0.000** **	-0.000	-0.000	0.000	0.000
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	(0.000)	(0.000)	(0.000)	(0.000)
Size	**-0.004*** **	**-0.005** **	-0.002	**0.004** **	-0.001	**0.003***	0.000	**-0.003** **
	(0.001)	**(0.002)**	(0.002)	**(0.002)**	(0.001)	**(0.002)**	(0.001)	**(0.001)**
Big-4	-0.001	-0.008	**-0.014*** **	-0.005	-0.000	**-0.012***	**0.009** **	-0.004
	(0.004)	(0.007)	**(0.005)**	(0.005)	(0.004)	**(0.007)**	**(0.004)**	(0.004)
Constant	0.002	0.019	**-0.023** **	**-0.104*** **	0.010	0.003	-0.009	**-0.068*** **
	(0.008)	(0.015)	**(0.011)**	**(0.011)**	(0.007)	(0.013)	(0.009)	**(0.009)**
Fixed effects	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y	I, Y
Adjust R^2	0.256	0.014	0.092	0.034	0.065	0.005	0.099	0.037
n. of observ.	4,006	4,006	4,006	4,006	5,786	5,786	5,786	5,786

Table 3.9 shows the trend in AEM and REM in each year following the disasters. The table reports OLS coefficient estimates as equation (2) and (in parentheses) robust standard errors. The dependent variable is the regression residuals from four different measures of earnings management (*Modified DD, Performance Match, CFO* and *Disc* variables). This table has the main independent variable of interest is *(treated*disastery$_0$, treated*disastery$_1$,* and *treated*disastery$_2$)* which are used to assess the effects of disasters on earnings management in each year following the disasters. The coefficients shown in bold are statistically significant at less than 10 percent level. The table also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 3.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

Overall, the evidence suggests that firms start to manage earnings by using both accruals and real-based earnings management in the first year after tsunami occurred; similarly, firms start to engage in only accruals earnings management in the first year after flooding occurred *(+1y)*. Specifically, in the tsunami sample, we find positive coefficients for our dummy variable *(treated*disastery$_1$)* of 0.026 ($p < 0.01$) and 0.031 ($p < 0.05$) when the dependent variable is *Modified DD* and *CFO* variables, respectively. Similarly, we find positive coefficients for *(treated*disastery$_1$)* in flooding sample of 0.024 ($p < 0.05$) when the dependent variable is discretionary accruals in modified Dechow and Dichev model (*Modified DD* variable). In contrast, there is no evidence that firms engage in both accruals and real earnings management in the period when the natural disasters hit *(y_0)* (tsunami and flooding occurred in 2004 and 2011, respectively) and in the second year after tsunami and flooding occurred *(+2y)*.

Next, we find that the coefficient b_1 (*treated*) is statistically significant when discretionary accruals (*Modified DD*) and abnormal real earning management *(Disc)* are measured for tsunami samples and when abnormal real earning management *(CFO* and *Disc)* are measured for flooding samples. This suggests that treated firms exhibit evidence of earnings management. The coefficient b_2 (*disastery$_0$*) is significant when discretionary accruals (*Performance Match*) and abnormal real earning management *(CFO)* are measured for tsunami samples and when abnormal real earning management *(CFO)* is measured for flooding samples. This means that firms exhibit evidence of earnings management in the period when the natural disasters hit *(y_0)* (tsunami and flooding occurred in 2004 and 2011, respectively). The coefficient

b_3 (*disastery$_1$*) is significantly positive for *Disc* variable for firms in the tsunami and flooding samples as shown in columns (4 and 8) in Table 3.9. This implies that firms are likely to manage earnings by using real earnings management in the first year after the disaster occurred (*+1y*). However, we find that the coefficient b_4 (*disastery$_2$*) is non-significant. This suggests that there is no significant effect of earnings management in the second year after the disaster occurred (*+2y*).

4.3.2 Additional analysis: high and low leverage firms

We separate the sample into two groups (high vs. low leverage) and run two separate regressions, to test whether the firms with higher leverage are more likely to use EM to re-assure investors and analysts about the firm's survival prospects. Firms in the high leverage group are identified when the leverage is higher than or equal to the industry average for a given year; whereas, firms in the low leverage group have leverage ratios lower than that of the industry average for a given year.

Table 3.10 presents the estimation results for equation (1) when separating the high and low leverage groups. Our first hypotheses (H1a and H1b) is tested by looking at the b_3 coefficients in each regression, which capture the impact of the natural disasters on high and low leverage.

The dependent variable is the regression residual from accruals earnings management models (*Modified DD* and *Performance Match* variables) and real earnings management models (*CFO* and *Disc* variables).

In the high leverage group over the tsunami period, the coefficient b_3 *(treated*disaster)* is positive (0.017 and 0.085) and highly significant ($p<0.10$ and $p<0.05$) when earnings management is measured as *Modified DD*, and

Disc. For the high leverage group over the flooding period, we find a positive coefficient of 0.025 at less than 10% level *(treated*disaster)* in the *CFO* regression, as shown in column (7). However, there is apparently no significant effect on AEM for the high leverage group during the flooding period.

Table 3.10: Additional test for high and low leverage groups

$EM_{i,t} = f_{i,t}(b_0 + b_1 treated + b_2 disaster + b_3 treated*disaster + b_4 control\ variables + e)$ (1)

Continuous earnings management variable

	High leverage group							
	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treated	**-0.027*** **	0.008	-0.002	**-0.132*** **	0.006	0.004	0.011	**-0.041*** **
	(0.007)	(0.017)	(0.011)	**(0.036)**	(0.009)	(0.017)	(0.011)	**(0.012)**
disaster	0.006	0.022	0.022	0.072	-0.011	-0.011	-0.012	**0.019***
	(0.010)	(0.021)	(0.014)	(0.045)	(0.009)	(0.016)	(0.011)	**(0.011)**
treated* disaster	**0.017***	-0.001	-0.013	**0.085****	-0.003	0.003	**0.025***	0.011
	(0.009)	(0.020)	(0.013)	**(0.042)**	(0.012)	(0.021)	**(0.014)**	(0.015)
ROA	**0.642*** **	**0.176*** **	**0.252*** **	0.126	**0.686*** **	**0.273*** **	**0.446*** **	**0.076****
	(0.022)	**(0.043)**	**(0.028)**	(0.093)	**(0.027)**	**(0.050)**	**(0.033)**	**(0.035)**
Growth	**0.074*** **	**0.082*** **	-0.011	**0.103*** **	**0.057*** **	**0.078*** **	**0.048*** **	**0.102*** **
	(0.007)	**(0.017)**	(0.011)	**(0.036)**	**(0.009)**	**(0.016)**	**(0.010)**	**(0.011)**
Lev	**0.002*** **	0.000	**0.001*** **	-0.000	0.000	**0.001****	0.000	-0.000
	(0.001)	(0.000)	**(0.000)**	(0.001)	(0.000)	**(0.000)**	(0.000)	(0.000)
Size	**-0.009*** **	-0.000	0.002	-0.009	-0.000	0.002	0.000	-0.001
	(0.002)	(0.003)	(0.002)	(0.007)	(0.002)	(0.003)	(0.002)	(0.002)
Big-4	-0.002	0.000	**0.021*** **	**0.039***	-0.007	**-0.024****	**0.020*** **	-0.007
	(0.005)	(0.010)	**(0.007)**	**(0.022)**	(0.005)	**(0.010)**	**(0.006)**	(0.007)
Constant	**-0.042*** **	-0.027	**-0.050*** **	**-0.932*** **	0.008	-0.017	0.007	**-0.091*** **
	(0.016)	(0.028)	**(0.018)**	**(0.059)**	(0.013)	(0.024)	(0.016)	**(0.016)**
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.262	0.026	0.084	0.027	0.244	0.027	0.099	0.061
n. of observ.	1,465	1,465	1,465	1,465	2,076	2,076	2,076	2,076

	Low leverage group							
	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treated	-0.004	**-0.024***	0.009	**-0.074*****	**-0.021*****	-0.016	0.011	**-0.017****
	(0.010)	**(0.014)**	(0.010)	**(0.028)**	**(0.007)**	(0.013)	(0.009)	**(0.008)**
disaster	**0.026****	0.018	**0.026***	-0.026	-0.011	-0.013	-0.007	-0.011
	(0.013)	(0.019)	**(0.014)**	(0.038)	(0.008)	(0.015)	(0.010)	(0.010)
treated* disaster	0.007	-0.011	-0.019	-0.007	0.009	0.002	0.003	0.003
	(0.012)	(0.017)	(0.012)	(0.035)	(0.009)	(0.017)	(0.012)	(0.011)
ROA	**0.559*****	**0.155*****	**0.459*****	-0.032	**0.545*****	**0.165*****	**0.477*****	0.036
	(0.026)	**(0.042)**	**(0.030)**	(0.085)	**(0.019)**	**(0.037)**	**(0.025)**	(0.024)
Growth	**0.040*****	**0.050*****	**0.088*****	**0.077*****	**0.044*****	**0.038*****	**0.064*****	**0.065*****
	(0.010)	**(0.014)**	**(0.010)**	**(0.027)**	**(0.006)**	**(0.013)**	**(0.008)**	**(0.008)**
Lev	-0.000	**0.002***	**0.002*****	-0.003	**0.002****	0.001	-0.000	-0.000
	(0.000)	**(0.001)**	**(0.001)**	(0.002)	**(0.001)**	(0.001)	(0.001)	(0.001)
Size	0.002	**-0.008****	0.001	**-0.018*****	**-0.004*****	0.002	0.000	**-0.008*****
	(0.002)	**(0.003)**	(0.002)	**(0.007)**	**(0.001)**	(0.003)	(0.002)	**(0.002)**
Big-4	0.000	-0.013	0.010	0.030	0.001	-0.012	0.006	-0.002
	(0.006)	(0.009)	(0.007)	(0.019)	(0.004)	(0.009)	(0.006)	(0.006)
Constant	**-0.042*****	0.034	**0.026***	**0.707*****	**0.031*****	-0.002	0.013	**0.058*****
	(0.016)	(0.021)	**(0.015)**	**(0.042)**	**(0.009)**	(0.017)	(0.012)	**(0.011)**
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.270	0.015	0.105	0.022	0.195	0.008	0.099	0.035
n. of observ.	2,541	2,541	2,541	2,541	3,710	3,710	3,710	3,710

Table 3.10 presents the result from an OLS regressions with accruals and real earnings management proxies as equation (1) and (in parentheses) robust standard errors. The final sample includes 1,465 (2,541) and 2,076 (3,710) firm-year observations over the period 2001-2006 and 2008-2013 to test the effect of the tsunami and flooding in high leverage group (low leverage group), respectively. The dependent variable is the regression residual from EM models (*Modified DD*, *Performance Match, CFO* and *Disc* variables). This table has the main independent variable of interest is *(treated*disaster*).

Columns (1-2) and (5-6) report the results from regressions of AEM proxies on tsunami and flooding, respectively; while, columns (3-4) and (7-8) report the results from regressions of REM proxies on tsunami and flooding, respectively. The coefficients shown in bold are statistically significant at less than 10 percent level. The table also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 3.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

For the low leverage group over the tsunami and flooding periods, there is no evidence that the coefficient b_3 *(treated*disaster)* is significant. This suggests that it is the firms with high leverage that are more likely to manage earnings during disasters, to attract prospective investors or re-assure investors and analysts about the firm's survival prospects. This is consistent with the market incentives hypothesis.

4.3.3 Alternative earnings management proxies

As reported in the previous section, we use modified Dechow and Dichev model and performance-matched Jones model to measure AEM (*Modified DD* and *Performance Match* variables), while, we use cash flow from operations model and discretionary expenses model to measure REM (*CFO* and *Disc* variables). However, we re-run our analyses by using three alternative measures of accruals and real earnings management in order to corroborate our results.

We consider the modified cross-sectional Jones model and modified Jones with ROA model following Dechowet al. (1995) and Kothari et al. (2005), respectively; whereas, we also measure REM using production model following Roychowdhury (2006). Results (not tabulated) remain qualitatively similar to those reported in the main tables. In addition, all models are presented with industry and year fixed effects but we have also run the models using firm and year fixed effects. Once again, the results (not tabulated) remain unchanged. Finally, we re-run the analysis on quarterly data for the first hypothesis to account for seasonality and the results (not tabulated) also remain unchanged.

5 Conclusions

This study provides evidence that exogenous shocks such as natural disasters can affect firms reporting incentives. We exploit two different disasters, the 2004 tsunami in the Indian Ocean and the 2011 flood in Thailand, to investigate the effect of natural disasters on firms' earnings management strategies.

The results show that firms in countries that are hit by a natural disaster are likely to engage in more accruals and real earnings management, in order to boost the market confidence over the firm survival in line with the market incentive hypothesis. In contrast, we find no evidence that firms manage earnings downwards to increase governmental help or reduce scrutiny as suggested by the political cost. Next, we use the absolute value of the residuals from the earnings management models to study the level of earnings management and reconcile the sensitivity results with main test. Consistent with the preliminary analysis, firms in the tsunami sample that engage in the level of REM decreased, while firms in the flooding sample that engage in the level of AEM increased. Further, we use the absolute value of earnings management to examine that the severity of the disaster plays a role for the level of earnings management by comparing coefficient of interest across the tsunami and flooding samples. The results also show that the interaction *(treated*disaster)* coefficients across the two regressions are statistically different from each other and the difference indicates more earnings management in the flooding setting. This supports that the level of earnings management is conditional on the severity of the disaster. Additional analyses report that our evidence is robust to alternative measures and specifications.

Finally, the study helps to understand how managers react to natural disasters and supports for stewardship and valuation purposes as discussed above. However, future study may replicate the result with other research designs such as the distribution of earnings after management and specific accruals to obtain greater validity to the findings.

Appendix 3.1: Abbreviations and variables used in the chapter

AEM	Accruals earnings management
REM	Real earnings management
EM	Earnings management
AbsAEM	Absolute value of discretionary accruals
AbsREM	Absolute value of abnormal real earnings management
DA	Discretionary accruals
TA	Total assets
∆sale	Change in sales
GrossPPE	Gross property, plant and equipment
NetPPE	Net property, plant and equipment
Modified DD	Modified Dechow and Dichev model following McNichols (2002)
Performance Match	Performance-matched Jones model following Kothari et al. (2005)
CFO	Cash flow from operations model following Roychowdhury (2006)
Disc	Discretionary expenses model following Roychowdhury (2006)
treated	Treatment group is dummy variable that takes the value of 1 in the countries which were hit by disasters and 0, otherwise
disaster	Dummy variable which takes the value of 1 for the year after the disasters occurred and 0, otherwise
-2y	Year (-2) is defined as second year before the disasters occurred
-1y	Year (-1) is defined as first year before the disasters occurred
y_0	Year (0) is defined as the fiscal year during which disaster occurs
+1y	Year (+1) is defined as first year after the disasters occurred
+2y	Year (+2) is defined as second year after the disasters occurred
$disastery_0$	Year dummy that the year (0) is defined as the fiscal year during which disaster occurred
$disastery_1$	Year dummy that the year (+1) is defined as first year after the disasters occurred
$disastery_2$	Year dummy that the year (+2) is defined as second year after the disasters occurred

ACCR	ACCR = net income before extraordinary items (EBXI) - cash flow from operation/ TA_{t-1}
ROA	A company's return on assets
Growth	The percentage change in sales
Lev	The percentage of long-term liabilities to total assets
Size	The natural logarithm of the firm's total assets
Big-4	A dummy variable that equals 1 if the firm's auditor is one of the big 4 audit firms, namely PricewaterhouseCoopers, Deloitte Touche Tohmatsu, Ernst and Young, and KPMG and 0, otherwise.
treated*disaster	Use to assess that natural disaster as determinants of earnings management
treated*disastery$_0$	Use to assess the effects of natural disaster on earnings management in the period immediately after natural disaster hit *(y_0)*
treated*disastery$_1$	Use to assess the effects of natural disaster on earnings management in the first year after natural disaster hit *(+1y)*
treated*disastery$_2$	Use to assess the effects of natural disaster on earnings management in the second year after natural disaster hit *(+2y)*

Chapter 4

Earnings Management and Credit Ratings during Natural Disasters

Abstract

The goal of this chapter is to study the impact of earnings management on credit ratings when a natural disaster occurs. Additionally, we investigate whether the effect of earnings management on the deviations from expected credit ratings is conditional on the severity of the disaster by comparing two different disasters, the 2004 tsunami in India Ocean and the 2011 flood in Thailand. Using a differences-in-differences approach, we further test whether the effect is different for investment vs. speculative grade firms. Collectively, our results support the view that (1) earnings management affects credit ratings negatively when a natural disaster hits, (2) the higher the intensity of the disaster, the stronger the effect of earnings management on credit ratings, and (3) the results are mainly driven by speculative grade firms.

Keywords: Natural disasters, expected credit rating, and earnings management

1 Introduction

Prior literature[17] has extensively examined incentives for earnings management such as initial public offerings, seasoned equity offerings, season bond issuers, earnings targets (i.e. loss avoidance, increase earnings, earnings smoothness, and meet or beat the expectations of financial analysts), corporate executive compensation, mergers and acquisitions, violating lending contracts, regulatory costs or regulatory benefits, including natural disasters (see empirical paper in Chapter 3). In addition, prior literature[18] investigates the consequences of earnings management (i.e. litigation propensity, market valuations, auditor opinions, and credit ratings). This chapter contributes to this second stream of literature by investigating the impact of earnings management on deviations from expected credit rating in a specific setting, i.e. when a natural disaster occurs. According to the World Economic Forum (2015), the occurrence of natural disasters is becoming more frequent and severe due to the climate change (i.e. extreme weather conditions and rise in CO_2 emission). Moreover, the potential environmental disasters stemming from the climate change pose

[17] For example, Francis et al., 2003; Beaver et al., 2003; Carter, 2015; Graham et al., 2005; Burgstahler and Eames, 2006; Amy, 2005; Zang, 2012; Brown and Pinello, 2007; Alissa et al., 2013; Cohen and Zarowin, 2010; Teoh et al., 1998; Erickson and Wang, 1999; Louis, 2004; Healy and Wahlem, 1999; Healy, 1985; Zang, 2012; Dechow and Skinner, 2000; Cohen et al., 2008; Turner and Guilding, 2011; Mendes et al., 2012; Zhang et al., 2008; Charoenwong and Jiraporn, 2009; Zamri et al., 2013; Roychowdhury, 2006; Defond and Jiambalvo, 1994; Leuz et al., 2003; Cahan, 1992; Jones, 1991; Watts and Zimmerman, 1978; Han and Wang, 1998; Byard et al., 2007; Chen et al., 2011; and Hall and Stammerjohan, 1997.

[18] For example, Dechow et al., 2011; Lennox and Li, 2014; DuCharme et al., 2004; Gong et al., 2008; Chan et al., 2006; Dechow et al., 1996; Dechow et al., 2010; Bhattacharya et al., 2003; Gill et al., 2013; Cupertino et al., 2016; Kim et al., 2011; Koumanakos, 2008; Chen et al., 2013; Omid, 2015; Francis and Krishnan, 1999; Bartov et al., 2001; Abolverdi and Kheradmand, 2017; Herbohn and Ragunathan, 2008; Butler et al., 2004; Ashbaugh-Skaife et al., 2006; Dechow and Dichev, 2002; Odders-White and Ready, 2006; and Lennox and Pittman, 2011.

as one of the most prominent risks for business that cannot always be adequately protected (World Economic Forum, 2018b). In other words, even if many firms have set plans to reduce disasters risk, their ability to remain in business in the aftermath of a disaster it may still be uncertain. This could encourage managers to engage in earnings management not only to increase credit rating agencies confidence in the survival of the firm after the occurrence of a disaster but also to convey information about future earnings prospects. We study the reaction of credit rating agencies to such earnings management efforts.

Although prior research has investigated the timeliness of credit ratings, the role of credit rating agencies and accuracy of credit ratings, little research (i.e. Kim et al., 2013; Hovakimian et al., 2009; Krichene and Khoufi, 2016; Alissa et al., 2013; and Jung et al., 2013) has directly examined the role that managerial incentives play in the process of credit rating. For example, Demirtas and Cornaggia (2013) find that firms make accounting choices around the time of initial credit rating to enhance their credit ratings, while Kim et al. (2013) find that firms are likely to engage in real earnings management to influence upcoming changes of credit rating.

To our knowledge, no study has examined managerial incentives around natural disasters and credit ratings before. Yet, the environmental issue is one of four key areas of the global risks report in 2018 that firms face (World Economic Forum, 2018a). Moreover, World Economic Forum (2016) suggests that the frequency of disasters between 2005 and 2014 increased 14% on the previous 10 years (1995-2004), and nearly double the level recorded from 1985 to 1994. Further, such cascading events (i.e. hurricanes, flooding, tsunami,

landslides, extreme temperatures, and rise in CO_2 emission) take an immediate effect on human life, disrupt local businesses in the short term (such as deteriorate production capacity), and can devastate local economics for years (World Economic Forum, 2018b). So, it is important to look at the relationship between credit ratings and earnings manipulation around natural disasters, and for this purpose, we consider two different events: the 2004 tsunami in the Indian Ocean and the 2011 flood in Thailand. Recognizing the potential influence of earnings management during natural disasters on deviations from expected credit rating is of interest not only to credit rating agencies and those who rely on their ratings (e.g. investors, regulators, and lenders), but also to researchers and those interested in the consequences of earnings management for the debt market during events such as natural disasters.

Compared to previous work studying financial reporting after natural disasters (i.e. Byard et al., 2007), this study offers a more robust methodological approach by employing a differences-in-differences design to assess differences between a treated (i.e. hit by a disaster) and a control group before and after the disasters. Specifically, we use a sample of companies from four countries, namely, Indonesia and Thailand (treatment sample), Korea and Philippines (control sample) between 2001-2006 for the tsunami test and a sample of companies from the same four countries, namely, Thailand (treatment sample), Indonesia, Korea and Philippines (control sample) between 2008-2013 for the flooding test, to investigate the consequences of earnings management on deviations from expected credit rating during such natural disasters.

Natural disasters tend to have a negative effect on firms' financial performance, so it would not be surprising to see that credit rating agencies provide a lower credit rating or credit rating downgrades over the disaster period. This is aligned with Standard and Poor's (2015) findings which indicate that natural disasters affect firms with credit rating downgrades. However, firms pay strong attention to their credit ratings (Graham and Harvey, 2001; and Alissa et al., 2013) and might try to offset this downgrading by manipulating their accounting accruals and/or real activities. For example, Kisgen (2006) finds that firms near a broad rating boundary (plus and minus) are more likely to decrease their financial leverage in order to obtain rating upgrades or avoid rating downgrades compared to firms in the middle of rating categories. Jung et al. (2013) further find that firms with credit ratings in the upper or lower end of each broad rating category (i.e. firms straddling the investment-grade cutoff (BBB- and BB+)) are more likely to smooth earnings to achieve or avoid a change in credit rating. Similarly, in order to obtain a more favourable credit rating or avoid a downgrade during natural disasters, managers might engage in earnings management around such events.

On the other hand, credit rating agencies choices around a natural disaster may be driven by two alternative concerns: reputational and financial. According to the reputational concerns hypothesis, when credit rating agencies recognize that the accounting process has been "tempered" after a natural disaster hits, they penalize firms with managed earnings by lowering their credit rating. This is consistent with the idea that credit rating agencies always defend themselves to build and protect their reputation because if a firm with high rating fails, the investors may doubt the credit rating agencies' integrity which leads to a

reputation cost (which in turn results in the loss of future business). At the same time, however, credit rating agencies might be financially motivated not to "penalize" earnings management when a disaster hits. This contradicting financial motive may arise because credit rating agencies are paid by rated firms themselves, so more lenient ratings may ensure client loyalty (Loana, 2014)[19]. If the financial motive prevails, credit rating agencies will not adjust for earnings management during disaster periods, resulting in a higher than expected credit ratings. Accordingly, whether firms are likely to affect their credit rating by managing earnings in periods of natural disasters is an empirical question.

Operationally, our focus is on the relation between earnings management and the deviation from the expected credit rating. Jiang (2008) suggests using changes in credit ratings which mitigate the effects of correlated omitted variables and autocorrelation in the error terms. However, credit rating levels are typically sticky (Demirtas and Cornaggia, 2013). To overcome these biases, we hence choose to use the deviations from expected credit rating *(diff)*, which is a firm's actual rating minus its expected credit rating. To estimate expected credit ratings, we follow Alissa et al. (2013). Their model uses firm's fundamentals as predictors which is similar to the credit rating agencies approach.

In the first part of the analysis, we investigate whether engaging in earnings management around the disaster is related to deviations from the expected credit rating. Overall, our evidence indicates that firms' earnings management activities are negatively associated with deviations from their expected credit

[19] Loana (2014) finds that almost two-thirds of the total income of a credit rating agency is paid by issuers being rated.

rating during disasters. We interpret this as evidence that credit rating agencies' reputation incentives prevail, and they penalize firms for manipulating earnings during natural disasters by lowering their credit rating.

Our analysis expands the scope of the previous study by Alissa et al. (2013) on the consequences of earnings management on deviations from expected credit rating by considering the moderating role of natural disasters. In addition, we extend the findings by Carter (2015), who examines the joint interaction of Sarbanes-Oxley Act (SOX), earnings management, and credit ratings. In contrast, we examine the joint relationship of earnings management, credit ratings, and natural disasters, which is a very different type of exogenous shock compared to regulation changes (SOX), to investigate the impact of external factor (natural disaster) on earnings management instant impact of internal factor (governance and internal controls) on earnings management for credit rating.

In additional analysis we consider the consequences of earnings management on deviations from expected credit rating separately for each year following the disasters in order to examine how fast earnings management affects deviations from expected credit ratings when a natural disaster hits. We find that earnings management is negatively associated with deviations from expected credit rating in the first year after tsunami hit *(+1y)* and in the second year after the flooding occurred *(+2y)*. The difference in the time period of each disaster may affect the timing of the issuance of the corporate financial statements including the effects from the disaster to the public and may therefore reflect the credit rating adjustment made by the credit rating agencies. Generally, floods have more long-lasting effects than a tsunami. The hospitality industry that was

affected by a series of tsunami needed less time to estimate the total damages and losses from the tsunami which lasted between 10 minutes to 2 hours, compared to the manufacturing industry that was affected by the flooding for a period of 2-3 months. Moreover, the flooding caused disruptions to manufacturing supply chains affecting the regional automobile production and causing a global shortage of hard disk drives which lasted throughout 2012. It can be shown that corporate financial statements disclosing the amount of total economic loss from flooding were issued publicly after 2012. It can be inferred thus that firms in the tsunami sample were able to issue the corporate financial statements including the effects from the disaster to the public sooner than the firms in the flooding sample; thus, it comes as no surprise that credit rating agencies can recognize that firms are managing earnings during the tsunami period sooner than during the flooding period. This is consistent with the result that credit rating agencies penalize firms in the tsunami sample engaging in earnings management in the first year after the disaster occurred by lowering their credit ratings. Whereas, they penalize firms in the flooding sample engaging in earnings management in the second year after the disaster occurred.

Throughout our analysis we distinguish between accrual earnings management (AEM) and real earnings management (REM). In doing so we contribute new insights into the influence of earnings management on debt market literature by trading-off the consequences between the two types of earnings management (AEM and REM) on the deviations from expected credit rating around natural disasters. Interestingly, we find that the difference in timing of each disaster has affected the selection of earnings management techniques by the managers.

Firms in the tsunami sample can manipulate earnings by using only accruals earnings management to affect deviations from expected credit rating because the tsunami occurred on the Boxing Day (26 December 2004), resulting in insufficient time to manipulate real operations. In contrast, firms in the flooding sample have more time to manage earnings by using real earnings management during the last quarterly reporting because flooding occurred at the beginning of the last quarter. Our results remain unchanged if we delete firms with high and low credit ratings levels of creditworthiness.

In the second set of our analysis, we expand the results in Chapter 3 regarding whether the effect of earnings management on the deviations from expected credit rating is conditional on the severity of the disaster. We measure the intensity of disasters by comparing the actual financial damage from the tsunami and the flooding. According to The Economist (2011) and the World Bank (2011), the actual financial damage and loss derived from the flooding is relatively larger than those of the tsunami. Overall, we find that the magnitude of the coefficients of interest for the tsunami sample is statistically lower than the magnitude of the coefficients of interest in the flooding group both for accruals and real earnings management. This suggests that the higher the level of intensity of the disaster, the more likely the credit rating agencies will adjust their ratings for earnings management.

Finally, we want to test the difference between bad and good performance firms. Therefore, we separate speculative grade (SG) firms and investment grade (IG) firms to examine whether the moderating role a natural disaster plays in the relation between deviations from expected credit rating and earnings management is different between SG and IG firms. Interestingly, we find that accruals earnings management is negatively associated with

deviations from expected credit rating during the tsunami occurrence only for speculative-grade firms. Similarly, we find that both accruals and real earnings management are negatively associated with deviations from expected credit rating during the flooding occurrence only for speculative-grade firms. However, we do not find evidence that earnings management is associated with deviations from expected credit rating during the tsunami and flooding occurrence for investment-grade firms.

Because of investors' and analysts' reluctance to invest and guide forecasts in non-investment grades loans, managers with SG firms have motivation to achieve upgrades to IG firms or to have a higher level of credit ratings. Moreover, SG firms have many constraints (i.e. cash flow problems and high level of cumulative accruals management) in earnings management. Thus, credit rating agencies tend to detect earnings management in SG firms easily and they penalize SG firms for manipulating earnings during the disaster by lowering their credit rating. While IG firms are likely to manage earnings to avoid downgrades to SG group, credit rating agencies are reluctant to adjust ratings of IG firms because they believe that IG's risk profile are unchanged (i.e. low bankruptcy risk) or they may not able to detect earning management in IG firms.

In summary, we contribute new insights into the credit ratings literature by providing empirical evidence that (1) the relation between accrual an real earnings management and deviations from expected credit rating is moderated by natural disasters, (2) the effect of earnings management on the deviations from expected credit rating is conditional on the severity of the disaster, and (3) earnings management by speculative grade firms is related to deviations from expected credit rating in areas affected by natural disaster.

The rest of this paper is organized as follows: Section 2 reviews the relevant prior literature and presents our hypotheses. Section 3 describes our research design and methods. Section 4 provides an overview of the empirical evidence and sensitivity analyses. Section 5 presents our study's conclusions.

2 Prior literature and hypotheses development

2.1 Credit ratings

2.1.1 Importance of credit ratings in capital markets

There are many reasons why credit ratings (CR) matter and are widely used by various market participants (Jorion et al., 2009; Covitz and Harrison, 2003; and Lin and Shen, 2015). First, firms having higher credit ratings are viewed as having higher liquidity, resulting in lower borrowing costs, which typically increase firm value (Kisgen and Strahan, 2010). According to Dichev and Piotroski (2001), the stock market reacts negatively in response to announcements of ratings revisions or downgrades news. Moreover, Kim et al. (2013) suggest that credit ratings have significant implications for issuers and determine firms' future borrowing costs, while Jung et al. (2013) document that managers are strongly motivated to improve or maintain their credit ratings because credit ratings have significant cost implications for firms, including the cost of future borrowing and valuation of stocks and bonds. Therefore, it is not surprising that issuers care deeply about credit ratings. This is also consistent with the results of a survey by Graham and Harvey (2001) finding that credit ratings are CFO's second highest concern when making capital structure decisions.

Second, credit ratings can also be used by investors (i.e. banks, bond funds, pension funds, and insurance firms) to assess credit risk and to comply with internal by-law restrictions or investment policies. For instance, bond fund managers pay strong attention to firms' credit ratings to comply with regulation-based cut-offs that require certain minimum ratings for bond investments (e.g. investment guidelines may indicate that bond fund managers can only invest in the investment-grade bonds). Moreover, in the U.S., broker-dealers need to maintain a minimum amount of capital on their balance sheet according to SEC's Net Capital Rule. The SEC determined that securities with a lower credit rating require higher capital, and vice versa. Additionally, credit ratings are used by broker-dealers to determine the amount of collateral to hold against derivatives credit exposure. But credit ratings can also be used in private contracts (e.g. financial contracts and trading contracts). For example, financial contracts between firm and lenders can specify that lenders may demand more collateral or accelerate payment of existing debt, if the credit rating of the firm falls below some specified level.

Finally, credit ratings are widely used by regulators to formulate appropriate policies or regulations (e.g. set capital requirements for financial institutions, and exempt certain financial transactions from disclosure requirements).

2.1.2 Criteria for determining credit ratings

Credit rating agencies play a prominent role as capital market participants because they provide ratings that are stable across time and consistent across issuers as a signal of overall quality of the firm (Jorion et al., 2009). Moreover, credit ratings reflect the agency's opinion about the creditworthiness of the firms and the overall risks of the firms (e.g. financial risks, and credit risks). SEC

(2013) suggests that the ability to pay financial obligations is one of the factors to assess an entity's creditworthiness by credit rating agencies.

As part of the credit rating process, credit rating agencies use both public (such as corporate financial statements and reporting choices) and non-public private information (such as minutes of broad meetings, detailed financials by product line or division, budget, internal capital spending plans, new product plans, and information obtained though frequent discussions and communication with the firm) to assess the firm's credit rating (Ashbaugh-Skaife et al., 2006; Kim et al., 2013; and Demirtas and Cornaggia, 2013). Vast literature suggests that credit rating agencies take into account earnings, profitability, interest coverage, liquidity, and leverage in their rating analysis (Jorion et al., 2009; Jung et al., 2013; and Carter, 2015). For example, Kim et al. (2013) document that the stability of earnings is considered a critical component of rating, while Demirtas and Cornaggia (2013) state that rating agencies focus on profit and reductions in debt costs as important factors in their rating analysis. In addition, Standard and Poor's (2006) notes that firms without growth in revenues, even if they generate cash, are considered as financially weak, and that they pay attention also to new competition or technology, changing debt burdens, capital spending requirements, and regulatory changes to use on credit rating process because these issues affect firms expected future profitability, competitive position, and credit risk (Standard and Poor's, 2011).

The quality of accounting information is also named by credit agencies as one of criteria in the credit ratings process (Standard and Poor's, 2003). Several recent studies demonstrate that opportunistic earnings management, deficiency in accounting standards, poor disclosure quality, poor internal controls, or weakness in firms' internal governance structures increase the noise in

accounting reports and could lead to lower credit ratings (Dechow et al., 2010; Schipper and Vincent, 2003; Dechow et al., 1996; and Jorion et al., 2009). For example, Yu (2005) suggests that lower disclosure quality, as proxied by lower accounting quality, is associated with higher credit spreads. Moreover, greater information risk associated with declining accounting quality and increasing costs of debt will lead to overall lower credit ratings (Francis et al., 2005; and Carter, 2015).

Carter (2015) indicates that credit rating standards are stiffer in the post-SOX period compared to pre-SOX period. As a result, an average firm experiences a rating downgrade after the introduction of SOX. Jorion et al. (2009) document that a tightening of credit standards by credit rating agencies could not only undermine the usefulness of credit ratings, but also have an adverse impact on the cost of debt financing. They find that a tightening of credit standards would result in significant decrease in the level of credit ratings (the average rating fell from A+ to A-) and increase in funding costs (average yields increased from 4.98% to 5.23%). Interestingly, they report a downward trend as a systematic tightening of ratings standards for only investment-grade firms but not for speculative-grade firms. Furthermore, a tightening of rating standards would not only affect issuers but also providers of capital. According to the Basel Committee on Banking Supervision (BCBS) (2004), banks have to hold a percentage of capital charge that maps to their credit rating. For example, BBB or BB- rated debt should hold an 8% capital charge, whereas, A- rated debt should hold only 4% capital charge. Suppose, for example, that credit rating agencies tighten credit standards, downgrading the debt of a bank from A- to BBB without any actual change in the default probability, the bank would be forced to raise more capital even though there is no fundamental change in the

risk of its loan portfolio. Thus, the tightening of credit standard can create severe distortions in capital requirements, which leads to cut lending and increased funding costs.

2.2 Earnings management and credit rating

The prior literature is inconclusive as to whether credit rating agencies can see through earnings management. One the one hand, Jorion et al. (2009) report that declining accounting quality due to earnings management would lead to greater default risk and higher debt yield spread and therefore to lower credit ratings. This is consistent with the idea that credit rating agencies are able to detect earnings management activities and adjust for discretionary accruals, resulting in low levels of ratings. On the other hand, credit ratings agencies role is not one of an auditor, thus, they rely on financial information provided by issuers that it is supposed to be reasonable and accurate (Standard and Poor's, 2006; Carter, 2015; and Jung et al., 2013). This creates a potential opportunity for firms to benefit from earnings manipulation in the credit ratings process. Indeed, Demirtas and Cornaggia (2013) find that managers of issuing firms can utilize the discretion afforded by accounting standards to obtain more favourable credit ratings because credit rating agencies believe issuer-reported financial and are reluctant to adjust ratings promptly.

Alissa et al. (2013) support the idea that credit ratings are a vehicle to reduce information processing costs for market participants (e.g. investors, banks, and customers). For example, investors pay strong attention to firms' credit ratings to make decisions on investment in firms' stocks or bonds, while, banks use firms' credit ratings in order to consider a minimum amount of collateral or loan interest rates. Alissa et al. (2013) also state that firms with ratings drifting away

from their expected levels bear additional costs (i.e. investors could be forced to liquidate their positions due to a prohibition from holding lower expected rated bonds, or a quantity restriction) when compared to their competitors, resulting in pressure on managers to reach their expected rating by managing earnings. This would be consistent with evidence in Lin and Shen (2015), who find that managers may boost credit rating by adopting discretionary accruals-based or real earnings management to acquire funds with lower capital costs, and to attract more investment. Similarly, Kim et al. (2013) indicate that managers have incentives to influence their future rating changes to maintain or improve their credit ratings, if firm managers can anticipate the changes in their firms' credit ratings before the information is revealed to capital markets. A downgrade of the credit rating significantly affects both stock and bond valuation, thus, managers use earnings management technique to avoid credit rating downgrades. Moreover, previous empirical studies (i.e. Alissa et al., 2013; and Jung et al., 2013) document that firms straddling the investment grade threshold (BBB- and BB+) are exhibiting greater earnings management behaviour. There are two reasons for managers to avoid downgrades from investment-grade firms to speculative-grade (SG) firms or to obtain upgrades from speculative-grade firms to investment-grade (IG) firms (Alissa et al., 2013; and Graham and Harvey, 2001). First, market participants believe that firms in the same rating category can be pooled together as being of the same quality, assuming that all such firms have similar default probabilities since credit ratings are a key metric in evaluating default risk. Second, SG firms have the tendency to be more costly (e.g. borrowing costs) than the IG firms. Hence, firms with BBB- rating level are more likely to manage earnings to avoid downgrades to speculative-

grade firms, whereas, firms with BB+ rating level tend to manage earnings to achieve upgrades to investment-grade firms.

As described above, credit ratings agencies rely heavily on financial information provided by issuers to assess the financial health of an entity and provide credit ratings as accurately and timely as possible. On the other side, managers have the incentive to obtain the most favourable credit rating and hence have incentives to manage earnings. Earnings management can take the form of upward bias in reported earnings through discretionary accounting adjustments by overstating revenues and underestimating expenses to artificially inflate reported earnings (Lo, 2008; Ghosh and Olsen, 2009; and Irani and Oesch, 2016). Managers can also change the business model or the operating environment by extending more lenient credit terms, offering significant price cuts, and increasing the product volume to manage the level of reported earnings upward (Roychowdhury, 2006; Alhadab et al., 2016; Cohen et al., 2008; and Bozzolan et al., 2015). To get the benefits of higher ratings, managers choose the earnings management strategy (i.e. real vs. accrual) by trading off the benefits and costs. On the one hand, managers can engage in accruals-based earnings management which have no direct cash flow consequences and can be done easily but can be detected easily as well (Kim et al., 2013; Irani and Oesch, 2016; and Cohen and Zarowin, 2010). On the other hand, managers can manipulate earnings through real earnings management with direct cash flow consequences and therefore, jeopardizing the firm's competitive advantage. The benefit of this method is that it is harder for auditors or investors to detect (Trombetta and Imperatore, 2014; Zang,

2012; Cohen et al., 2008; Cohen et al., 2010; Chen et al., 2015; and Irani and Oesch, 2016).

Alissa et al. (2013) find that managers use more discretion and income-increasing real earnings management when firms are below their expected ratings and Demirtas and Cornaggia (2013), find that firms borrow from future earnings in order to boost earnings and achieve a desired initial credit rating. Kim et al. (2013) find that managers actively engage in more real earnings management (REM) rather than income-increasing accruals manipulation before credit rating changes, to avoid credit rating downgrades. In addition, Kim et al. (2013) find a positive relationship between REM and credit rating upgrades, but no relationship between REM and credit rating downgrades. Firms with credit rating downgrades tend to have cash flow problems, thus, it is too hard to actively engage in REM. Moreover, Graham et al. (2005) indicate that the high degree of scrutiny lowers the likelihood of accruals earnings management (AEM) with respect to REM. In other words, credit ratings agencies perceive accruals management practices as a negative signal. Jung et al. (2013) argue that the incentive for earnings management on credit ratings could be weakened by possible constraints in (1) earnings management, and (2) credit rating agencies' ability to detect earnings management.

2.2.1 Credit rating agencies incentives

Prior literature (i.e. Jorion et al., 2009; Covitz and Harrison, 2003; and Alissa et al., 2013) indicates that there are two contradicting incentives for credit rating agencies. On the one hand, credit rating agencies have a countervailing incentive to protect their reputation for being objective and independent. Jung et al. (2013) document that the reputation of credit rating agencies plays a critical

role in revenues generation, while Alissa et al. (2013) indicate that any reduction in reputational capital in the views of investors could potentially decrease the value that credit rating agencies provide to issuers. If the reputational incentives prevail and credit rating agencies recognize the manipulation of the accounting accruals generating process and/or any changes in the operating environment/business model by issuers, then credit rating agencies will make analytical adjustment to the firms' financial statements to better portray the underlying corporate performance. Ultimately, credit rating agencies adjust the credit rating to be consistent and informative about the firms' economic reality. This incentive of credit rating agencies is consistent with Ashbaugh-Skaife et al. (2006) and Lin and Shen (2015) showing that accruals quality is positively associated with credit rating. In the same vein, Jiang (2008) finds that firms meeting earnings benchmarks increase their probability of rating upgrades and benefit from lower cost of debt, whereas firms that meet earnings benchmarks by managing earnings actually have a lower probability of rating upgrades. This implies that credit rating agencies can quickly and accurately detect earnings management, whether accruals- or real-based, and provide accurate ratings.

On the other hand, credit rating agencies have a conflict of interest related to the compensation received by the issuer. Because the majority of rating agencies revenue stems from ratings fees paid by issuers, credit rating agencies may be motivated to accommodate the preferences of a bond issuer by fully ignoring firms' potential manipulation of reported earnings in order to maintain a good relationship. In this view, credit ratings may be too lax (Jorion et al., 2009; Jung et al., 2013). Covitz and Harrison (2003) perform an empirical

study of these two different views (reputational and financial incentives). Their findings strongly suggest that reputation incentives dominate, while the financial incentive argument does not appear to play a role in rating changes by credit ratings agencies.

2.3 Joint interactions among earnings management, natural disasters and credit ratings

As mentioned earlier, there are several reasons why managers manage earnings to influence credit ratings. For example, they may want to issue stocks with higher prices, obtain financing with lower cost, and prevent contractual violation. While there is extant literature investigating whether earnings management is associated with credit ratings, the impact of earnings management on deviations from expected credit ratings around natural disasters has not yet been analysed. As natural disaster risk arises (World Economic Forum, 2016) and environmental risks are among the top five in the list of global risks[20] (World Economic Forum, 2015), it seems important and timely to understand whether the association between earnings management and deviations from expected credit ratings is moderated by the occurrence of a natural disaster.

Natural disasters cause losses and a weaker financial status which, in turn, lead to lower future credit ratings/ rating downgrades. Unfortunately, some firms hit by natural disasters may become bankrupt after the disaster occurs. Table 4.1 below presents some descriptive data from Bloomberg about bankruptcy and

[20] Global risks are uncertain event, if it occurs, can also lead to serious disruption of critical infrastructure and so seem to be bad for the economy.

delisting rates for the sample of companies used in this study which is consistent with this view.

Table 4.1: Descriptive statistics about bankruptcy and delisting rates

Panel A: Distribution of the observations breakdown by country

Country	Unique firms	Firm-years affected by a disaster	Firm-years not affected by a disaster	Sample
Indonesia	42	30	208	238
Korea	20	0	154	154
Philippines	29	0	152	152
Thailand	45	86	179	265
Total	136	116	693	809

Panel B: Bankruptcy and delisting breakdown by firms that are hit by disaster and firms that are not hit by disaster

	Firms affected by a disaster	%	Firms not affected by disaster	%	Total	%
Delisting and bankruptcy firms	8	12.12%	4	5.71%	12	8.82%
Non-delisting and bankruptcy firms	58	87.88%	66	94.29%	124	91.12%
Total	66		70		136	

Table 4.1 illustrates the distribution of the observations and breakdown by country (Panel A), and the ratio of bankruptcy and delisting breakdown by firms that are hit by disaster and firms that are not hit by disaster (Panel B). As can be seen, the percentage of bankruptcy and delisting in firms that are hit by disaster is twice as high as the respective percentage for firms that are not hit by disaster (12.12% for firms that are hit by disaster and 5.71% for firms that are not hit by disaster) as shown in Panel B.

In order to avoid bankruptcy and maintain the level of their credit ratings during natural disaster, managers may have incentives to increase earnings through accruals and real earnings management. Interestingly, the question of whether earnings management has an effect on credit rating during disasters is a

controversial one. Whether credit ratings move upwards or downwards over the disaster period will ultimately depend on the trade-off between the reputational and financial incentives of the credit rating agencies, as shown in figure 4.1.

Figure 4.1: Summary of the relations in earnings management on credit ratings during natural disasters

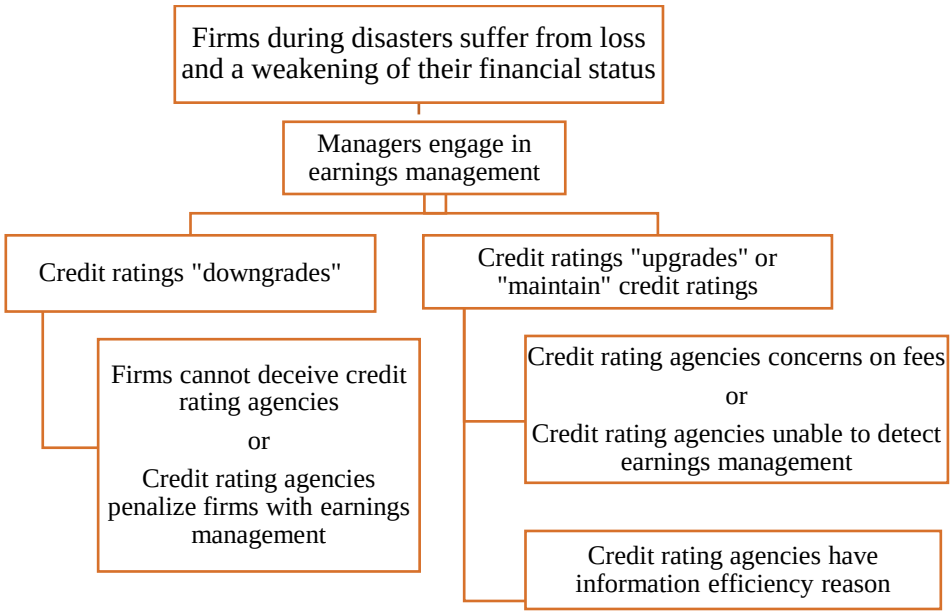


Figure 4.1 summarises the arguments presented above. On the one hand, firms that manage earnings in the disaster period may experience a lower credit rating or a credit rating downgrade. This would be consistent with the idea that earnings management is associated with lower quality and the prevailing of reputational concerns. This would further mean that firms with earnings management during disasters cannot deceive credit rating agencies. In other words, credit rating agencies can detect earnings management and penalize firms with earnings management during natural disaster, resulting in lower than expected credit ratings. Following this argument, managers would not be able to favourably influence their credit rating by managing earnings.

On the other hand, firms that manage earnings in the disaster period may have a higher credit rating if credit rating agencies are unable to detect issuers' earnings management activities during disasters. Alternatively, credit rating agencies may be able to see through earnings management during the disasters but choose to not adjust for discretionary activity because of their financial incentives[21]. Following this argument, managers can engage in earnings management during disasters to affect credit rating upgrades or maintain credit ratings.

In summary, given the benefits and constraints related to earnings management during disaster, the ability (or lack thereof) of ratings agencies to uncover accruals and real based earnings management during disaster, and the opposing incentives for rating agencies to detect earnings management behaviour during disaster (reputation concerns versus their dependence on revenues), the question of whether managers are able to influence credit ratings during the disasters by managing earnings can only be answered empirically. Based on the preceding discussion, we develop the following hypothesis.

> *H1: The association between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster.*

While the first hypothesis focuses on the moderating role of occurrence of a natural disaster in the relation between earnings management and deviations

[21] Another plausible explanation for why credit rating agencies do not adjust for earnings management is that even though credit rating agencies are able to see through earnings management, they view discretionary accruals as being informative about future performance at assisting managers' communication with outsiders and act accordingly (Demirtas and Cornaggia, 2013; Choi et al., 2011; and Bowen et al., 2008).

from an expected credit rating, our second hypothesis is concerned with whether the effect of earnings management on the deviations from expected credit rating, if any, is higher for firms that were more seriously hit by a disaster. More specifically, we expect that the loss of investors' confidence in the survival of the firm shortly after the disaster would be more (less) severe in countries with high (low) level intensity of disaster and this could affect how earnings management relate to the deviations from expected credit rating. Building upon the preceding arguments, we formulate the second hypothesis as follows:

> *H2: The moderating role of a natural disaster in the relation between earnings management and deviations from expected credit rating will is conditional on the severity of the disaster.*

Generally, credit ratings are separated into two categories, investment-grade firms and speculative-grade firms, to set minimum quality investment standards for money market funds. According to Standard & Poor's (S&P's) long-term credit ratings level, investment-grade ratings include BBB- and higher ratings, whereas, speculative-grade ratings include BB+ and lower ratings. Firms with speculative grade *(SG)* are typically more volatile and less liquid than firms with investment grade *(IG)* (Demirtas and Cornaggia, 2013).

A survey by Graham et al. (2005) finds that high level of earnings management is associated with large firms and high credit rating, typically investment-grade firms. This is because investment-grade firms have higher pressure to meet their earnings benchmarks or to meet the market expectations than speculative-grade firms. Additionally, Alissa et al. (2013) report that downgrading to SG could be costly for firms because most investors are unwilling to invest in these

firms due to self-imposed or regulation-based cut-offs. For example, SG firms may force investors to liquidate their positions as the rating-based triggers in debt covenants. Moreover, the scale of investment-grade firms' operations makes it easier to shift earnings, while, SG firms could be more constrained in earnings management (i.e. a high level of cumulative accruals management, cash flow problems, and close monitoring by credit rating agencies). Therefore, SG firms are likely to be less able to engage in as large earnings management as investment-grade firms (Jung et al., 2013). This is consistent with the evidence by Matsumoto (2002) that firms with higher institutional ownership, which correspond to investment-grade firms, can better manage earnings.

Demirtas and Cornaggia (2013) indicate that many institutional investors (e.g. insurance firms, securities firms, banks, mutual funds, and private pensions) are prohibited or limited from holding debt downgraded to non-investment grades or purchasing SG debt. This is one of the reasons why firms with non-investment grades (or SG firms) need to manage earnings to have a higher level of credit ratings or move to IG firms.

In summary, IG firms tend to manage earnings to avoid downgrading to SG group, while, SG firms are likely to engage in income-increasing earnings management to move to IG group. Nonetheless, we expect that credit ratings of SG firms are less stable than those of IG firms. The reason is that credit rating agencies are able to detect engagement in earnings management in the period of natural disasters in SG firms easier than IG firms due to the several constraints in SG firms mentioned above, resulting in a higher tendency to adjust their credit rating in SG firms. Accordingly, the effect of a natural disaster on the relation between earnings management and deviations from expected

credit ratings should be larger for SG firms than IG firms. Based on the preceding discussion, our third hypothesis is as follows:

> *H3: The moderating role of a natural disaster in the relation between earnings management and deviations from expected credit rating will be different between speculative grade and investment grade firms.*

3 Research design and methodology

3.1 Sample and data

Our empirical investigation requires drawing data from Bloomberg and Capital IQ. All financial firms are excluded from the sample due to differences in their financial reporting. We obtain accounting data for listed firms from four countries, namely, Indonesia, Thailand, Korea and Philippines from Bloomberg. In our analysis we consider only firms with fiscal year end in December because both the tsunami in 2004 and the flooding in 2011 occurred during the last quarter of the calendar year. Corporate financial statement including the effect on disasters (both tsunami and flooding) are issued to the public by the end of March in 2005 and 2012, respectively. Therefore, we focus on credit rating as of 31st March, instant of credit rating as of 31st December following Alissa et al. (2013), Kim et al. (2013), and Hovakimian et al. (2009). We obtain firms' S&P's long-term issuer level credit rating as of 31st March each year from Capital IQ.

The final sample includes 281 firm-year observations over the period 2001-2006 (tsunami sample) and 528 firm-year observations over the period 2008-2013 (flooding sample). Table 4.2 presents the distribution of the observations for actual credit rating as of 31st March by separating treatment (i.e. hit by the

disaster) and control groups for firms in the tsunami sub-sample and firms in the flooding sub-sample.

Table 4.2: Sample selection and distribution of actual credit rating as of 31st March

			Tsunami (Data in 2001-2006)				Flooding (Data in 2008-2013)			
Score	S&P credit ratings	Description	Treated	Control	Total		Treated	Control	Total	
1	D	In default	11	20	31		0	63	63	
2	C	Default imminent with little prospect for recovery	0	0	0		0	0	0	
3	CC		0	4	4		0	1	1	
4	CCC-		0	0	0		0	0	0	
5	CCC	Extremely speculative	0	3	3		0	0	0	
6	CCC+	Substantial risks	0	4	4	SG 135	0	2	2	SG 256
7	B-		1	3	4		4	13	17	
8	B		6	5	11		4	35	39	
9	B+	Highly speculative	6	12	18		4	51	55	
10	BB-		6	17	23		6	32	38	
11	BB	Non-investment grade speculative	0	19	19		2	24	26	
12	***BB+***		**4**	**14**	**18**		**3**	**12**	**15**	
13	***BBB-***		**5**	**17**	**22**		**2**	**54**	**56**	
14	BBB		6	20	26		13	58	71	
15	BBB+	Lower medium grade	5	27	32		7	34	41	
16	A-		7	24	31	IG 146	6	50	56	IG 272
17	A		2	17	19		3	37	40	
18	A+	Upper medium grade	0	5	5		2	3	5	
19	AA-		1	9	10		0	3	3	
20	AA		0	1	1		0	0	0	
21	AA+	High grade	0	0	0		0	0	0	
22	AAA	Prime	0	0	0		0	0	0	
			60	**221**	**281**		**56**	**472**	**528**	

In Table 4.2, the level of credit ratings as of 31st March *(Actual CR)* is a numeric transformation of Standard & Poor's (S&P's) long-term issuer level ratings by assigning a value of one for the lowest S&P's credit ratings (D) and a value of twenty-two to the highest credit rating (AAA). Thus, a higher number indicates a better rating. It follows that a decrease in the rating variable is associated with an increase in firms' credit risk. In Table 4.2 we further present the number of observations separately for speculative-grades and investment-grades firms in

both the tsunami and flooding samples to facilitate comparative analysis of the distribution between bad and good performance firms.

3.2 Research models and variables measurement

Jiang (2008) indicates that most empirical research on the determinants of credit ratings suffers from potential correlated omitted variable concerns because the researchers do not know the exact metric that credit rating agencies use and what weight they put on these metrics in producing ratings. In addition, credit ratings are potentially sticky because credit ratings are changed only when credit rating agencies are confident that observed changes in the firm's risk profile are permanent (Demirtas and Cornaggia, 2013). This may cause concerns about the effect of any correlated omitted variables and the error terms in a rating-level regression over time. To solve these problems, Jiang (2008) suggests that credit ratings change is the dependent variable, to control for mitigating effects of correlated omitted variables and autocorrelation in the error terms. However, changes in credit ratings are not common and they may also be influenced by credit rating agencies bias such as conservatism (Jorion et al., 2009). To address these concerns, we use deviations from expected credit rating *(diff)* as the dependent variable.

We calculate deviations from expected credit rating *(diff),* as a firm's actual rating as of 31st March minus its expected credit rating, which we estimate based on the work of Alissa et al. (2013). To test the first hypothesis on whether the association between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disasters, we run the following regression with year fixed effects and robust standard errors clustered at industry level as follows:

$$diff_{i,\ t+1} = f_{i,t}\ (b_0 + b_1 treatedT/treatedF + b_2 em + b_3 treatedT/treatedF*em + b_4 control\ variables + e) \quad (1)$$

In equation (1) the dependent variable *(diff)* is the difference in credit rating (actual minus expected credit rating) which takes positive values for above-expected-rating firms[22] and negative values for below-expected-rating firms[23]. Appendix 4.1 provides the definition for the variables used throughout this study. Subscripts form firm (i) and year (t) are omitted from all models for simplicity.

This study uses a differences-in-differences approach to assess differences between the treatment (i.e. *treatedT* – i.e. tsunami sample, and *treatedF* – i.e. flooding sample*)* and the control groups before and after the disasters*.* We include dummy variables, which are *treatedT* and *treatedF* in our model. TreatedT equals to one if the firm is located in the countries which were hit by the tsunami (Indonesia and Thailand) during 2005-2006, while, treatedF equals to one for firms in countries which were hit by the flooding (only Thailand) in 2012-2013 and 0 otherwise.

For our first hypothesis, we want to test whether the association between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster. The coefficient of *treatedT/ treatedF*em* in equation (1), b_3, is our coefficient of interest as it captures the difference in the association of earnings management with the deviations from expected credit rating levels (*diff*) between firms that were hit by disasters (*treatedT* is Indonesia and Thailand in 2005-2006, and *treatedF* is Thailand in 2012-2013)

[22] Actual credit rating is above their expected credit ratings.

[23] Actual credit rating is below their expected credit ratings.

and the control firms. If the coefficient is statistically significantly different to zero, it would indicate that treated firms, engaging in earnings management after the disasters occurred, have indeed influenced their credit rating more than control firms. In this case, we can infer that the association between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster.

More importantly, we examine whether credit rating agencies will penalize firms engaging in earnings management during disasters. If the coefficient b_3 is significantly negative, it would indicate that managers of treated firms with strong earnings management during the disaster are negatively associated with deviations from expected credit rating. Such a result would be evidence that credit rating agencies' reputation incentives prevail, and they penalize firms for manipulating earnings in periods of natural disasters by lowering their credit rating. On the other hand, if the coefficient b_3 is significantly positive or is a zero, it would suggest that managers of treated firms can improve or maintain their credit rating by engaging in earnings management during the disaster. In other words, earnings management affects positively deviations from expected credit rating in periods of natural disaster. In this case, at least one of three things would be true. First, credit rating agencies may be able to see through earnings management during natural disaster, but, they do not penalize firms with earnings management because of their financial incentives. Second, credit rating agencies are unable to detect issuers' earnings management activities during natural disaster, thus, actual credit rating is higher than expected credit rating. Finally, credit rating agencies view discretionary accruals as being

informative about further performance at assisting managers' communication with outsiders.

For our second hypothesis, we want to test whether the effect of earnings management on the deviations from expected credit rating is conditional on the severity of the disaster. To do this, we run regression (1) separately for the tsunami and flooding samples. In particular, we expect the coefficient of interest, b_3, to be statistically different between the tsunami and the flooding group. If firms in the flooding group have a higher (lower) in magnitude coefficient, we can infer that the more important the level of intensity of the disaster, the more (less) the credit rating agencies will adjust their credit ratings for earnings management.

For our third hypothesis, we want to test whether the effect on the relationship between earnings management and deviations from expected credit rating during the natural disaster in SG firms will be different from that of IG firms. To do this, we run regression with robust standard errors clustered at industry level and year fixed affects as in equation (1) by separating speculative and investment grade groups. According to the rating level on the S&P scale, BBB- rating level is the lowest rated investment grade rating, whereas, BB+ rating level is the highest rated speculative grade rating.

Again, coefficient b_3 is our coefficient of interest when investigating whether the relation between earnings management and deviations from expected credit rating for bad and good performance firms is moderated by the occurrence of a natural disaster. If the coefficient b_3 is significantly positive (negative) and of similar magnitude for SG and IG firms, it would suggest that credit rating agencies treat both types of firms the same way. If, on the other hand, the

relationship between earnings management and deviations from expected credit rating during the natural disaster in bad performance firms is different from that of good performance firms, it would be evidence that credit rating agencies differentiate between the two.

3.2.1 Earnings management variables

To measure earnings management, we use two variants: (1) continuous earnings management variables, using the residual from the modified Dechow and Dichev model *(Modified DD)*, the performance-matched Jones model *(Performance Match)*, cash flow from operations model *(CFO)* and discretionary expenses model *(Disc)* following McNichols (2002), Kothari et al. (2005), Roychowdhury (2006) and Cohen et al. (2008), respectively; (2) earnings management dummies *(em dummy),* taking the value of one if *Modified DD, Performance Match, CFO*, and *Disc* variables are higher than or equal to the industry average for a given year, and zero otherwise. This alternative measure allows us to control for changes in economic conditions that influence earnings management across different industry groups.

3.2.2 Credit rating variables

To test whether earnings management during disasters affects the deviations from expected credit rating, we use the level of credit ratings as of 31st March *(Actual CR)* following each fiscal year end and we perform a numeric transformation of Standard & Poor's long-term issuer level ratings as shown in Table 4.2.

We estimate a firm's "expected" credit rating in a given year using observations before the disasters occurred and a model from the target capital structure

literature. Following Alissa et al. (2013) and Hovakimian et al. (2009) we run equation (2) below:

$$Actual\ CR_{i,t+1} = f_{i,t}\ (b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 oprisk + e) \quad (2)$$

For the estimation of the "expected" credit rating of years after the disasters we use the coefficients estimated from equation (2) applied to the pre-disaster periods. More specifically, we use the period from 2001 to 2003, which is the period before the tsunami occurred, to estimate expected credit rating for firms in the tsunami sample. Then the period from 2008 to 2010 is used to estimate expected credit rating for firms in the flooding sample (tsunami and flooding occurred in 2004 and 2011, respectively). The final samples used to estimate expected credit rating for firms in the tsunami and firms in the flooding periods is 152 firm-year observations over the period 2001-2003 and 304 firm-year observations over the period 2008-2010, respectively.

The dependent variable in equation (2) is the actual credit rating as of 31st March after the fiscal year end and it is an ordinal variable taking on values from 1 to 20 representing the firm's S&P long-term credit rating (e.g. D=1, and AA=20 as shown in appendix 4.2). However, as shown in Table 4.2, our sample has some scores missing (i.e. C, CCC-, AA+, and AAA in tsunami sample, and, C, CCC-, CCC, AA, AA+, and AAA in flooding sample). For that reason, we also run sensitivity analysis by grouping all junk range as having the same rating (e.g. D to CCC- equal to one in tsunami sample and D to CCC equal to one in flooding sample). We present the range of credit ratings which we use for the preliminary analysis and sensitivity analysis in appendix 4.2.

We estimate the coefficient of expected credit rating by comparing four different models, ordered probit, ordered logit, normal regression, and poisson model, to select the one with the best fit. Based on our analysis, we conclude that the ordered probit model is the best model in estimating expected credit rating because the coefficients of firms' expected rating in ordered probit model are the most statistically significant and consistent with previous research (i.e. Alissa et al., 2013; and Hovakimian et al., 2009).

Table 4.3: Coefficients of expected credit rating

	Ordered probit	**Ordered probit**	
Dependent variable	**Alissa et al., 2013**	**Tusnami 2004**	**Flooding 2011**
mb	**0.107*** **	**0.047***	**0.027***
	(5.16)	**(0.029)**	**(0.016)**
tang	**0.849*** **	-0.002	**0.025***
	(7.43)	(0.023)	**(0.015)**
rd	0.009	-33.972	8.232
	-1.14	(23.247)	(11.358)
rdind	**0.251*** **	**1.499** **	-0.235
	(5.03)	**(0.593)**	(0.176)
sga	**0.291*** **	-2.818	0.753
	(2.92)	(1.726)	(0.777)
profit	**3.084*** **	-0.000	**0.004***
	(17.72)	(0.006)	**(0.002)**
size	**0.411*** **	-0.160	0.007
	(24.65)	(0.101)	(0.046)
oprisk	**-3.237** **	-0.000	**-0.006** **
	(-11.36)	(0.002)	**(0.003)**
Industry	Y	Y	Y
Country	N	Y	Y
Pseudo R^2	0.117	0.321	0.160
n. of observ.	23,909	152	304

This table presents estimated coefficients for equation (2) using an ordered probit model. We estimate a firm's "expected" credit rating for a given firm in a given year before the disasters by using a model from the target capital structure literature, following Alissa et al. (2013) and Hovakimian et al. (2009) as shown in equation (2)

$$Actual\ CR_{i,t+1} = f_{i,t}(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

We use the first period (2001-2003) and the second period (2008-2010), which are the period before tsunami and flooding occurred, to estimate expected credit rating for firms in the tsunami and flooding samples, respectively. Column (2) for the results of Alissa et al. (2013) presents t-

statistics in parentheses below coefficient estimates, while, columns (3-4) for the results of firms in the tsunami and flooding sample report standard error in parentheses below coefficient estimates. The final sample to estimate expected credit ratings is 152 and 304 firm-year observations over the period 2001-2003 and 2008-2010. To avoid the influence of outliers all continuous financial data are winsorized at 1% and 99% by separating firms in the tsunami and flooding sample. All variables are otherwise calculated as described in appendix 4.1. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively. Industry and country fixed effects are included.

In Table 4.3, we present the results from estimating equation (2). Note that Column (2) for the results of Alissa et al. (2013) presents t-statistics in parentheses below coefficient estimates, while, columns (3-4) for the results of firms in the tsunami and flooding sample report standard error in parentheses below coefficient estimates.

Alissa et al. (2013) and Hovakimian et al. (2009) identify five firm characteristics, growth opportunities, asset specialization, profitability, size, and operating risk as determinants of firms' expected credit rating. As per equation (2), we include market-to-book ratio *(mb),* the ratio of a firm's research and development expenses to sales *(rd),* R&D indicator *(rdind),* and the ratio of a firm's selling, general, and administrative expenses to sales *(sga)* as controls for growth opportunities. The results in Table 4.3 are consistent with Alissa et al. (2013) that firms in the tsunami and flooding samples with higher market-to-book ratios, and firms in the tsunami sample with research and development expenses are likely to have less risk which, in turn, translates to higher expected credit ratings. We also control for asset specialization by using tangible assets *(tang).* Firms with more tangible assets are likely to have more specialized assets and product. Alissa et al. (2013) and Hovakimian et al. (2009) assume that firms with this characteristic should be willing to bear more bankruptcy risk. Hence, they should have higher expected credit ratings. This is

consistent with our results that firms in the flooding sample with more tangible assets have higher expected credit rating as shown in Table 4.3.

Controlling for a firm's profitability is also important because firms that generate more income, should have higher expected credit rating because of their lower default risk (Alissa et al., 2013). Thus, we include profitability *(profit)* in equation (2), to estimate a firm's expected credit rating and the result is consistent with prior studies, for firms in the flooding sample. Next, we control for firm risk by using size *(size)* measured as the natural logarithm of the firm's total assets in the model. Alissa et al. (2013) document that larger firms have higher expected credit ratings because they are better able to survive market volatility and have greater transparency and lower bankruptcy risk. However, the coefficient of size for firms in the tsunami and flooding samples in Table 4.3 is non-significant. Finally, following Alssia et al. (2013) we control for operating risk by using a firm's operating income scaled by lagged total assets *(oprisk).* Our result for firms in the flooding sample is consistent with Alissa et al. (2013) that riskier firms face a greater likelihood of failure. Thus, such firms should have lower expected credit rating[24].

[24] In addition, we run sensitivity analysis where the dependent variable, the actual credit rating as of 31st March, takes on values from 1 to 17 for the tsunami sample and 1 to 15 for the to correct for some scores missing as mentioned above. We present the level of credit ratings which we use for those sensitivity analyses in appendix 4.2 (columns 4-5). The sensitivity results (not tabulated) remain qualitatively similar to those reported in the main result in Table 4.3.

Table 4.4: Distribution of actual rating deviations from expected credit ratings

Panel A: Tsunami (Data in 2001-2003)

Actual CR		Expected CR								Total
Ordinal variable	**Score**	**D**	**CCC+**	**BB-**	**BB**	**BBB**	**BBB+**	**A-**	**AA-**	
Non-Investment-grade ratings										
1	**D**	**13**	0	0	1	0	0	0	0	**14**
3	**CC**	3	0	1	0	0	0	0	0	**4**
5	**CCC**	1	1	1	0	0	0	0	0	**3**
6	**CCC+**	0	**2**	2	1	0	0	0	0	**5**
7	**B-**	0	1	0	0	0	0	0	0	**1**
8	**B**	2	0	2	0	0	0	0	0	**4**
9	**B+**	0	0	5	1	0	0	0	0	**6**
10	**BB-**	0	0	**9**	3	0	0	0	0	**12**
11	**BB**	0	0	2	**6**	0	4	0	0	**12**
12	**BB+**	0	0	1	2	0	6	0	0	**9**
Investment-grade ratings										
13	**BBB-**	0	0	0	0	3	5	0	0	**8**
14	**BBB**	0	0	1	3	**1**	11	0	0	**16**
15	**BBB+**	0	0	2	0	0	**21**	0	1	**24**
16	**A-**	0	0	0	2	0	4	**7**	1	**14**
17	**A**	0	0	0	0	0	4	0	0	**4**
18	**A+**	0	0	0	0	0	4	0	1	**5**
19	**AA-**	0	0	0	0	0	1	3	**6**	**10**
20	**AA**	0	0	0	0	0	0	0	1	**1**
Total		**19**	**4**	**26**	**19**	**4**	**60**	**10**	**10**	**152**

Panel B: Flooding (Data in 2008-2010)

Actual CR		Expected CR							Total
Ordinal variable	**Score**	**D**	**B**	**B+**	**BBB-**	**BBB**	**A**	**AA-**	
Non-Investment-grade ratings									
1	**D**	**1**	1	1	1	1	0	0	**5**
3	**CC**	0	0	0	0	1	0	0	**1**
7	**B-**	1	3	2	2	3	0	0	**11**
8	**B**	2	**7**	9	2	4	0	0	**24**
9	**B+**	0	5	**21**	6	3	1	0	**36**
10	**BB-**	0	0	11	3	5	1	0	**20**
11	**BB**	0	0	6	6	5	0	0	**17**
12	**BB+**	0	0	2	4	3	0	0	**9**
Investment-grade ratings									
13	**BBB-**	0	1	10	**12**	17	3	0	**43**
14	**BBB**	0	0	5	10	**29**	4	0	**48**
15	**BBB+**	0	0	1	1	14	3	0	**19**
16	**A-**	0	0	1	4	17	9	0	**31**
17	**A**	0	0	0	0	14	**21**	0	**35**
18	**A+**	0	0	0	0	0	1	0	**1**
19	**AA-**	0	0	0	0	1	0	**3**	**4**
20	**AA**	0	0	0	0	0	0	0	**0**
Total		**4**	**17**	**69**	**51**	**117**	**43**	**3**	**304**

This table presents the distribution of actual credit ratings as of 31st March by expected credit ratings based on annual estimations of the expected rating ordered probit model for firms in the tsunami sample (Panel A) and firms in the flooding sample (Panel B). In this table, actual credit rating is an ordinal variable taking on values from 1 to 20 representing the firm's S&P long-term credit rating (e.g. D=1, and AA=20).

We estimate a firm's "expected" credit rating for a given firm in a given year before the disasters occurred by using a model from the target capital structure literature, following Alissa et al. (2013) and Hovakimian et al. (2009) as shown in equation (2)

$$Actual\ CR_{i,t+1} = f_{i,t}\,(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

Actual credit ratings are showed by row and expected credit ratings are showed by column. The bold numbers are row and column, which combinations for the same rating level indicate at-expected-rating firms. For example, in Panel A for firms in the tsunami sample, the 9 firm-years with both a BB- actual rating as of 31st March and BB- expected rating are considered at-expected.

Table 4.4 presents the distribution of actual credit ratings as of 31st March by expected credit ratings based on annual estimations of the expected rating ordered probit model in equation (2) for firms in the tsunami sample (Panel A) and firms in the flooding sample (Panel B). In this table, actual and expected credit ratings are ordinal variables taking on values from 1 to 20 representing the firm's S&P long-term credit rating (e.g. D=1, and AA=20). Actual credit ratings are presented in rows and expected credit ratings are presented in columns. The numbers in bold represent instances where the actual and expected credit ratings are the same. Based on the results reported in Table 4.4, overall the expected rating is a good proxy for actual credit rating.

3.2.3 Control variables

Following prior research (e.g. Alissa et al., 2013; Demirtas and Cornaggia, 2013; Kim et al., 2013; Jiang, 2008; and Jung et al., 2013), we include eight control variables that could affect both the actual and expected credit ratings. This controls include growth opportunities, asset specialization, profitability, size, operating risk, and performance. Three control variables *(mb, profit,* and *size)* also appear in equation (2), to estimate a firm's expected credit rating as discussed above. Moreover, we computed sales growth *(growth)* as the percentage of the year growth in sales to control for growth opportunities. Firms with higher future growth options should expect a higher credit rating (Alissa et

al., 2013). Moreover, we include a firm's return on assets *(roa)* to control for firm's performance. Jiang (2008) indicates that firms with better performance have a lower cost of debt and are considered to have higher credit ratings. Jiang (2008) also documents that firms with higher leverage ratios have a higher cost of debt, and are considered to have lower credit ratings because of high probability of bankruptcy. Thus, we include the leverage ratios *(lev)* as a control variable too. Next, we control for a firm's expected ability to repay interest and principal. This is important because a greater value of a firm's interest coverage ratio implies that the firm is able to meet future debt obligations, suggesting higher credit ratings (Carter, 2015). Thus, we include, as a control variable, the interest coverage ratio *(intcov)* which is measured as earnings before interest and taxes (EBIT) divided by interest expense. Finally, we include dummy variables for the firms close to broad credit rating categories cut-off points *(plusminus)* to control for differences in incentives for earnings management activity across the firms. Kisgen (2006) indicates that firms near a broad rating boundary (plus and minus) are more likely to decrease their financial leverage than firms in the middle of ratings in order to achieve rating upgrades or avoid rating downgrades. All of these variables are based on information obtained from Bloomberg. All continuous non-log transformed variables are winsorized at 1%.

4 Results

4.1 Descriptive statistics and correlations

We begin with descriptive statistics of the various credit ratings and earnings management metrics for the two disaster periods (tsunami and flooding). Table 4.5 presents sample descriptive statistics for credit ratings in pre- and post-

disasters occurred (Panel A), independent variables that influence firm's expected credit ratings (Panel B), accruals earnings management (Panel C), real earnings management (Panel D), and other variables (Panel E). Note that the *CFO* and *Disc* variables in Panel D are multiplied by minus one to allow real and accruals earnings management proxies to have the same interpretation.

Table 4.5: Descriptive statistics

Panel A: Descriptive statistics for credit ratings in pre- and post- disasters occurred

Description	Samples	mean	SD	median	min	max	P25	P75
Pre-disaster periods								
Tsunami (Data in 2001-2004)								
Actual CR	195	11.687	5.085	13.000	0.000	20.000	10.000	15.000
Expected CR	195	11.786	5.042	15.000	1.000	19.000	10.000	15.000
diff	195	-0.005	2.353	0.000	-8.000	9.000	-1.000	1.000
Flooding (Data in 2008-2011)								
Actual CR	374	11.066	5.102	13.000	0.000	19.000	9.000	15.000
Expected CR	374	11.650	4.076	13.000	1.000	19.000	9.000	14.000
diff	374	-0.413	3.330	0.000	-9.000	9.000	-1.000	1.000
Post-disaster periods								
Tsunami (Data in 2005-2006)								
Actual CR	86	12.779	3.513	13.000	1.000	19.000	10.000	16.000
Expected CR	86	12.605	3.692	14.000	1.000	19.000	10.000	15.000
diff	86	0.174	2.943	0.000	-9.000	8.000	-2.000	2.000
Flooding (Data in 2012-2013)								
Actual CR	154	12.318	3.281	13.000	1.000	18.000	9.000	15.000
Expected CR	154	12.188	2.890	13.500	1.000	17.000	9.000	14.000
diff	154	0.130	2.943	1.000	-8.000	8.000	-1.000	2.000

Panel B: Descriptive statistics for independent variables that influence firm's expected credit ratings

Description	Samples	mean	SD	median	min	max	P25	P75
Tsunami (Data in 2001-2003)								
mb	152	1.061	2.260	0.598	0.000	25.105	0.000	1.348
tang	152	1.051	3.507	0.015	0.000	24.396	0.002	0.123
rd	152	0.003	0.009	0.000	0.000	0.060	0.000	0.000
rdind	152	0.421	0.495	0.000	0.000	1.000	0.000	1.000
sga	152	0.009	0.057	0.000	0.000	0.407	0.000	0.000
profit	152	5.448	22.903	0.021	-0.692	160.411	0 .000	0.674
size	152	5.268	2.608	5.206	0.464	9.834	3.177	7.577
operrisk	152	13.406	35.443	2.848	0.000	211.712	0.000	10.746
Flooding (Data in 2008-2010)								
mb	304	2.724	4.510	1.383	0.000	31.120	0.858	2.577
tang	304	2.054	5.801	0.019	0.000	26.918	0.002	0.222
rd	304	0.005	0.013	0.000	0.000	0.068	0.000	0.000
rdind	304	0.632	0.483	1.000	0.000	1.000	0.000	1.000
sga	304	0.023	0.088	0.000	0.000	0.614	0.000	0 .000
profit	304	7.523	21.294	0.252	-5.043	164.041	0.008	4.006
size	304	6.216	2.631	6.563	1.228	9.841	3.925	8.867
operrisk	304	18.023	32.869	4.180	0.000	188.833	0.153	16.743

Panel C: Descriptive statistics for accruals earnings management

Description	Samples	mean	SD	median	min	max	P25	P75
Tsunami (Data in 2001-2006)								
Accruals earnings management								
AEM_Modified DD	281	-0.013	0.198	-0.003	-0.575	0.455	-0.083	0.072
AEM_Performance Match	281	-0.008	0.194	-0.009	-0.927	0.805	-0.086	0.077
Accruals earnings management dummies								
AEM_Modified DD dummy	281	0.466	0.500	0.000	0.000	1.000	0.000	1.000
AEM_Performance Match dummy	281	0.498	0.501	0.000	0.000	1.000	0.000	1.000

Description	Samples	mean	SD	median	min	max	P25	P75
Flooding (Data in 2008-2013)								
Accruals earnings management								
AEM_Modified DD	528	0.019	0.181	0.021	-0.550	0.535	-0.037	0.075
AEM_Performance Match	528	-0.003	0.294	-0.007	-0.927	0.805	-0.097	0.088
Accruals earnings management dummies								
AEM_Modified DD dummy	528	0.491	0.500	0.000	0.000	1.000	0.000	1.000
AEM_Performance Match dummy	528	0.504	0.500	1.000	0.000	1.000	0.000	1.000

Panel D: Descriptive statistics for real earnings management

Description	Samples	mean	SD	median	min	max	P25	P75
Tsunami (Data in 2001-2006)								
Real earnings management								
REM_CFO	281	-0.018	0.206	-0.019	-0.642	0.607	-0.087	0.045
REM_Disc	281	-0.057	0.165	-0.022	-0.357	0.748	-0.091	0.014
Real earnings management dummies								
REM_CFO dummy	281	0.544	0.499	1.000	0.000	1.000	0.000	1.000
REM _Disc dummy	281	0.630	0.484	1.000	0.000	1.000	0.000	1.000
Flooding (Data in 2008-2013)								
Real earnings management								
REM_CFO	528	-0.031	0.254	-0.013	-0.642	0.607	-0.119	0.057
REM_Disc	528	-0.090	0.224	-0.038	-0.385	0.748	-0.143	0.173
Real earnings management dummies								
REM _CFO dummy	528	0.509	0.500	1.000	0.000	1.000	0.000	1.000
REM _Disc dummy	528	0.587	0.493	1.000	0.000	1.000	0.000	1.000

Panel E: Descriptive statistics for other variables

Description	Samples	mean	SD	median	min	max	P25	P75
Tsunami (Data in 2001-2006)								
mb	281	1.242	1.923	0.859	0.000	25.105	0.174	1.667
profit	281	7.730	26.384	0.069	-1.441	164.041	0.000	2.344
size	281	5.743	2.683	5.791	0.464	9.834	3.661	7.877
growth (%)	281	0.117	0.215	0.071	-0.357	1.070	0.002	0.196
roa	281	0.015	0.128	0.017	-0.472	0.631	-0.034	0.056
lev (%)	281	14.956	18.537	6.993	0.000	85.299	0.018	27.510
intcov	281	4.754	5.947	3.244	0.000	15.651	0.390	10.961
plusminus	281	0.612	0.488	1.000	0.000	1.000	0.000	1.000
Flooding (Data in 2008-2013)								
mb	528	2.870	4.773	1.437	0.000	31.120	0.844	2.890
profit	528	7.977	22.782	0.324	-5.043	164.041	0.007	3.614
size	528	6.382	2.524	6.682	1.228	9.841	4.125	8.753
growth (%)	528	0.100	0.316	0.055	-0.753	1.551	-0.014	0.168
roa	528	0.047	0.138	0.030	-0.495	0.620	0.003	0.085
lev (%)	528	12.148	18.678	2.907	0.000	98.806	0.000	17.970
intcov	528	6.962	7.982	3.704	0.000	22.374	0.740	13.098
plusminus	528	0.540	0.499	1.000	0.000	1.000	0.000	1.000

This table shows the descriptive statistics of variables used in the analyses. Panel A presents sample descriptive statistics for credit ratings in pre- and post- disaster periods and Panel B presents independent variables that influence firms' expected credit ratings. We estimate a firm's "expected" credit rating for a given firm in a given year before the disasters occurred (2001-2003 for firms in tsunami and 2008-2010 for firms in flooding) by using a model from the target capital structure literature, following Alissa et al. (2013) and Hovakimian et al. (2009) as shown in equation (2)

$$Actual\ CR_{i,t+1} = f_{i,t}(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

The coefficients obtained from regression (2) above use to estimate expected credit ratings for both pre- and post- disaster years.

Panels C and D show sample descriptive statistics for AEM and REM respectively. EM is measured as the residuals from EM models and a dummies (*Modified DD, Performance Match, CFO, Disc, Modified DD dummy, Performance Match dummy, CFO dummy,* and *Disc dummy* variables). Panel E presents sample descriptive statistics for control variables, which we use to assess the consequences of earnings management during natural disasters on deviations from expected credit rating as shown in equation (1)

$$diff_{i,t+1} = f_{i,t}(b_0 + b_1 treatedT/treatedF + b_2 em + b_3 treatedT/treatedF*em + b_4 control\ variables + e) \quad (1)$$

To avoid the influence of outliers all continuous financial data are winsorized at 1% and 99% by separating firms in the tsunami and flooding samples. All variables are otherwise calculated as described in appendix 4.1.

As discussed above, annual corporate financial statements including the effects of the tsunami and flooding are issued to the public by the end of March in 2005 and 2012, respectively, because we consider only firms with fiscal year ending in December in our analysis and both tsunami and flooding occurred during the last quarter in 2004 and 2011, respectively. Therefore, we focus on credit ratings as of 31st March, instead of credit ratings as of 31st December. To be consistent with the setting of credit ratings term, we set two periods which are the periods before and after disaster in Panel A of Table 4.5 as follows: (1) the periods before the tsunami and flooding occurred are 2001-2004 and 2008-2011, respectively; and (2) the periods after the tsunami and flooding occurred are 2005-2006 and 2012-2013, respectively. However, to estimate the coefficients applied in the calculation of expected credit rating for both the pre- and post- disaster periods, we use two samples periods before the disasters occurred (2001-2003 and 2008-2010), corresponding to the two natural disasters investigated, the tsunami and flooding which occurred in 2004 and 2011, respectively. The size of the final samples we use to estimate expected credit ratings is 152 firm-year observations over the period 2001-2003 and 304 firm-year observations over the period 2008-2010.

In Panel A, the mean expected CR for firms in the pre-disaster sub-samples is only slightly higher than the mean actual CR, while, the mean expected CR for firms in the post-disaster sub-samples is only slightly lower than the mean actual CR. Specifically, the mean expected CR for firms in the pre- (post) tsunami and firms in the pre- (post) flooding samples are 11.786 (12.605) and 11.605 (12.188), respectively, while, the mean actual CR for firms in the pre-

(post) tsunami and firms in the pre- (post) flooding samples are 11.687 (12.779) and 11.066 (12.318), respectively.

Because our study was conducted on the behaviour of firms whose credit ratings diverge from their expected credit rating, it is useful to understand the distribution of rating deviations (*diff*) in our sample. The interquartile range extends from -1.000 to 1.000 for firms in the pre-disasters sample, which indicates that 50% of the sample possesses a credit rating between one notch below and one notch above its expected value for both firms in the pre-tsunami sample and firms in the pre-flooding sample. In contrast, we find that the interquartile range extends from -2.000 to 2.000 (-1.000 to 2.000) for both firms in the post-tsunami and firms in the post-flooding samples. Interestingly, mean rating deviations (*diff*) for firms in the pre-tsunami and firms in the pre-flooding samples are negative, which are -0.005 and -0.413, respectively, while, mean rating deviations (*diff*) for firms in the post-tsunami and firms in the post-flooding samples are positive, which are 0.174 and 0.130, respectively.

As shown in Panel B, the tsunami sample firms have an average market value to total book assets of 1.06, net property, plant, and equipment, to total assets of 1.05, research and development (R&D) expenses to sales of 0.00, R&D indicator of 0.42, selling, general, and administrative (SG&A) expenses to sales of 0.01, operating income to lagged total assets of 5.45, a size of 5.27, and standard deviations of operating income to lagged total assets of 13.41 (2.72, 2.05, 0.01, 0.63, 0.02, 7.52, 6.22, and 18.02 respectively for flooding sample firms).

Next, we provide descriptive statistics for the two main time periods (2001-2006 and 2008-2013), which are the periods we use to test the consequences of

earnings management on deviations from expected credit rating around the tsunami and flooding disasters. The final sample is 281 firm-year observations over the period 2001-2006 and 528 firm-year observations over the period 2008-2013.

In Panel C, mean *Modified DD* and *Performance Match* variables for both firms in the tsunami and firms in the flooding samples are negative (between -0.003 to -0.013), except from the mean *Modified DD* variable for firms in the flooding sample which is approximately 0.019. This means that, at the descriptive level, firms appear to manipulate earnings both upward and downward by using discretionary accruals.

In Panel D, the mean real earnings management in all models (*CFO* and *Disc* variables) for firms in the tsunami and firms in the flooding samples are negative (between -0.018 to -0.090). This suggests that on average firms engaging in downward earnings management by changing their real decision or expenses (e.g. cutting price discounts, reducing credit terms, increasing R&D expenses, increasing advertising expenditure, and decreasing product volume).

Furthermore, when we compare the magnitude of (1) mean accruals and real earnings management, and (2) mean accruals and real earnings management dummies, we find at the descriptive level that firms in the tsunami and firms in the flooding samples are more likely to manage earnings via REM than AEM. For example, in the tsunami sample, the magnitude of mean *CFO* variable is higher than the magnitude of mean *Modified DD* variable (0.018 - 0.013 = 0.005), whereas, mean *CFO dummy* variable is higher than mean *Modified DD dummy* variable (0.544 - 0.466 = 0.078). Similarly, the magnitude of mean *CFO* and *Disc dummy* for firms in the flooding sample are 0.031 and 0.587, respectively, while, the magnitude of mean *Modified DD* and *Performance*

Match dummy for firms in the flooding sample are 0.019 and 0.504, respectively. From the analysis of EM and EM dummy at the descriptive level above, we can infer that firms are less likely to manage earnings via AEM compared to REM because REM are harder for auditors or investors to detect.

In Panel E, tsunami sample firms have firm's market value to total book assets of 1.24, operating income to lagged total assets of 7.73, a size of 5.74, a 11.70% annual growth in sales, a ROA of 0.02, a 14.96% of long-term liabilities to total assets, interest coverage ratio of 4.75, and plus minus of 0.61 (2.87, 7.98, 6.38, 10.00%, 0.05, 12.15%, 6.96, and 0.54, respectively for flooding sample firms).

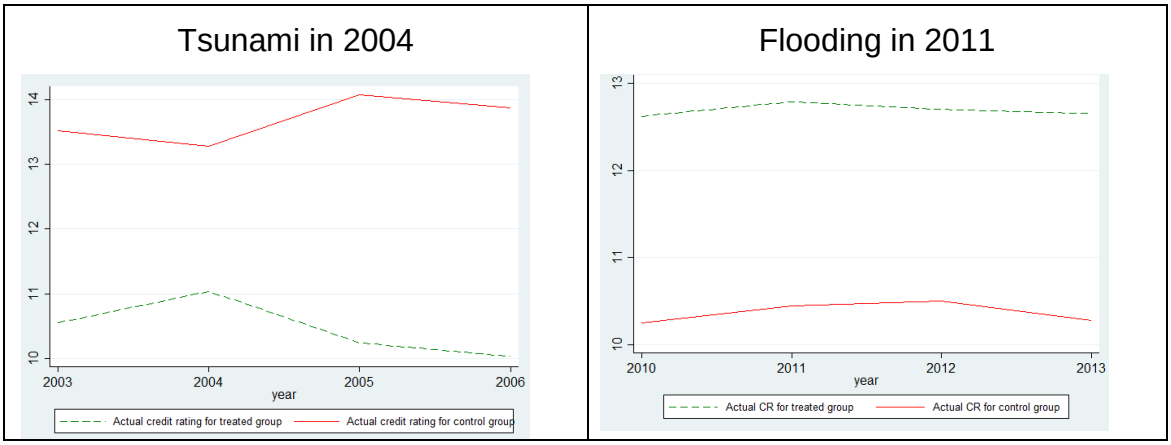
Before turning to the formal empirical analysis, we examine the time-trends behaviour of actual CR and expected CR as illustrated by the graphs below. Figure 4.2 presents the graphs for yearly mean actual CR as at 31st March and mean expected CR for the event years, one year before and two years after the disasters occurred for each group (treatment and control groups). Panel A provides time-series plots of mean actual CR for firm-years in treatment and control groups; whereas, Panel B shows time-series plots of mean expected CR for firm-years in treatment group and control group.

The graphs illustrate that mean actual CR in Panel A and mean expected CR in Panel B for the treatment group (green dot) appear to decrease immediately in the fiscal year during which disasters occurred *(y_0)* (tsunami and flooding occur in 2004 and 2011, respectively). In the control group (red line), the trend of actual CR in Panel A and expected CR in Panel B during post-tsunami is higher than pre-tsunami, while, the trend of expected CR in control group (red line) during post-flooding occurred is a little bit lower than during the pre-flooding

period. Overall, graphs imply that natural disasters affected expected CR downgrades for treated firms in the tsunami and firms in the flooding samples.

Figure 4.2: Time-series plots of actual credit rating and expected credit rating

Panel A: Comparing trends of actual credit rating between treatment and control groups



Panel B: Comparing trends of expected credit rating between treatment and control groups

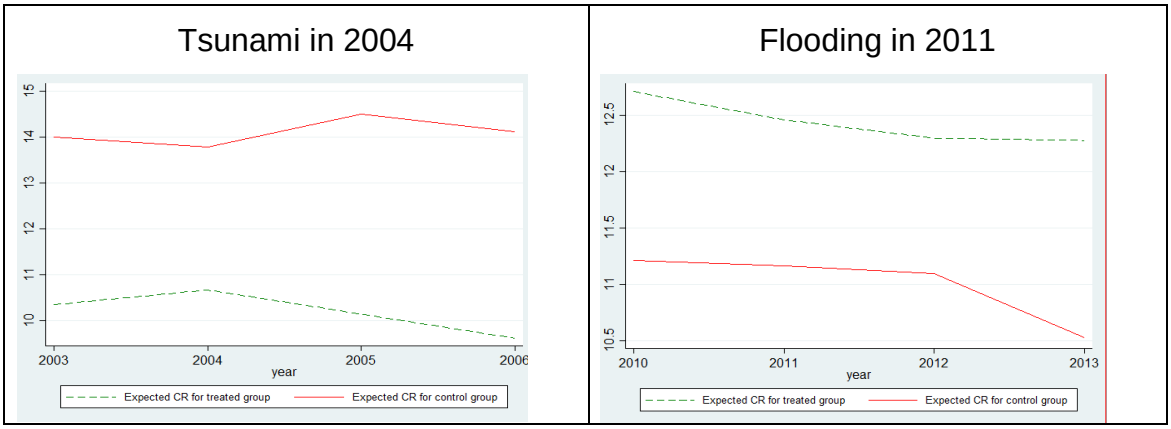


Figure 4.2 provides time-series plots of actual and expected CR for the event years, one year before and two years after the disaster occurred for each group (treatment and control groups). $Year_0$ (i.e. the fiscal year during which each disaster occurred) is respectively 2004 for the tsunami and 2011 for the flooding. Panel A compares trends of actual CR between treatment and control groups. Panel B compares trends of expected CR between treatment and control groups.

To support the visual results reported above, we compare the differences between treatment group and control group before and after two disasters (tsunami and flooding) by actual credit ratings (Panel A), expected credit ratings (Panel B), and the deviations from expected credit rating (Panel C) as shown in Table 4.6. Again, we set two periods to be consistent with the setting of credit rating term which are the periods before and after disaster in Table 4.6 as follows: (1) the periods before the tsunami and flooding occurred are 2001-2004 and 2008-2011, respectively; and (2) the periods after the tsunami and flooding occurred are 2005-2006 and 2012-2013, respectively.

Table 4.6: Comparing differences between the two groups (treatment and control) before and after the disasters

Panel A: Comparing differences of actual credit rating

Group	Tsunami			Flooding		
	Before disaster	After disaster	Difference	Before disaster	After disaster	Difference
Actual credit rating						
Treated	10.330	10.133	-0.197	12.660	12.678	0.018
Control	14.044	13.967	0.078	10.352	10.380	0.029
Difference	-3.714***	-3.833***	**-0.275*** **	2.309***	2.298***	**-0.011** **

Panel B: Comparing differences of expected credit rating

Group	Tsunami			Flooding		
	Before disaster	After disaster	Difference	Before disaster	After disaster	Difference
Expected credit rating						
Treated	10.330	9.867	-0.464	12.890	12.286	-0.604*
Control	14.149	14.300	0.151	11.104	10.788	0.316
Difference	-3.819***	-4.433***	**-0.615*** **	1.786***	1.498***	**-0.920*** **

Panel C: Comparing differences of the deviations from expected credit rating

Group	Tsunami			Flooding		
	Before disaster	After disaster	Difference	Before disaster	After disaster	Difference
Deviations from expected credit rating						
Treated	0.081	0.267	0.186	-0.009	0.393	0.402
Control	-0.104	-0.333	-0.229	-0.707	-0.407	0.300
Difference	0.185	-0.600	0.043	0.698*	0.800	**0.102** **

Table 4.6 presents differences between the two groups (treatment and control) before and after the two disasters (tsunami and flooding) based on actual CR (Panel A), expected CR (Panel B), and diff (Panel C). The actual CR is an ordinal variable taking on values from 1 to 20 representing the firm's S&P long-term credit rating. We estimate a firm's "expected" credit rating

for a given firm in a given year before the disasters occurred by using a model following Alissa et al. (2013) and Hovakimian et al. (2009) as shown in equation (2)

$$Actual\ CR_{i,t+1} = f_{i,t}(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

Deviations from expected credit ratings *(diff)* is a firm's actual CR as at 31st March minus its expected CR as estimated based on equation (2). The "Difference" in the last column is the mean of actual CR, expected CR, and diff after disasters minus the corresponding mean before the disasters; whereas, "Difference" in the last row is the mean of actual CR, expected CR, and diff in treated group minus that of the control group. The main coefficient of interest is reported in bold. Differences in means are tested using t-tests. The differences shown in red colour are statistically significant at less than 10 percent level. All variables are otherwise calculated as described in appendix 4.1. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

There are three points to discuss. We start by looking at the difference (column-wise) between the mean actual CR (Panel A), mean expected CR (Panel B), and mean diff (Panel C) before and after disasters. We cannot find statistical differences between the mean actual CR and the mean diff for the treatment and control groups between before and after disasters as shown in Panel A and Panel C. However, we find that mean expected CR for the treatment group decreases from 12.890 in the pre-flooding to 12.286 in the post- flooding and the decrease (-0.604) is significant at the 10% level (t = -1.66), while we cannot find statistically significant differences in the mean expected CR for the control group before and after the disasters.

Next, we consider the difference (row-wise) between the mean actual CR (Panel A), mean expected CR (Panel B), and mean diff (Panel C) in the treatment group minus the control group. We find that before and after the disasters, the magnitude of mean actual CR and magnitude of mean expected CR for the treatment group are significantly different from the control group at 1% level as shown in Panel A and Panel B of Table 4.6. Interestingly, we find that during pre- and post-tsunami, the magnitude of mean actual CR and expected CR in the treatment group are lower than the control group. In contrast, during pre- and post-flooding, the magnitude of mean actual CR and

expected CR in the treatment group are higher than the control group. In Panel C, there is no evidence that during pre- and post-disasters, the mean diff in the treatment group is significantly different from the control group, except during pre-flooding, the mean diff in the treatment group is significantly different from the control group which is 0.698 at 10% level (t = 1.90).

The main coefficient of interest is the diff-in-diff between the two groups (*treatment* and *control*) and two periods (pre- and post-disasters), which is reported in bold. As presented in Table 4.6 in Panel A, after both disasters the post- minus pre- mean of the actual CR is significantly lower for the treatment group compared to the control group. The same is true for expected CR in Panel B. However, the magnitude of the diff-in-diff for the expected CR is significantly higher compared to the actual CR, providing some very preliminary evidence consistent with treated firms managing to manipulate their actual CR. Similarly, in Panel C, we find a positive (0.102) and statistically significant at 5% level (t = -2.48) difference between the average diff of the treatment and control group.

The correlation among rating deviations (*diff*), AEM, REM, and control variables for our main analysis is reported in Table 4.7. Table 4.7 presents Spearman correlation (above the diagonal) and Pearson correlation (below the diagonal) for the entire sample of 281 firm-years over the period 2001-2006 (Panel A) and 528 firm-years over the period 2008-2013 (Panel B).

In the tsunami sample as shown in Panel A, both Spearman and Pearson correlation show a significant positive correlation at 10% confidence level between rating deviations (*diff*) and the *Disc* variable. This suggests that firms engaging in REM have achieved to influence their credit rating following the tsunami in 2004. Furthermore, we find that both Spearman and Pearson

correlation show a significant negative correlation at 1% confidence level between (1) *Performance Match* and *CFO* variables, and (2) *Performance Match* and *Disc* variables. This high negative correlation between AEM and REM can be explained by the fact that firm managers utilize accruals and real earning management in tsunami period by trading-off the costs and benefits of each other as substitute. This is consistent with past research findings (e.g. Irani and Oesch, 2016; and Alhadab et al., 2016) and the idea that managers prefer to use discretionary accruals for firms in the tsunami sample and REM for firms in the flooding sample (also confirmed by sensitivity analysis tests below). On the other hand, the correlation coefficient between (1) *Modified DD* and *Performance Match* variables, and (2) *CFO* and *Disc* variables are positive and statistically significant at 1 % confidence level, consistent with these types of earnings management being complementary in this setting.

Further, we find that rating deviations (*diff*) is significantly higher for firms that are more profitable and larger in size, have high growth opportunities, higher firm's performance and higher interest coverage ratio. Lastly, we find that accruals and real earnings management are significantly higher for firms that are more profitable, larger in size, and have higher firm's performance; whereas, they are lower for firms that have higher leverage.

In general, correlations in Panel B are consistent with correlations in Panel A and prior research work. In the flooding sample, only Spearman correlation show a significant positive correlation at less than 5% level between rating deviations (*diff*) and REM (*CFO* and *Disc* variables). We, further, find a significant negative correlation at less than 10% level between AEM and REM variables, suggesting that firms are likely to use these two earnings

management techniques as substitutes. However, the correlation coefficient between (1) *Modified DD* and *Performance Match* variables, and (2) *CFO* and *Disc* variables are positive and statistically significant at less than 10 % level. Finally, we find that rating deviations (*diff*) is significantly higher for firms that have higher firm's performance, higher interest coverage ratio, and are near a broad rating boundary (plus and minus); whereas, AEM and REM are significantly higher for firms that have higher firm's performance, are more profitable, growing larger, have higher interest coverage ratio, and are near a broad rating boundary.

Table 4.7: Pearson and Spearman correlation

Panel A: Tsunami (Data in 2001-2006)

Pearson correlation / Spearman correlation	diff	Modified DD	Performance Match	CFO	Disc	mb	profit	size	growth	roa	lev	intcov	Plus minus
diff		-0.051	-0.033	0.001	0.104*	0.101*	0.034	0.158***	0.148**	0.130**	-0.007	0.158***	0.080
		(0.395)	(0.579)	(0.983)	(0.083)	(0.091)	(0.572)	(0.008)	(0.013)	(0.030)	(0.910)	(0.008)	(0.184)
Modified DD	-0.059		0.214***	0.081	0.058	-0.098	0.134**	0.033	-0.022	0.383***	-0.043	0.020	-0.061
	(0.324)		(0.000)	(0.178)	(0.338)	(0.101)	(0.025)	(0.579)	(0.721)	(0.000)	(0.471)	(0.738)	(0.309)
Performance Match	-0.028	0.217***		-0.352***	-0.187***	-0.038	0.089	0.127**	0.023	0.016	-0.055	0.003	-0.094
	(0.647)	(0.000)		(0.000)	(0.002)	(0.532)	(0.137)	(0.033)	(0.707)	(0.787)	(0.356)	(0.955)	(0.118)
CFO	0.003	0.084	-0.354***		0.185***	0.023	0.048	0.048	-0.020	0.165***	-0.050	0.010	-0.094
	(0.957)	(0.161)	(0.000)		(0.002)	(0.708)	(0.423)	(0.427)	(0.741)	(0.006)	(0.403)	(0.864)	(0.117)
Disc	0.103*	0.060	-0.189***	0.187***		0.003	0.125**	0.161***	-0.076	0.079	-0.099*	-0.057	-0.048
	(0.085)	(0.316)	(0.002)	(0.002)		(0.965)	(0.036)	(0.007)	(0.204)	(0.189)	(0.097)	(0.340)	(0.431)
mb	0.085	-0.022	0.011	-0.063	0.068		0.445***	0.443***	0.292***	-0.157***	0.036	0.383***	0.067
	(0.158)	(0.710)	(0.851)	(0.290)	(0.255)		(0.000)	(0.000)	(0.000)	(0.009)	(0.545)	(0.000)	(0.261)
profit	0.123**	0.008	0.064	0.074	0.259***	0.047		0.379***	0.205***	-0.121**	0.105*	0.359***	0.023
	(0.040)	(0.891)	(0.282)	(0.219)	(0.000)	(0.437)		(0.000)	(0.001)	(0.044)	(0.080)	(0.000)	(0.702)
size	0.179***	0.034	0.125**	0.054	0.160***	0.227***	0.131**		0.167***	0.012	0.075	0.138**	0.096
	(0.003)	(0.571)	(0.036)	(0.369)	(0.007)	(0.000)	(0.028)		(0.005)	(0.844)	(0.209)	(0.021)	(0.110)
growth	0.126**	0.007	0.027	-0.056	-0.054	0.078	0.041	0.033		-0.086	0.025	0.318***	0.095
	(0.035)	(0.913)	(0.650)	(0.351)	(0.369)	(0.192)	(0.498)	(0.580)		(0.152)	(0.673)	(0.000)	(0.112)
roa	0.038	0.314***	0.021	0.157***	0.025	-0.109*	-0.016	0.093	-0.037		0.008	-0.066	-0.053
	(0.523)	(0.000)	(0.723)	(0.008)	(0.682)	(0.068)	(0.788)	(0.120)	(0.533)		(0.898)	(0.272)	(0.381)
lev	0.050	-0.004	-0.060	-0.018	-0.111*	0.012	-0.117*	0.146**	-0.043	0.072		0.010	0.087
	(0.402)	(0.950)	(0.314)	(0.758)	(0.064)	(0.844)	(0.051)	(0.014)	(0.469)	(0.229)		(0.872)	(0.147)
intcov	0.009	0.008	-0.057	-0.050	0.062	-0.006	-0.055	-0.155***	-0.040	0.028	-0.017		0.190***
	(0.882)	(0.907)	(0.342)	(0.408)	(0.299)	(0.927)	(0.355)	(0.009)	(0.501)	(0.637)	(0.733)		(0.001)
plusminus	0.067	-0.065	-0.098	-0.098	-0.051	0.064	-0.013	0.091	0.031	-0.044	0.095	0.125**	
	(0.264)	(0.275)	(0.102)	(0.103)	(0.399)	(0.287)	(0.823)	(0.129)	(0.603)	(0.463)	(0.114)	(0.037)	

Panel B: Flooding (Data in 2008-2013)

Pearson correlation / Spearman correlation	diff	Modified DD	Performance Match	CFO	Disc	mb	profit	size	growth	roa	lev	intcov	Plus minus
diff		-0.064	0.025	0.088**	0.125***	0.009	-0.043	-0.058	0.041	0.172***	-0.005	0.197***	0.096**
		(0.146)	(0.561)	(0.044)	(0.004)	(0.838)	(0.321)	(0.188)	(0.345)	(0.000)	(0.902)	(0.000)	(0.028)
Modified DD	-0.020		0.192***	-0.053	-0.072*	-0.050	0.052	0.086**	-0.038	0.428***	-0.067	-0.038	0.010
	(0.641)		(0.000)	(0.223)	(0.099)	(0.252)	(0.232)	(0.049)	(0.384)	(0.000)	(0.124)	(0.383)	(0.813)
Performance Match	0.038	0.130***		-0.400***	0.031	0.015	-0.042	0.043	-0.031	0.029	-0.025	0.017	0.073*
	(0.385)	(0.003)		(0.000)	(0.480)	(0.733)	(0.340)	(0.321)	(0.473)	(0.509)	(0.563)	(0.694)	(0.095)
CFO	0.057	-0.142***	-0.347***		0.086*	-0.005	0.085*	-0.037	0.007	0.267***	-0.008	-0.008	0.023
	(0.192)	(0.001)	(0.000)		(0.050)	(0.913)	(0.052)	(0.399)	(0.876)	(0.000)	(0.862)	(0.860)	(0.607)
Disc	0.020	-0.036	-0.091**	0.020		0.009	0.198***	0.080*	-0.046	0.186***	0.023	-0.038	0.090**
	(0.645)	(0.408)	(0.036)	(0.647)		(0.837)	(0.000)	(0.066)	(0.293)	(0.000)	(0.594)	(0.385)	(0.040)
mb	-0.033	-0.018	-0.026	0.014	0.076*		0.163***	-0.011	0.077*	0.004	-0.000	0.148***	0.060
	(0.451)	(0.676)	(0.550)	(0.748)	(0.080)		(0.000)	(0.808)	(0.077)	(0.925)	(0.995)	(0.001)	(0.169)
profit	-0.047	0.023	0.021	-0.011	0.215***	-0.010		0.622***	0.239***	0.036	0.172***	0.483***	-0.008
	(0.285)	(0.592)	(0.639)	(0.800)	(0.000)	(0.816)		(0.000)	(0.000)	(0.409)	(0.000)	(0.000)	(0.862)
size	-0.021	0.047	0.042	0.074*	-0.054	-0.124***	0.283***		0.091**	0.130***	0.061	0.227***	-0.047
	(0.634)	(0.282)	(0.339)	(0.088)	(0.214)	(0.004)	(0.000)		(0.037)	(0.003)	(0.165)	(0.000)	(0.286)
growth	0.022	-0.052	0.046	0.040	-0.019	-0.005	0.041	0.015		-0.013	-0.002	-0.261***	-0.035
	(0.616)	(0.237)	(0.293)	(0.358)	(0.661)	(0.902)	(0.352)	(0.735)		(0.763)	(0.968)	(0.000)	(0.429)
roa	0.124***	0.394***	-0.027	0.386***	0.194***	-0.015	-0.002	0.138***	-0.051		-0.166***	-0.094**	-0.030
	(0.004)	(0.000)	(0.538)	(0.000)	(0.000)	(0.734)	(0.956)	(0.002)	(0.244)		(0.000)	(0.032)	(0.497)
lev	-0.054	-0.040	-0.052	-0.005	-0.000	-0.089**	-0.046	0.004	-0.058	-0.113***		0.139***	-0.003
	(0.214)	(0.363)	(0.237)	(0.916)	(0.993)	(0.041)	(0.294)	(0.927)	(0.185)	(0.009)		(0.001)	(0.952)
intcov	0.081*	-0.043	-0.013	0.044	0.120***	-0.034	-0.057	-0.170***	-0.020	-0.072*	-0.021		-0.032
	(0.065)	(0.323)	(0.767)	(0.319)	(0.006)	(0.431)	(0.194)	(0.000)	(0.646)	(0.097)	(0.637)		(0.463)
plusminus	0.093**	0.034	0.064	-0.007	0.041	0.084*	0.061	-0.049	0.007	0.003	-0.024	0.100**	
	(0.033)	(0.443)	(0.143)	(0.873)	(0.343)	(0.053)	(0.163)	(0.263)	(0.876)	(0.940)	(0.580)	(0.021)	

Table 4.7 presents Spearman correlation (above the diagonal) and Pearson correlation (below the diagonal) for the entire sample of 281 firm-years over the period 2001-2006 for firms in the tsunami sample (Panel A) and 528 firm-years over the period 2008-2013 firms in the flooding sample (Panel B) to assess the consequences of EM during natural disasters on diff. All variables are otherwise calculated as described in appendix 4.1. To avoid the influence of outliers all continuous financial data are winsorized at 1% and 99% by separating firms in the tsunami and firms in the flooding samples *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

4.2 Multivariate analyses

As mentioned before, we use a diff-in-diff approach to assess differences between two groups *(treatedT/treatedF* and *control)* before and after the disasters. Table 4.8 presents the estimation results for equation (1).

Table 4.8: The consequences of earnings management during natural disasters on deviations from expected credit rating

$$diff_{i,t+1} = f_{i,t}(b_0 + b_1 treatedT/treatedF + b_2 em + b_3 treatedT/treatedF*em + b_4 control\ variables + e) \quad (1)$$

Panel A: Continuous earnings management variable

	Tsunami				**Flooding**			
	AEM		**REM**		**AEM**		**REM**	
	Modified DD	**Performance Match**	**CFO**	**Disc**	**Modified DD**	**Performance Match**	**CFO**	**Disc**
treatedT/ treatedF	0.097	-0.045	-0.362	-0.006	-0.246	-0.293	0.007	-0.232
	(0.638)	(0.655)	(0.637)	(0.723)	(0.390)	(0.403)	(0.418)	(0.398)
em	**0.966***	**1.010*****	0.286	-1.611	-0.708	-0.099	-0.123	-1.096
	(0.548)	**(0.294)**	(0.639)	(1.747)	(0.600)	(0.187)	(0.460)	(0.786)
treatedT/ treatedF*em	**-7.181****	**-3.106****	-4.862	-0.312	1.792	**-1.139****	**-1.715***	**-3.972*****
	(3.225)	**(1.542)**	(3.926)	(0.630)	(1.544)	**(0.452)**	**(1.023)**	**(1.416)**
mb	0.003	0.022	-0.003	0.001	**-0.107*****	**-0.116*****	**-0.098*****	**-0.094*****
	(0.031)	(0.030)	(0.032)	(0.027)	**(0.026)**	**(0.027)**	**(0.026)**	**(0.027)**
profit	**-0.023*****	**-0.024*****	**-0.026*****	**-0.027*****	-0.003	-0.005	-0.011	-0.012
	(0.007)	**(0.007)**	**(0.005)**	**(0.005)**	(0.011)	(0.010)	(0.010)	(0.010)
size	**0.677****	**0.702****	**0.638****	**0.692****	0.198	0.184	**0.589***	**0.591***
	(0.299)	**(0.287)**	**(0.253)**	**(0.294)**	(0.224)	(0.227)	**(0.337)**	**(0.329)**
growth	-0.517	-0.745	**-1.137****	**-1.007***	0.194	0.185	**0.431*****	**0.545*****
	(0.598)	(0.677)	**(0.545)**	**(0.518)**	(0.234)	(0.238)	**(0.138)**	**(0.144)**
roa	0.575	0.922	1.174	1.173	-0.734	-0.021	**-1.251***	**-1.356*****
	(1.504)	(1.470)	(1.615)	(1.587)	(0.862)	(0.042)	**(0.652)**	**(0.467)**
lev	0.005	0.005	-0.002	-0.003	-0.041	-0.039	**-0.054***	**-0.052***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.025)	(0.025)	**(0.031)**	**(0.029)**
intcov	**-0.000****	**-0.000****	-0.000	**-0.000****	0.000	**0.000****	0.000	0.000
	(0.000)	**(0.000)**	(0.000)	**(0.000)**	(0.000)	**(0.000)**	(0.000)	(0.000)
plusminus	**0.698****	**0.660***	**0.500***	**0.563****	0.599	0.567	0.561	0.543
	(0.332)	**(0.336)**	**(0.265)**	**(0.272)**	(0.589)	(0.576)	(0.548)	(0.546)
Intercept	**-3.970****	**-4.086*****	**-3.323****	**-3.572****	-0.650	-0.544	-2.946	-2.847
	(1.514)	**(1.456)**	**(1.313)**	**(1.472)**	(1.513)	(1.533)	(2.094)	(2.058)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.247	0.199	0.213	0.196	0.132	0.127	0.173	0.183
Observ.	281	281	281	281	528	528	528	528

Panel B: Earnings management dummy

	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treatedT/ treatedF	0.161	-0.048	0.118	-0.273	-0.255	-0.295	-0.181	-0.431
	(0.643)	(0.667)	(0.615)	(0.809)	(0.427)	(0.403)	(0.428)	(0.381)
em dummy	0.081	**0.212***	0.148	0.431	-0.106	0.065	-0.069	-0.427
	(0.169)	**(0.105)**	(0.202)	(0.361)	(0.151)	(0.097)	(0.172)	(0.337)
treatedT/ treatedF*em	**-6.483****	-2.331	-0.512	-0.026	1.264	**-1.256*****	-1.452	**-2.452****
	(2.964)	(1.538)	(0.603)	(0.683)	(1.372)	**(0.343)**	(0.956)	**(1.083)**
mb	-0.000	-0.001	0.001	-0.012	**-0.109*****	**-0.116*****	**-0.113*****	**-0.109*****
	(0.028)	(0.028)	(0.029)	(0.031)	**(0.027)**	**(0.027)**	**(0.025)**	**(0.025)**
profit	**-0.023*****	**-0.023*****	**-0.023*****	**-0.024*****	-0.005	-0.005	-0.006	-0.007
	(0.007)	**(0.007)**	**(0.007)**	**(0.007)**	(0.010)	(0.010)	(0.009)	(0.009)
size	**0.691****	**0.695****	**0.733****	**0.702****	0.194	0.174	0.213	0.178
	(0.304)	**(0.291)**	**(0.301)**	**(0.304)**	(0.231)	(0.228)	(0.249)	(0.234)
growth	-0.625	-0.629	-0.705	-0.553	0.210	0.186	0.226	0.228
	(0.546)	(0.642)	(0.656)	(0.635)	(0.231)	(0.242)	(0.234)	(0.255)
roa	0.823	0.431	0.362	0.001	-1.169	-0.020	-1.222	-1.469
	(1.670)	(1.565)	(1.624)	(1.626)	(0.909)	(0.042)	(0.868)	(0.920)
lev	0.007	0.007	0.007	0.007	-0.040	-0.039	-0.039	-0.042
	(0.009)	(0.009)	(0.009)	(0.009)	(0.026)	(0.026)	(0.025)	(0.027)
intcov	**-0.000****	**-0.000****	**-0.000****	**-0.000****	0.000	**0.000****	0.000	**0.000****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	(0.000)	**(0.000)**	(0.000)	**(0.000)**
plusminus	**0.631***	**0.673***	**0.669***	**0.655***	0.528	0.556	0.554	0.514
	(0.360)	**(0.370)**	**(0.364)**	**(0.363)**	(0.570)	(0.585)	(0.570)	(0.551)
Intercept	**-4.067****	**-4.222*****	**-4.331*****	**-4.360****	-0.507	-0.502	-0.664	-0.201
	(1.568)	**(1.473)**	**(1.502)**	**(1.604)**	(1.523)	(1.531)	(1.599)	(1.571)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.236	0.177	0.164	0.168	0.131	0.127	0.134	0.141
Observ.	281	281	281	281	528	528	528	528

Table 4.8 presents the result from an OLS regressions with firms' deviations from expected credit ratings *(Diff)* proxies as equation (1) and (in parentheses) robust standard errors. Diff as the dependent variable, which is a firm's actual CR as at 31st March minus its expected CR as estimating the ordered probit model in equation (2).

$$Actual\ CR_{i,t+1} = f_{i,t}\,(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

The final sample includes 281 and 528 firm-year observations over the period 2001-2006 and 2008-2013 to test the consequences of earnings management during tsunami and flooding occurred on deviations from expected credit rating, respectively. Both panels have the main independent variable of interest, which is coefficient for *(treatedT/treatedF*em)* in equation (1). We use two earnings management measures, which are the independent variable, as follows: (1) the residuals of AEM and REM from four models as shown in Panel A; and (2) accruals and real earnings management dummy as shown in Panel B. The coefficients shown in bold are statistically significant at less than 10 percent level. Table 4.8 also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 4.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

In Table 4.8, the dependent variable is the deviation of the actual credit rating from the expected credit rating *(diff)*, where the expected CR is estimated by the ordered probit model in equation (2). Our first hypothesis is tested using the b_3 coefficient, which captures the consequences of earnings management during the natural disasters on deviations from expected credit rating for the treatment compared to the control group. To be consistent with our first hypothesis, b_3 should be statistically significant.

In Panel A earnings management is measured as the residuals from AEM models (*Modified DD* and *Performance Match* variables) and REM models (*CFO* and *Disc* variables). In the tsunami sample, the coefficient b_3 *(treatedT*em)* is negative (-7.181 and -3.106) and highly significant ($p < 0.05$ and $p < 0.05$), where *Modified DD* and *Performance Match* variables are used to measure AEM, as shown in columns (1) and (2). However, there is apparently no significant difference in the credit rating of firms engaging in REM (*CFO* and *Disc* variables) for firms in the tsunami sample. In the flooding sample, we find a negative coefficient of -1.139 ($p < 0.05$) on b_3 *(treatedF*em)* when *Performance Match* variable is used as a measure of AEM, as shown in column (6). Further, the coefficient b_3 *(treatedF*em)* is negative (-1.715 and -3.972) and highly significant ($p < 0.10$ and $p < 0.01$), when *CFO* and *Disc* variables are used to measure REM, as reported in columns (7) and (8).

Our results indicate that earnings management affects negatively deviations of actual credit ratings from expected credit ratings in periods of natural disaster. This indicates that credit rating agencies can detect earnings management activities in periods of natural disaster and penalize firms with earnings

management by lowering their credit rating as dictated by their reputation incentives.

Next, we run additional analyses with an alternative earnings management measure as reported in Panel B. In this panel, we attempt to controls for changes in economic conditions that influence earnings management across different industry groups by using an earnings management dummy, taking the value of one if *Modified DD, Performance Match, CFO*, and *Disc* variables are higher than or equal to the industry average for a given year, and zero otherwise.

Consistent with the preliminary analysis reported in Panel A, we find b_3 to be negative (-6.483) and highly significant ($p < 0.05$) in the *Modified DD dummy* regression for firms in the tsunami sample as shown in column (1). In the flooding sample, we find a negative relationship between deviations from expected credit rating *(diff*) and both *Performance Match dummy* and *Disc dummy* interaction variables. For example, the coefficient b_3 (treatedF*em) for firms in the flooding sample in *Performance Match dummy* and *Disc dummy* variables are negative (-1.256, and -2.452, respectively) and highly significant ($p < 0.01$, and $p < 0.05$, respectively) as shown in columns (6) and (8) of Panel B. These results are evidence that natural disasters moderate the relation between earnings management and deviations from expected credit rating, and they are consistent with the first hypothesis. Moreover, the results in Panel B are consistent with the results reported in Panel A that earnings management affect negatively deviations from expected credit rating during disasters. Hence, the results in Panel B also imply that credit rating agencies are able to detect firms with earnings management activities in the higher level than or equal to

industry average in periods of natural disaster and protect their reputation by lowering the credit rating of those firms.

In addition, Panel A and Panel B show that the coefficient b_2 (*em*) is significantly positive for only AEM variables (*Modified DD, Performance Match*, and *Performance Match dummy* variables) and for firms in the tsunami sample. This means that credit ratings penalized firms for engaging in accrual earnings management in general. In contrast, there is no significant relation between accruals and real earnings management variables and deviations from expected credit ratings for firms in the flooding sample. Moreover, Panel A and Panel B show that the coefficient b_1 (*treatedT/ treatedF*) is insignificant in both AEM and REM regressions and for both the tsunami and the flooding samples. This implies that deviations from expected credit ratings are not unconditionally different for firms in the treatment and control countries.

Consistent with our expectations, we find that the coefficient of *size* in Panel A for firms in the tsunami and firms in the flooding samples is positive and significant for both discretionary accruals and real earnings management regressions. Also, the coefficient of *size* in Panel B for firms in the tsunami samples is positive and significant for both discretionary accruals and real earnings management regressions. This implies that larger firms have higher deviations from expected credit rating. However, we find that the coefficients of *mb* (in Panel A and Panel B), *roa* (in Panel A), and *lev* (in Panel A) for firms in the flooding sample and the coefficient of *profit* (in Panel A and Panel B) for firms in the tsunami sample are negative and significant. This means that firms in the flooding sample with higher market-to-book ratio, better performance, higher leverage ratios and firms in the tsunami sample that generate more

income have lower deviations from expected credit rating. Finally, we find that the coefficient of *plusminus* (in Panel A and Panel B) for firms in the tsunami sample is positive and significant for all regressions. This means that firms near a broad ration boundary (plus and minus) have higher deviations from expected credit rating.

Next, we test our second hypothesis by testing whether the interaction coefficients *(treatedT/treatedF*em)*, as reported in Table 4.8 Panel A, are statistically different between the tsunami and flooding samples. Table 4.9 compares the coefficients on *(treatedT/treatedF*em)* in the flooding and the tsunami groups. The difference is the coefficient on *(treatedF*em)* in the flooding group minus coefficient on *(treatedT*em)* in the tsunami group. We find that the coefficient of interest in the flooding setting is statistically different from tsunami group (significant differences presented in red) for most earnings management measures. More specifically, the coefficients of interest in the tsunami group, are statistically different from the flooding group as shown in columns 1, 2, and 3, where *Modified DD, Performance Match,* and *CFO* are used as measures of earnings management. The different in the magnitude of the interaction coefficients in the *Modified DD, Performance Match*, and *CFO* regressions are 8.973 (at 5%), 1.967 (at 10%), and 3.147 (at 10%), respectively. Overall, the evidence in this table confirms that the effect of earnings management on deviations from expected credit ratings is conditional on the severity of the disaster, since the coefficient of interest in the flooding group has a greater statistical magnitude than the coefficient of interest in the tsunami group.

Table 4.9: Comparing the coefficient across the two samples

	AEM		REM	
	Modified DD	**Performance Match**	**CFO**	**Disc**
*treatedT/treatedF*em* in flooding group	1.792	**-1.139****	**-1.715***	**-3.972*****
*treatedT/treatedF*em* in tsunami group	**-7.181****	**-3.106****	-4.862	-0.312
Difference	**8.973****	**1.967***	**3.147***	-3.660
P-value	0.035	0.058	0.096	0.349

Table 4.9 compares the coefficients on *(treatedT/treatedF*em)* from regression (1) below of the flooding and tsunami groups.

$$diff_{i,t+1} = f_{i,t}\,(b_0 + b_1 treatedT/treatedF + b_2 em + b_3 treatedT/treatedF*em + b_4 control\ variables + e)(1)$$

Four different measures of earnings management are used for the comparison, the *Modified DD,* the *Performance Match,* the *CFO*, and the *Disc* variable as shown in Panel A in Table 4.8. Differences are tested using t-tests. The coefficients shown in bold are statistically significant at less than 10 percent level. All variables are otherwise calculated as described in appendix 4.1. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

We are, thus, able to conclude that the higher the intensity of disaster, the more the credit rating agencies will adjust their credit rating for earnings management. This analysis provides us with greater confidence in the earlier results (in Chapter 3) and confirms our second hypothesis that the effect of accruals and real based-earnings management on deviations from expected credit rating is conditional on the severity of the disaster.

Finally, we test the third hypothesis by separating bad and good performance firms, and then, we run regression (1) with robust standard errors clustered at industry level and year fixed affects to assess whether the moderating role of a natural disaster in the relationship between earnings management and deviations from expected credit rating will be different between SG and IG firms. Our third hypothesis is tested again by the b_3 coefficient, which captures the consequences of earnings management during disasters on deviations from expected credit rating for firms on speculative-grade and investment-grade.

Again, the dependent variable in this table is *diff*, which is a firm's actual CR as of 31st March minus its expected CR as estimating based on the ordered probit model in equation (2). In Panel A, earnings management is measured as the residuals from AEM and REM models (*Modified DD, Performance Match, CFO,* and *Disc* variables), while, as additional analysis, in Panel B earnings management *(em dummy)* is measured as a dummy, taking the value of one if *Modified DD, Performance Match, CFO*, and *Disc* variables are higher than or equal to the industry average for a given year, otherwise the value is zero.

In the SG group over the tsunami period, the coefficient b_3 *(treatedT*em)* is negative (-7.047 and -8.060 in Panel A, and -7.733 and -8.791 in Panel B) and highly significant ($p < 0.05$ and $p < 0.10$ in Panel A, and $p < 0.01$ and $p < 0.10$ in Panel B) when *Modified DD, Performance Match, Modified DD dummy*, and *Performance Match dummy* variables are used to proxy for earnings management. However, there are apparently no significant effects of REM for SG firms in the tsunami sample as can be seen on both panels in Table 4.10.

Next, for the SG group in the flooding sample, we find a negative coefficient of -6.246, -3.997 and -6.043 at less 10% level on b_3 *(treatedF*em)* in the *Performance Match, CFO,* and *Disc* regressions, as shown in column (6-8) in Panel A. The respective negative coefficient in EM dummy variables (*Performance Match dummy, CFO dummy*, and *Disc dummy* variables) are -6.081, -4.062 and -4.561 at less than 10% level as reported on B.

Table 4.10: The consequences of earnings management during natural disasters on deviations from expected credit rating after separate SG and IG Groups

$$diff_{i,t+1} = f_{i,t}(b_0 + b_1 treatedT/treatedF + b_2 em + b_3 treatedT/treatedF*em + b_4 control\ variables + e) \quad (1)$$

Panel A: Continuous earnings management variable

	Speculative grade (SG)							
	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treatedT/ treatedF	-0.295	-0.819	-0.715	-0.744	-0.310	0.116	0.033	0.013
	(0.993)	(0.893)	(1.001)	(0.975)	(0.754)	(0.674)	(0.648)	(0.656)
em	-0.598	0.604	-1.696	2.599	-0.388	-0.496	-0.039	1.480
	(1.008)	(0.580)	(1.513)	(2.954)	(1.260)	(0.393)	(0.501)	(1.103)
treatedT/ treatedF*em	**-7.047****	**-8.060***	-1.108	0.250	1.397	**-6.246***	**-3.997*****	**-6.043*****
	(2.893)	**(4.800)**	(3.318)	(0.562)	(0.859)	**(3.618)**	**(1.277)**	**(1.399)**
mb	0.093	-0.020	0.137	0.140	**-0.186****	**-0.201****	**-0.194****	**-0.198****
	(0.148)	(0.195)	(0.205)	(0.182)	**(0.067)**	**(0.077)**	**(0.074)**	**(0.078)**
profit	0.014	**0.029***	0.023	0.020	0.016	0.007	0.007	0.006
	(0.019)	**(0.016)**	(0.019)	(0.020)	(0.021)	(0.015)	(0.015)	(0.017)
size	**0.926****	**0.748****	**0.972****	**1.014****	0.442	0.432	0.492	0.525
	(0.399)	**(0.276)**	**(0.378)**	**(0.398)**	(0.352)	(0.352)	(0.329)	(0.333)
growth	-0.271	**-2.746***	-1.103	-0.662	0.459	0.579	**0.754***	**0.794***
	(1.775)	**(1.579)**	(1.733)	(1.910)	(0.365)	(0.414)	**(0.439)**	**(0.409)**
roa	-0.086	1.314	-0.882	-0.344	-1.570	-0.089	**-2.522*****	**-2.122****
	(2.050)	(2.385)	(1.633)	(1.599)	(1.616)	(0.067)	**(0.720)**	**(0.771)**
lev	0.006	**-0.017****	0.011	0.012	**-0.064****	**-0.063****	**-0.067****	**-0.063****
	(0.010)	**(0.007)**	(0.009)	(0.011)	**(0.028)**	**(0.029)**	**(0.029)**	**(0.028)**
intcov	**-0.000***	-0.000	-0.000	-0.000	**0.000****	**0.000****	**0.000****	**0.000****
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
plusminus	**0.769****	0.689	**0.776****	**0.886****	**1.455***	**1.490***	**1.354***	**1.387***
	(0.347)	(0.425)	**(0.367)**	**(0.416)**	**(0.787)**	**(0.770)**	**(0.763)**	**(0.759)**
Intercept	**-5.740****	**-3.704***	**-5.888****	**-6.086****	-2.560	-2.608	-2.745	-2.835
	(2.450)	**(1.975)**	**(2.198)**	**(2.249)**	(2.156)	(2.011)	(1.948)	(1.980)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.386	0.377	0.293	0.271	0.294	0.293	0.292	0.306
Observ.	135	135	135	135	256	256	256	256

Investment grade (IG)								
	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treatedT/ treatedF	0.167	0.287	0.127	2.046	**-0.965*** **	**-0.983*** **	**-0.920*** **	**-1.004*** **
	(0.536)	(0.601)	(0.542)	(1.418)	**(0.315)**	**(0.310)**	**(0.303)**	**(0.347)**
em	0.748	0.057	0.072	-0.083	**-0.503***	0.080	0.008	-0.105
	(0.484)	(0.354)	(0.649)	(2.010)	**(0.253)**	(0.165)	(0.246)	(0.600)
treatedT/ treatedF*em	-1.434	-0.977	0.781	-2.133	-0.037	-0.085	-0.582	-0.429
	(2.033)	(2.439)	(0.951)	(1.562)	(0.509)	(0.327)	(0.459)	(1.492)
mb	0.003	0.013	-0.001	0.005	**-0.113*** **	**-0.109*** **	**-0.112*** **	**-0.110*** **
	(0.042)	(0.037)	(0.042)	(0.036)	**(0.018)**	**(0.019)**	**(0.018)**	**(0.019)**
profit	**-0.015*** **	**-0.019*** **	**-0.016*** **	**-0.015*** **	-0.009	-0.010	-0.010	-0.010
	(0.005)	**(0.003)**	**(0.005)**	**(0.005)**	(0.012)	(0.011)	(0.012)	(0.012)
size	-0.071	-0.028	-0.028	-0.056	0.157	0.145	0.154	0.145
	(0.383)	(0.338)	(0.354)	(0.344)	(0.139)	(0.134)	(0.140)	(0.138)
growth	-0.427	-0.456	-0.552	-0.644	0.170	0.183	0.179	0.175
	(0.700)	(0.690)	(0.643)	(0.611)	(0.256)	(0.262)	(0.253)	(0.284)
roa	0.209	0.820	0.636	1.215	0.921	0.378	0.507	0.421
	(1.267)	(1.544)	(1.444)	(1.549)	(0.549)	(0.555)	(0.617)	(0.548)
lev	-0.000	-0.003	0.000	-0.000	0.007	0.007	0.007	0.007
	(0.009)	(0.010)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)
intcov	**-0.000** **	**-0.000** **	**-0.000** **	**-0.000** **	**0.000** **	**0.000** **	**0.000** **	**0.000** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
plusminus	0.295	0.471	0.274	0.296	**-0.798** **	**-0.821** **	**-0.796** **	**-0.815** **
	(0.394)	(0.416)	(0.381)	(0.425)	**(0.327)**	**(0.334)**	**(0.344)**	**(0.328)**
Intercept	0.586	0.317	0.332	0.487	0.365	0.448	0.378	0.440
	(1.998)	(1.762)	(1.859)	(1.854)	(1.063)	(1.031)	(1.076)	(1.057)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.143	0.141	0.131	0.167	0.309	0.303	0.305	0.303
Observ.	146	146	146	146	272	272	272	272

Panel B: Earning management dummy

	Speculative grade (SG)							
	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treatedT/ treatedF	-0.179	-0.792	-0.145	-0.813	-0.349	0.139	0.014	-0.054
	(1.002)	(0.890)	(0.945)	(0.967)	(0.802)	(0.670)	(0.644)	(0.666)
em dummy	-0.032	0.357	0.149	0.101	-0.125	-0.108	-0.200	-0.982
	(0.276)	(0.283)	(0.334)	(0.500)	(0.158)	(0.205)	(0.395)	(0.977)
treatedT/ treatedF*em	**-7.733*** **	**-8.791***	-1.232	0.448	1.387	**-6.081***	**-4.062*** **	**-4.561*** **
	(2.825)	**(4.962)**	(1.015)	(0.781)	(0.947)	**(3.529)**	**(1.179)**	**(0.593)**
mb	0.090	-0.016	0.104	0.146	**-0.198** **	**-0.199** **	**-0.193** **	**-0.181*** **
	(0.131)	(0.196)	(0.209)	(0.183)	**(0.074)**	**(0.077)**	**(0.075)**	**(0.065)**
profit	0.013	**0.032***	0.022	0.022	0.008	0.007	0.007	0.009
	(0.021)	**(0.015)**	(0.019)	(0.019)	(0.015)	(0.016)	(0.015)	(0.015)
size	**0.922** **	**0.678** **	**0.958** **	**0.976** **	0.479	0.451	0.523	0.403
	(0.402)	**(0.289)**	**(0.357)**	**(0.384)**	(0.364)	(0.347)	(0.362)	(0.359)
growth	-0.295	-2.714	-0.811	-0.744	0.444	0.566	**0.776***	**0.723***
	(1.877)	(1.586)	(1.798)	(1.891)	(0.362)	(0.404)	**(0.444)**	**(0.369)**
roa	0.224	0.801	-0.454	-0.251	-1.717	-0.080	**-2.606*** **	**-3.381** **
	(1.934)	(2.224)	(1.500)	(1.828)	(1.013)	(0.063)	**(0.848)**	**(1.422)**
lev	0.006	**-0.018** **	0.006	0.011	**-0.066** **	**-0.062** **	**-0.066** **	**-0.072** **
	(0.012)	**(0.007)**	(0.013)	(0.010)	**(0.030)**	**(0.030)**	**(0.028)**	**(0.033)**
intcov	**-0.000** **	-0.000	-0.000	-0.000	**0.000** **	**0.000** **	**0.000** **	**0.000** **
	(0.000)	(0.000)	(0.000)	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
plusminus	**0.708***	**0.727***	**0.807***	**0.874** **	**1.400***	**1.479***	**1.352***	**1.204***
	(0.396)	**(0.411)**	**(0.434)**	**(0.400)**	**(0.765)**	**(0.777)**	**(0.756)**	**(0.643)**
Intercept	**-5.626** **	**-3.671***	**-5.873***	**-6.160** **	-2.595	-2.684	-2.845	-1.571
	(2.361)	**(2.024)**	**(2.154)**	**(2.366)**	(2.165)	(2.003)	(2.026)	(2.352)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.378	0.384	0.282	0.263	0.288	0.290	0.294	0.308
Observ.	135	135	135	135	256	256	256	256

	Investment grade (IG)							
	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treatedT/ treatedF	0.185	0.173	0.181	2.065	**-0.916****	**-0.993*****	**-0.928*****	**-1.027****
	(0.526)	(0.528)	(0.450)	(1.502)	**(0.339)**	**(0.305)**	**(0.307)**	**(0.363)**
em dummy	0.299	0.047	0.093	0.227	-0.254	**-0.205***	-0.057	-0.158
	(0.245)	(0.235)	(0.306)	(0.431)	(0.166)	**(0.116)**	(0.150)	(0.282)
treatedT/ treatedF*em	-1.334	-0.485	0.009	-2.247	-0.295	-0.120	-0.516	-0.390
	(1.641)	(1.985)	(0.392)	(1.687)	(0.432)	(0.327)	(0.434)	(1.479)
mb	-0.013	-0.001	-0.001	-0.004	**-0.111****	**-0.109*****	**-0.111*****	**-0.110****
	(0.043)	(0.040)	(0.041)	(0.038)	**(0.019)**	**(0.018)**	**(0.019)**	**(0.018)**
profit	**-0.015****	**-0.015****	**-0.015****	**-0.015****	-0.009	-0.010	-0.009	-0.010
	(0.005)	**(0.005)**	**(0.005)**	**(0.005)**	(0.012)	(0.011)	(0.012)	(0.012)
size	-0.038	-0.014	-0.020	-0.066	0.156	0.126	0.158	0.147
	(0.389)	(0.353)	(0.353)	(0.361)	(0.136)	(0.131)	(0.143)	(0.139)
growth	-0.504	-0.590	-0.551	-0.585	0.210	0.171	0.181	0.172
	(0.668)	(0.652)	(0.584)	(0.619)	(0.256)	(0.263)	(0.254)	(0.279)
roa	0.270	0.675	0.659	1.061	**0.972***	0.341	0.478	0.508
	(1.363)	(1.513)	(1.480)	(1.452)	**(0.516)**	(0.550)	(0.556)	(0.561)
lev	0.001	0.000	0.000	-0.001	0.010	0.006	0.007	0.007
	(0.009)	(0.009)	(0.008)	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)
intcov	**-0.000****	**-0.000****	**-0.000****	**-0.000****	**0.000****	**0.000****	**0.000****	**0.000****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
plusminus	0.279	0.263	0.274	0.321	**-0.798****	**-0.824****	**-0.801****	**-0.814****
	(0.428)	(0.394)	(0.393)	(0.399)	**(0.324)**	**(0.322)**	**(0.336)**	**(0.324)**
Intercept	0.192	0.239	0.229	0.347	0.451	0.499	0.377	0.523
	(1.974)	(1.866)	(1.965)	(1.685)	(1.020)	(1.006)	(1.067)	(1.047)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.142	0.129	0.130	0.169	0.315	0.312	0.305	0.306
Observ.	146	146	146	146	272	272	272	272

Table 4.10 presents the result from an OLS regressions with firms' deviations from expected credit rating *(Diff)* proxies as equation (1) and (in parentheses) robust standard errors. Diff as the dependent variable, which is a firm's actual CR as at 31St March minus its expected CR as estimating the ordered probit model as following:

$$Actual\ CR_{i,t+1} = f_{i,t}(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

This table separate SG and IG groups to assess the difference between consequences of earnings management for bad and good performance firms during natural disasters on deviations from expected credit rating. Both panels have the main independent variable of interest, which is coefficient for *(treatedT/treatedF*em)* in equation (1). We use two EM measures, which are the independent variable, as follows: (1) the residuals of AEM and REM (*Modified DD, Performance Match, CFO,* and *Disc)* as shown in Panel A; and (2) accruals and real earnings management dummies (*Modified DD dummy, Performance Match dummy, CFO dummy* and *Disc dummy*) as shown in Panel B. The coefficients shown in bold are statistically significant at less than 10 percent level. Table 4.10 also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 4.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the

coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

Consistent with the preliminary analysis reported in Table 4.8 (non-separate between SG and IG groups), our results suggest that credit rating agencies penalize SG firms with earnings management by lowering their credit rating. Because of several constraints in earnings management for SG firms, it is not surprising that credit rating agencies are likely to detect earnings management in SG firms easily. However, both panels show that the coefficient b_1 (*treatedT/ treatedF*) and b_2 (*em*) are insignificant for both AEM and REM and for both the tsunami and the flooding samples. This means that treatment firms in the SG group and SG firms engaging earnings management do not affect deviations from expected credit rating during the disasters.

In the IG group, there is no evidence that firms engaging in AEM and REM during the tsunami and flooding periods have affected deviations from expected credit rating as shown on both panels in Table 4.10. In other words, our results do not suggest that managers of treated IG firms that manipulate earnings management after disasters have been penalized by credit rating agencies. Thus, consistent with H3, the moderating role of a natural disaster in the relation between earnings management and deviations from expected credit rating is different between SG and IG firms.

Moreover, we find that the coefficients b_1 (*treatedT/ treatedF*) and b_2 (*em*) are insignificant in all regressions for the tsunami sample of the IG group on both panels. On the other hand, both panels in IG group over flooding period show that the coefficient b_1 (*treatedT/ treatedF*) is negative in all regressions. This implies that IG firms in Thailand have on average lower deviations from

expected credit rating compared to the control countries. The coefficient b_2 (*em*) is insignificant in all specifications but one, this implies that generally credit rating agencies do not adjust IG firms credit score for earnings management.

We find that coefficients of key variables are consistent with the preliminary analysis as reported in Table 4.8. For example, in SG group, the coefficients of *size* in Panel A and Panel B for firms in tsunami sample are positive and significant for AEM and REM regressions. Again, this suggests that larger firms have higher deviations from expected credit rating.

In summary, these results provide support for our set of hypotheses that (1) firms managing significant earnings after natural disasters have influenced deviations from expected credit rating, (2) the effect of earnings management on deviations from expected credit rating increases when the severity of the disaster increases and (3) the moderating role of a natural disaster in the relation between earnings management and deviations from expected credit rating will be different between investment and non-investment grade firms.

4.3 Additional tests and sensitivity analysis

4.3.1 Additional test for trend in the consequences of earnings management on deviations from expected credit rating

We study our first hypothesis further by considering the consequences of earnings management on deviations from expected credit rating separately for each year following each disaster to examine how fast earnings management affects deviations from expected credit ratings when a natural disaster hits. As discussed above, we focus on future credit rating as of 31st March in the next year, instead of credit rating as of 31st December. Hence, we create year

dummies for the first year *(treatedTy$_1$[25]and treatedFy$_1$[26])* and the second year *(treatedTy$_2$[27]and treatedFy$_2$[28])* after the disaster occurred to examine time-series profiles of the consequences of AEM and REM on deviations from expected credit rating in the first and second year after the disaster occurred as shown in equation (3).

$$diff_{i,t+1} = f_{i,t}(b_0 + b_1 treatedTy_1/treatedFy_1 + b_2 treatedTy_2/treatedFy_2 + b_3 em + b_4 treatedTy_1/treatedFy_1 * em + b_5 treatedTy_2/treatedFy_2 * em + b_6 control\ variables + e) \quad (3)$$

We base our conclusion about H1 on the statistical significance of coefficients of *treatedTy$_1$/treatedFy$_1$*em* and *treatedTy$_2$/treatedFy$_2$*em*, that are, b_4 and b_5 in equation (3), namely, the consequences of earnings management on deviations from expected credit rating of treated firms relative to control firms in the first and second year after the disaster occurred, respectively. Table 4.11 reports OLS coefficient estimates as shown in equation (3).

[25] *treatedTy$_1$* is Indonesia and Thailand in 2005.

[26] *treatedFy$_1$* is Thailand in 2012.

[27] *treatedTy$_2$* is Indonesia and Thailand in 2006.

[28] *treatedFy$_2$* is Thailand in 2013.

Table 4.11: Trend in the consequence of earnings management on deviations from expected credit rating in each year following the disaster

$$diff_{i,t+1} = f_{i,t}(b_0 + b_1 treatedTy_1/treatedFy_1 + b_2 treatedTy_2/treatedFy_2 + b_3 em + b_4 treatedTy_1/treatedFy_1 * em + b_5 treatedTy_2/treatedFy_2 * em + b_6 control\ variables + e) \quad (3)$$

Panel A: Continuous earnings management variable

	Tsunami				**Flooding**			
	AEM		**REM**		**AEM**		**REM**	
	Modified DD	**Performance Match**	**CFO**	**Disc**	**Modified DD**	**Performance Match**	**CFO**	**Disc**
$treatedTy_1/treatedFy_1$	0.119	0.548	0.181	0.468	0.732	1.121	0.410	0.418
	(0.498)	(0.596)	(0.584)	(0.546)	(0.796)	(0.810)	(0.625)	(0.414)
$treatedTy_2/treatedFy_2$	0.185	0.302	0.071	-0.113	1.076	1.213	-0.117	-0.133
	(0.568)	(0.589)	(0.559)	(0.589)	(0.777)	(0.828)	(0.415)	(0.442)
em	0.361	-0.339	-0.783	-1.218	0.875	0.017	-0.037	-1.053
	(1.117)	(0.713)	(1.046)	(1.912)	(0.563)	(0.602)	(0.287)	(0.780)
$treatedTy_1/treatedFy_1$*em	**-2.102***	0.900	-0.024	1.191	-1.464	3.337	-0.381	0.778
	(1.128)	(0.765)	(0.436)	(3.499)	(2.413)	(2.081)	(0.588)	(1.447)
$treatedTy_2/treatedFy_2$*em	-3.642	**-0.802***	1.303	-2.885	**-3.063*****	0.154	-2.086	**-4.226****
	(3.590)	**(0.461)**	(1.274)	(3.769)	**(1.092)**	(1.956)	(1.542)	**(1.684)**
mb	-0.003	0.002	-0.007	-0.005	**-0.046****	-0.030	**-0.110*****	**-0.090*****
	(0.033)	(0.035)	(0.040)	(0.031)	**(0.021)**	(0.031)	**(0.027)**	**(0.029)**
profit	**-0.023*****	**-0.027*****	**-0.023*****	**-0.026*****	-0.006	-0.007	-0.006	-0.011
	(0.007)	**(0.005)**	**(0.008)**	**(0.005)**	(0.006)	(0.007)	(0.010)	(0.010)
size	**0.724****	**0.666****	**0.716****	**0.684****	-0.035	0.009	0.201	**0.614***
	(0.306)	**(0.277)**	**(0.302)**	**(0.302)**	(0.179)	(0.086)	(0.239)	**(0.336)**
growth	-0.710	**-1.078****	-0.657	**-1.041****	-0.317	-0.321	0.237	**0.513*****
	(0.569)	**(0.498)**	(0.515)	**(0.458)**	(0.495)	(0.501)	(0.255)	**(0.144)**
roa	0.291	1.549	0.281	1.245	**-3.598*****	**-2.849****	**-1.434****	**-1.450*****
	(1.670)	(1.766)	(1.698)	(1.675)	**(1.206)**	**(1.188)**	**(0.692)**	**(0.419)**
lev	0.006	-0.004	0.007	-0.004	-0.012	**-0.015***	-0.040	**-0.052***
	(0.008)	(0.008)	(0.009)	(0.008)	(0.024)	**(0.009)**	(0.025)	**(0.029)**
intcov	**-0.000*****	**-0.000*****	**-0.000****	**-0.000*****	0.000	0.000	0.000	0.000
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	(0.000)	(0.000)	(0.000)	(0.000)
plusminus	0.625	**0.583****	**0.588***	**0.560***	0.445	0.266	0.544	0.547
	(0.367)	**(0.267)**	**(0.336)**	**(0.279)**	(0.560)	(0.304)	(0.564)	(0.545)
Intercept	**-4.136****	**-3.533****	-1.381	**-3.518****	0.636	0.207	-0.614	-2.997
	(1.563)	**(1.446)**	(1.291)	**(1.495)**	(1.011)	(0.707)	(1.587)	(2.107)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.173	0.205	0.198	0.198	0.140	0.177	0.134	0.185
Observ.	281	281	281	281	528	528	528	528

Panel B: Earnings management dummy

	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treatedTy_1/ treatedFy_1	0.139	0.338	0.426	0.295	0.087	0.249	0.380	0.133
	(0.493)	(0.540)	(0.510)	(0.580)	(0.316)	(0.344)	(0.656)	(0.378)
treatedTy_2/ treatedFy_2	0.204	0.245	0.360	0.007	-0.276	-0.297	-0.121	-0.381
	(0.576)	(0.506)	(0.497)	(0.706)	(0.562)	(0.444)	(0.420)	(0.401)
em dummy	-0.052	0.160	0.169	0.403	-0.101	0.079	-0.070	-0.414
	(0.211)	(0.137)	(0.213)	(0.377)	(0.159)	(0.094)	(0.189)	(0.346)
treatedTy_1/ treatedFy_1*em	**-1.776*** **	-0.420	-0.430	-0.131	-2.268	-0.992	-0.326	0.970
	(0.668)	(0.261)	(0.337)	(0.599)	(1.528)	(0.796)	(0.653)	(1.445)
treatedTy_2/ treatedFy_2*em	-3.352	-0.385	-0.740	-1.055	0.346	**-1.910*** **	-2.068	**-2.776** **
	(3.191)	(0.575)	(0.498)	(0.727)	(0.340)	**(0.549)**	(1.483)	**(1.304)**
mb	-0.002	-0.007	-0.004	-0.014	**-0.112*** **	**-0.116*** **	**-0.109*** **	**-0.107*** **
	(0.031)	(0.031)	(0.031)	(0.032)	**(0.026)**	**(0.028)**	**(0.027)**	**(0.027)**
profit	**-0.024*** **	**-0.023*** **	**-0.023*** **	**-0.023*** **	-0.005	-0.005	-0.006	-0.007
	(0.007)	**(0.008)**	**(0.007)**	**(0.008)**	(0.010)	(0.010)	(0.010)	(0.009)
size	**0.725** **	**0.743** **	**0.765** **	**0.711** **	0.201	0.185	0.208	0.185
	(0.305)	**(0.307)**	**(0.297)**	**(0.309)**	(0.244)	(0.228)	(0.253)	(0.239)
growth	-0.752	-0.596	-0.696	-0.541	0.184	0.199	0.238	0.227
	(0.502)	(0.565)	(0.569)	(0.659)	(0.221)	(0.250)	(0.255)	(0.250)
roa	0.481	-0.255	0.366	0.070	-0.886	-0.024	**-1.444***	**-1.573***
	(1.717)	(0.410)	(1.662)	(1.712)	(1.122)	(0.037)	**(0.760)**	**(0.880)**
lev	0.007	0.008	0.007	0.006	-0.039	-0.040	-0.040	-0.042
	(0.009)	(0.009)	(0.009)	(0.009)	(0.026)	(0.025)	(0.025)	(0.026)
intcov	**-0.000*** **	**-0.000*** **	**-0.000*** **	**-0.000** **	0.000	**0.000** **	0.000	**0.000***
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	(0.000)	**(0.000)**	(0.000)	**(0.000)**
plusminus	0.612	**0.689***	**0.697***	0.635	0.577	0.567	0.542	0.522
	(0.368)	**(0.361)**	**(0.371)**	(0.377)	(0.562)	(0.576)	(0.563)	(0.548)
Intercept	**-4.130** **	**-4.436*** **	**-4.518*** **	**-4.357** **	-0.583	-0.568	-0.623	-0.249
	(1.548)	**(1.526)**	**(1.461)**	**(1.631)**	(1.601)	(1.535)	(1.615)	(1.607)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.172	0.163	0.165	0.167	0.133	0.132	0.134	0.141
Observ.	281	281	281	281	528	528	528	528

Table 4.11 shows the trend in the consequences of earnings management on deviations from expected credit rating in the first and second year after the disasters. This table reports the results of OLS regressions as equation (3) and (in parentheses) robust standard errors. The dependent variable is the regression of firms' diff, which is a firm's actual CR as at 31st March minus its expected CR as estimating the ordered probit model in equation (2).

$$Actual\ CR_{i,t+1} = f_{i,t}(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

Both panels have the main independent variable of interest, which is coefficient for *(treatedTy_1/treatedFy_1*em*, and *treatedTy_2/treatedFy_2*em)*, respectively in equation (3). We use two earnings management measures, which are the independent variable, as follows: (1)

the residuals of accruals and real earnings management from four models as shown in Panel A; and (2) accruals and real earnings management dummy as shown in Panel B.

The coefficients shown in bold are statistically significant at less than 10 percent level. Table 4.11 also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 4.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

In Table 4.11, the dependent variable is the deviation from expected credit rating, which is a firm's actual CR as of 31st March minus its expected CR as estimated using the ordered probit model in equation (2). Panel A uses the residuals from AEM and REM models *(Modified DD, Performance Match, CFO,* and *Disc* variables) to measure earnings management; whereas, Panel B has *Modified DD dummy, Performance Match dummy, CFO dummy,* and *Disc dummy* variables as independent variable to measure earnings management.

In the tsunami sample, we find negative coefficients b_4 on our dummy variable *(treatedTy$_1$/treatedFy$_1$*em)* of -2.102 ($p < 0.10$) and -1.776 ($p < 0.01$) when earnings management measures are *Modified DD* and *Modified DD dummy* variables as shown in Panel A and B. Moreover, we find a negative coefficient b_5 on *(treatedTy$_2$/treatedFy$_2$*em)* for firms in the tsunami sample of -0.802 ($p < 0.10$) when earnings management measures are captured by the *Performance Match* variable as shown in Panel A. In contrast, there is no evidence that firms in the tsunami sample engaging in REM in the first and second year after the disaster occurred have affected deviations from expected credit rating as shown in both panels.

In the flooding sample, both panels present evidence that firms in the flooding sample manipulating both accruals and real earnings management have influenced deviations from expected credit rating in the second year after the

flooding occurred *(+2y)*. On the other hand, there is no evidence that firms in the flooding sample engaging in accruals and real earnings management have affected deviations from expected credit rating in the first year after the flooding occurred *(+1y).* For instance, the coefficient b_5 *(treatedTy$_2$/treatedFy$_2$*em)* is negative (-3.063) and significant at 1% level when earnings management measures are *Modified DD* variable as shown in Panel A and -1.910 ($p < 0.01$) and when earnings management measures are *Performance Match dummy* variable as shown in Panel B. Similarly for REM measures and firms in the flooding sample, the coefficient b_5 *(treatedTy$_2$/treatedFy$_2$*em)* is negative (-4.226 and -2.776) and significant at 5% level and 5% level when earnings management measures are *Disc* and *Disc dummy* variables, respectively as shown in Panel A and B.

Overall, we find the impact of AEM on deviations from expected credit rating in the first year after the tsunami occurred *(+1y)*; whereas, we find the consequences of both accruals and real earnings management on deviations from expected credit rating in the second year after the flooding occurred *(+2y).*

This is likely due to the difference in the time period of each disaster, which may affect the timing of the issuance of the corporate financial statements including the effects from the disaster to the public and may therefore reflect the credit rating adjustment made by the credit rating agencies. Generally, floods have more long-lasting effects than a tsunami. The hospitality industry that was affected by a series of tsunami needed less time to estimate the total damages and losses from the tsunami which lasted between 10 minutes to 2 hours, compared to the manufacturing industry that was affected by the flooding for a period of 2-3 months. Moreover, the flooding caused disruptions to

manufacturing supply chains affecting the regional automobile production and causing a global shortage of hard disk drives which lasted throughout 2012. It can be shown that corporate financial statements disclosing the amount of total economic loss from flooding were issued publicly after 2012. It can be inferred thus that firms in the tsunami sample were able to issue the corporate financial statements including the effects from the disaster to the public sooner than the firms in the flooding sample; thus, it comes as no surprise that credit rating agencies can recognize that firms are managing earnings during the tsunami period sooner than during the flooding period. This is consistent with the result that credit rating agencies penalize firms in the tsunami sample engaging in earnings management in the first year after the disaster occurred by lowering their credit ratings. Whereas, they penalize firms in the flooding sample engaging in earnings management in the second year after the disaster occurred.

As mentioned above, our results show that the coefficients b_4 and b_5 are significantly negative for both the tsunami and the flooding samples. This is consistent with our prediction that treated firms with strong earnings management during disasters are negatively associated with deviations from expected credit rating. This suggests that credit rating agencies can detect earnings management activities in periods of natural disaster and penalize firms with earnings management by lowering their credit rating.

In summary, consistent with the main analysis reported in Table 4.8, these results support the H1 that in the first and second year after the disasters hit, the managers managing earnings have affected deviations from expected credit rating. In other words, this analysis provides us with greater confidence in the

main results and strengthens the evidence over our first hypothesis that the association between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster.

4.3.2 Additional test to trade-off the consequences of the preference between AEM and REM on deviations from expected credit rating during the disaster

Next, we run additional tests to examine whether firms engaging in AEM over the disaster period have influenced deviations from their expected credit as well as firms engaging in REM. In other words, the purpose of this sensitivity analyse is to trade-off the consequences of the preference between accruals and real earnings management on deviations from expected credit rating during natural disasters. We employ the ordinary least square (OLS) regression model with robust standard errors clustered at industry level and year fixed effects as follow:

$$diff_{i,t+1} = f_{i,t}(b_0 + b_1 treatedT/treatedF + b_2 AEM + b_3 treatedT/treatedF*AEM + b_4 REM + b_5 treatedT/treatedF*REM + b_6 control\ variables + e) \quad (4)$$

As equation (4), we interact the *treatedT/treatedF*AEM* (b_3) and *treatedT/treatedF*REM* (b_5) to trade-off the preference between two types of earnings management (AEM and REM) in four models as follows: (1) between *Modified DD* and *CFO* variables; (2) between *Modified DD* and *Disc* variables; (3) between *Performance Match* and *CFO* variables; and (4) between *Performance Match* and *Disc* variables.

If the coefficients b_3 and b_5 are significant, treated firms prefer the use of both discretionary accruals and REM strategy to influence deviations from expected

credit rating during natural disaster more than control firms. However, if either coefficients b_3 or b_5 is statistically significantly different to zero, it indicates that treated firms prefer to use discretionary accruals or REM technique managing credit rating during natural disaster by trading-off the costs and benefits of each other as substitute.

Table 4.12 reports OLS coefficient estimates as equation (4), in which the dependent variable is the regression of deviations from expected credit rating *(diff)*, which is a firm's actual CR as of 31st March minus its expected CR as estimating the ordered probit model in equation (2).

This table reports the results and presents evidence that firms in the tsunami sample engaging in only discretionary accruals (but not real earnings management) after the tsunami occurred have indeed influenced deviations from their expected credit rating. Furthermore, we find negative coefficients b_3 in all models as reported in columns (1-4) on our dummy variable *(treatedT/treatedF*AEM)* for firms in the tsunami sample of -7.356, -6.998, -3.536, and -2.923 ($p < 0.05$, $p < 0.05$, $p < 0.05$, and $p < 0.10$), respectively.

However, in the flooding sample, our results show that firms engaging in only REM after the flooding occurred have indeed influenced deviations from their expected credit rating. Table 4.12 reports negative coefficients b_5 in model 2 and model 4 as reported in columns (6 and 8) on our dummy variable *(treatedT/treatedF*REM)* for firms in the flooding sample of -4.058, and -2.712 ($p < 0.01$, and $p < 0.05$), respectively.

Table 4.12: Trading-off the consequences of the preference between accruals and real earnings management during disasters on deviations from expected credit rating

$$diff_{i,t+1} = f_{i,t}\,(b_0 + b_1 treatedT/treatedF + b_2 AEM + b_3 treatedT/treatedF*AEM + b_4 REM + b_5 treatedT/treatedF*REM + b_6 control\ variables + e) \quad (4)$$

	Residual of earnings management							
	Tsunami				Flooding			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
treatedT/ treatedF	0.132	0.079	-0.110	-0.021	-0.225	-0.359	-0.169	-0.338
	(0.641)	(0.685)	(0.670)	(0.709)	(0.537)	(0.525)	(0.400)	(0.392)
Modified DD	**0.923***	**0.931***			-0.620	**-1.122****		
	(0.533)	**(0.539)**			(0.486)	**(0.431)**		
Performance Match			**1.360*****	**0.968*****			-0.155	-0.133
			(0.412)	**(0.299)**			(0.224)	(0.213)
CFO	-0.334		-1.451		0.232		0.113	
	(1.052)		(1.217)		(0.451)		(0.337)	
Disc		0.937		0.847		**1.041***		0.614
		(1.363)		(1.397)		**(0.587)**		(0.485)
treatedT/ treatedF*AEM	**-7.356****	**-6.998****	**-3.536****	**-2.923***	0.427	0.311	0.070	-0.256
	(2.958)	**(3.405)**	**(1.675)**	**(1.502)**	(0.373)	(0.344)	(0.271)	(0.337)
treatedT/ treatedF*REM	1.301	0.380	0.642	2.166	-1.721	**-4.058*****	-1.467	**-2.712****
	(2.359)	(2.139)	(1.999)	(2.094)	(1.171)	**(1.462)**	(1.040)	**(1.386)**
mb	0.001	0.004	0.013	0.023	**-0.101*****	**-0.098*****	**-0.115*****	**-0.113*****
	(0.035)	(0.031)	(0.029)	(0.031)	**(0.026)**	**(0.028)**	**(0.020)**	**(0.022)**
profit	**-0.023*****	**-0.024*****	**-0.024*****	**-0.024*****	-0.010	-0.012	-0.003	-0.004
	(0.007)	**(0.007)**	**(0.007)**	**(0.007)**	(0.010)	(0.010)	(0.011)	(0.011)
size	**0.677****	**0.692****	**0.701****	**0.701****	**0.592***	**0.601***	0.200	0.197
	(0.306)	**(0.305)**	**(0.280)**	**(0.286)**	**(0.339)**	**(0.333)**	(0.225)	(0.224)
growth	-0.495	-0.506	-0.804	-0.689	**0.404*****	**0.515*****	0.206	0.267
	(0.585)	(0.597)	(0.595)	(0.655)	**(0.146)**	**(0.154)**	(0.226)	(0.230)
roa	0.640	0.473	1.113	0.813	-0.746	-0.463	-1.191	**-1.357***
	(1.476)	(1.465)	(1.414)	(1.431)	(0.802)	(0.658)	(0.829)	**(0.713)**
lev	0.005	0.005	0.006	0.005	**-0.054***	**-0.052***	-0.040	-0.039
	(0.009)	(0.009)	(0.009)	(0.009)	**(0.030)**	**(0.029)**	(0.025)	(0.024)
intcov	**-0.000*****	**-0.000****	**-0.000***	**-0.000****	0.000	**0.000***	0.000	**0.000***
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	(0.000)	**(0.000)**	(0.000)	**(0.000)**
plusminus	**0.687****	**0.688***	**0.578****	**0.662***	0.575	0.579	0.594	0.583
	(0.293)	**(0.340)**	**(0.268)**	**(0.327)**	(0.546)	(0.544)	(0.587)	(0.589)
Intercept	**-3.969****	**-4.003****	**-4.038*****	**-4.080*****	-3.006	-2.980	-0.633	-0.555
	(1.556)	**(1.506)**	**(1.417)**	**(1.422)**	(2.116)	(2.082)	(1.510)	(1.520)
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.251	0.249	0.215	0.200	0.178	0.190	0.135	0.139
Observ.	281	281	281	281	528	528	528	528

Table 4.12 trades-off the consequences of the preference between two types of earnings management (AEM and REM) during natural disaster on deviations from expected credit rating. This table reports the results of OLS regressions with firms' deviations from expected credit ratings *(Diff)* as equation (4) and (in parentheses) robust standard errors. Diff is a firm's actual credit rating as at 31st March minus its expected credit rating as estimating the ordered probit model in equation (2).

$$Actual\ CR_{i,t+1} = f_{i,t}(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

Table 4.12 has the main independent variable of interest, which is coefficient for *(treatedT/treatedF*AEM*, and *treatedT/treatedF*REM)* in equation (4). We use the residuals of AEM and REM, which are independent variable. Moreover, we compare between AEM and REM by using four models: (1) between *modified DD* and *CFO* variables as shown in columns (1 and 5), (2) between *modified DD* and *Disc* variables as shown in columns (2 and 6), (3) between *Performance Match* and *CFO* variables as shown in columns (3 and 7); and (4) between *Performance Match* and *Disc* variables as shown in columns (4 and 8). The coefficients shown in bold are statistically significant at less than 10 percent level. Table 4.12 also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 4.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

Overall, coefficients b_3 is significant for firms in the tsunami sample in all models, while, coefficients b_5 is significant for firms in the flooding sample when we compare between (1) *Modified DD* and *Disc* variables, and (2) *Performance Match* and *Disc* variables. Therefore, it can be inferred that treated firm managers utilizing two types of earnings management as substitute have affected deviations from expected credit rating during disasters by selecting use discretionary accruals for firms in the tsunami sample and REM for firms in the flooding sample.

Again, this analysis provides us with greater confidence in the main results as shown in Table 4.8 and supporting reason that the difference in timing of each disaster occurred is associated with the selecting on earnings management techniques of managers. The reason is that managers can engage in REM only during the quarterly reporting; whereas, they can manipulate earnings via AEM at the end of period. Thus, firms in the tsunami sample have insufficient time to have indeed influenced deviations from their expected credit rating by using

REM. In contrast, firms in the flooding sample have sufficient time to manipulate earnings via REM because flooding occurred at the beginning of the last quarter.

Moreover, our results report that coefficients b_3 and b_5 are significantly negative. Hence, we can imply that credit rating agencies are able to detect earnings management and penalize firms with earnings management by lowering their credit rating. This supports the first hypothesis that the relation between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster.

4.3.3 Additional test after deleting firms with high and low credit ratings levels of creditworthiness

We run additional test to re-examine the relationship between deviations from expected credit rating and earnings management over the disasters period by deleting firms with actual and expected credit rating better than A+ and worse than C.

Because firms with the highest levels of creditworthiness are more likely to obtain the most favourable credit ratings, they have the least incentives to manage earnings around natural disaster. Similarly, financially constrained firms with the low levels of creditworthiness may have the inability to manipulate earnings. Therefore, we re-examine the relationship between deviations from expected credit rating and earnings management over the disasters period as equation (1) after deleting firms with the high and low levels of creditworthiness.

Again, the dependent variable is the firms' deviations from expected credit ratings *(diff)*. However, we delete firms with actual CR and expected CR better

than A+ and worse than C. We present the level of credit ratings which we use for this sensitivity analysis as in appendix 4.2 (column 6).

Table 4.13: Additional and sensitivity analyses by deleting firms with high and low credit ratings levels of creditworthiness

$$diff_{t+1} = f_{i,t}(b_0 + b_1 treatedT/treatedF + b_2 em + b_3 treatedT/treatedF*em + b_4 control\ variables + e) \quad (1)$$

	Tsunami				Flooding			
	AEM		REM		AEM		REM	
	Modified DD	Performance Match	CFO	Disc	Modified DD	Performance Match	CFO	Disc
treatedT/ treatedF	-0.240	0.027	-0.216	0.162	**-0.681*** **	-0.271	**-0.489***	**-0.648****
	(0.609)	(0.671)	(0.645)	(0.824)	**(0.208)**	(0.474)	**(0.243)**	**(0.242)**
em	**1.551****	**1.488*****	**-1.044***	-2.077	-0.452	-0.003	0.185	0.347
	(0.604)	**(0.449)**	**(0.516)**	(2.199)	(0.584)	(0.197)	(0.318)	(0.354)
treatedT/ treatedF*em	**-5.079***	-1.715	1.217	-0.608	0.772	**-1.199*****	**-1.113****	**-2.004*****
	(2.956)	(1.790)	(3.024)	(0.712)	(1.160)	**(0.446)**	**(0.567)**	**(0.764)**
mb	0.044	**0.062***	0.038	0.034	**-0.073*****	**-0.107*****	**-0.077*****	**-0.073*****
	(0.031)	**(0.033)**	(0.029)	(0.029)	**(0.020)**	**(0.024)**	**(0.020)**	**(0.020)**
profit	**-0.033*****	**-0.031*****	**-0.031*****	**-0.032*****	-0.008	-0.005	-0.010	-0.011
	(0.005)	**(0.005)**	**(0.005)**	**(0.005)**	(0.011)	(0.012)	(0.010)	(0.010)
size	**0.508*****	**0.489*****	**0.480*****	**0.529*****	0.183	0.227	**0.453***	**0.430***
	(0.149)	**(0.167)**	**(0.163)**	**(0.178)**	(0.137)	(0.254)	**(0.234)**	**(0.230)**
growth	-0.636	-0.198	-0.561	-0.528	0.146	0.168	**0.297***	**0.307***
	(0.426)	(0.409)	(0.370)	(0.561)	(0.199)	(0.237)	**(0.156)**	**(0.166)**
roa	1.342	0.990	1.075	0.843	0.870	-0.018	0.075	-0.186
	(1.560)	(1.338)	(1.585)	(1.522)	(0.540)	(0.041)	(0.431)	(0.403)
lev	-0.004	0.004	-0.003	-0.002	**0.014***	-0.044	0.011	0.009
	(0.008)	(0.009)	(0.009)	(0.009)	**(0.008)**	(0.027)	(0.011)	(0.010)
intcov	**-0.000*****	**-0.000***	**-0.000*****	**-0.000*****	**0.000*****	**0.000****	**0.000****	**0.000*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
plusminus	**0.533***	0.562	**0.570****	**0.528***	**-0.408***	0.572	**-0.388***	**-0.414****
	(0.270)	(0.336)	**(0.257)**	**(0.294)**	**(0.218)**	(0.614)	**(0.199)**	**(0.193)**
Intercept	**-3.460*****	**-3.932*****	**-3.485*****	**-3.563*****	-1.013	-0.963	**-2.590***	**-2.451***
	(0.654)	**(0.733)**	**(0.731)**	**(0.690)**	(0.895)	(1.722)	**(1.396)**	**(1.386)**
Fixed effects	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y	I,Y
Adjust R^2	0.345	0.339	0.324	0.324	0.165	0.147	0.187	0.191
Observ.	221	221	221	221	480	480	480	480

Table 4.13 presents the result from an OLS regressions with firms' deviations from expected credit ratings proxies as equation (1) and (in parentheses) robust standard errors by deleting firms with high and low credit ratings levels of creditworthiness. The final sample includes 221 and 480 firm-year observations over the period 2001-2006 and 2008-2013, respectively. The dependent variable is the regression of firms' diff, which is a firm's actual CR as at 31st March, which is an ordinal variable taking on values from 2 to 18 representing the firm's S&P long-term

credit rating, minus its expected CR, which is an ordinal variable taking on values between 2 and 18 as estimating the ordered probit model in equation (2).

$$Actual\ CR_{i,t+1} = f_{i,t}(b_0 + b_1 mb + b_2 tang + b_3 rd + b_4 rdind + b_5 sga + b_6 profit + b_7 size + b_8 operrisk + e) \quad (2)$$

This table has the main independent variable of interest, which is coefficient for *(treatedT/treatedF*em)* in equation (1). We use the residuals of two earnings management measures, which are the independent variable. The coefficients shown in bold are statistically significant at less than 10 percent level. Table 4.13 also reports the mean R^2 for each of these regressions. All variables are otherwise calculated as described in appendix 4.1. We include industry (I) and year (Y) fixed effects in the models as indicated, but do not report the coefficients. *, **, and *** represent significance levels of 0.01, 0.05, and 0.10 (two-tailed), respectively.

We base our conclusion about H1 on the statistical significance of coefficients of *treatedT/treatedF*em*, that is, b_3 in equation (1). In Table 4.13, we use only the residuals from four earnings management models (*Modified DD, Performance Match, CFO,* and *Disc* variables) as the independent variable to measure earnings management.

For the tsunami sample, the coefficient b_3 *(treatedT/treatedF*em)* is negative (-5.079) and highly significant ($p < 0.10$), in the *Modified DD* regression as shown in column (1). However, results appear to be statistically insignificant for all REM regressions for firms in the tsunami sample. In the flooding sample, we find a negative coefficient of -1.199, -1.113, and -2.004 ($p < 0.01$, $p < 0.05$, and $p < 0.01$) on b_3 *(treatedT/treatedF*em)* in *Performance Match, CFO* and *Disc* variables, respectively as shown in columns (6-8).

Consistent with the main analysis reported in Table 4.8, these results confirm once again our first hypothesis that the relation between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster. Moreover, our results support the idea that credit rating agencies are able to detect earnings management and make adjustments in the financial report, including reconsider credit rating by lowering their credit rating.

In other words, they penalize firms with engage in earnings management as reputation incentive.

4.3.4 Alternative earnings management proxies

As reported in the previous section, we use two variants, the residuals from earnings management models and an earnings management dummy, to measure earnings management. However, we re-run our analyses by using alternative measures of accruals and real earnings management, which is the absolute value of earnings management in order to corroborate our results. Results (not tabulated) remain qualitatively similar to those reported in the main tables. Moreover, all models are presented with industry and year fixed effects but we have also run the models using firm and year fixed effects. Once again, the results (not tabulated) remain unchanged.

5 Conclusions

This research provides evidence that the occurrence of two different natural disasters, the 2004 tsunami in the Indian Ocean and the 2011 flood in Thailand, affect the relationship of earnings management with deviations from expected credit rating. We test the joint relation among three important phenomena, the natural disasters, earnings management, and deviations from expected credit ratings and find that the relation between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster. Interestingly, results obtained are significantly negative between deviations from expected credit rating and earnings management during the disasters. This suggests that earnings management affect negatively deviations from expected credit rating during natural disaster, resulting in actual credit

rating to be a lower than expected credit rating. It implies that credit rating agencies are able to detect earnings management activities and make adjustments in the financial report during the disaster. In other words, they penalize firms with earnings management by providing a lower credit rating during the disaster as reputation incentive.

Next, we also provide evidence to support the argument that the decline in the firm performance due to the disasters would be more severe in countries with high level of intensity of disaster. Our results also report that the interaction *(treatedT/treatedF*em)* coefficients across the two regressions are statistically different from each other, with firms in the flooding sample group showing greater statistically magnitude than firms in the tsunami group. This supports that the effect of earnings management on deviations from expected credit rating is conditional on the severity of the disaster. In other words, the more important the level of intensity of the disaster, the more likely the credit rating agencies will adjust their credit ratings for earnings management.

Finally, we separate bad and good performance firms to examine and support that earnings management measures for SG and IG firms are related to deviations from expected credit rating in areas affected by natural disaster. The results show that managers manipulating earnings during disasters have affected deviations from expected credit rating for only SG firms but not for IG firms. This supports that the moderating role of a natural disaster in the relation between earnings management and deviations from expected credit rating will be different between SG and IG firms.

Additional analyses confirm these primary results by considering the consequences of earnings management on deviations from expected credit

rating in each year following the disasters, trading-off the consequences of the two types of earnings management (AEM and REM) on deviations from expected credit rating during natural disaster, deleting firms with the high and low credit ratings levels of creditworthiness, and employing alternative proxies for earnings management.

Our study helps investors to better understand how managers react to reduce the impact of natural disasters on rating deviations. However, our sample is relatively small compared to many archival studies examining credit rating due to limitations on data availability from Capital IQ. Moreover, this thesis is limited to ratings that were issued only by Standard and Poor's but does not contain ratings from the other two large credit rating agencies, which are Moody's and Fitch. Future studies could use larger sample sizes when and if more data becomes available to can be generalized to the larger population.

.

Appendix 4.1: Abbreviations and variables used in the chapter

AEM	Accruals earnings management
REM	Real earnings management
IG	Investment grade rating (BBB- or above)
SG	Speculative grade rating (BB+ or below)
CR	Credit rating
Actual CR	Actual credit rating as of 31st March is an ordinal variable taking on values from 1 to 20 representing the firm's S&P long-term credit rating (e.g. D=1, and AA=20)
Expected CR	Firms' expected ratings estimate by using a model from the target capital structure literature, following Alissa et al. (2013) and Hovakimian et al. (2009)
diff	Deviations from expected credit rating is a firm's actual rating as of 31st March minus its expected rating as estimating the ordered probit model in equation (2)
em dummy	Earnings management dummy that takes the value of 1 if firm's AEM and REM estimated are higher or equal to industry average for a given year and 0, otherwise
treatedT	Treatment firms in tsunami sample is dummy variable that takes the value of 1 in the countries which were hit by tsunami in 2005-2006 and 0, otherwise
treatedF	Treatment firms in flooding sample is dummy variable that takes the value of 1 in the countries which were hit by flooding in 2012-2013 and 0, otherwise
treatedT/treatedF*em	Use to assess the consequences of earnings management during natural disasters (tsunami/ flooding) on deviations from expected credit rating
Modified DD	The residual from modified Dechow and Dichev model following McNichols (2002)
Performance Match	The residual from performance-matched Jones model following Kothari et al. (2005)
CFO	The residual from cash flow from operations model

	following Roychowdhury (2006)
Disc	The residual from discretionary expenses model following Roychowdhury (2006)
Modified DD dummy	A dummy variable that equals 1 if *Modified DD* variable is higher or equal to the industry average for a given year, otherwise is zero
Performance Match dummy	A dummy variable that equals 1 if *Performance Mat*ch variable is higher or equal to the industry average for a given year, otherwise is zero
CFO dummy	A dummy variable that equals 1 if *CFO* variable is higher or equal to the industry average for a given year, otherwise is zero
Disc dummy	A dummy variable that equals 1 if *Disc* variable is higher or equal to the industry average for a given year, otherwise is zero
mb	Firm's market value of assets scaled by total assets
tang	Asset tangibility is net property, plant, and equipment, scaled by total assets
rd	Research and development (R&D) expenses scaled by sales
rdind	A binary variable set equal to 1 if R&D expenses is not missing and 0, otherwise
sga	Selling, general, and administrative (SG&A) expenses scaled by sales
profit	Operating income scaled by lagged total assets.
size	The natural logarithm of sales
operrisk	The standard deviation of operating income scaled by lagged total assets
growth	The percentage change in sales
roa	A firm's return on assets
lev	Ratio of long-term liabilities to total assets
intcov	Interest coverage ratio
plusminus	A binary variable set equals to 1 if firms are near a

	broad rating boundary (plus and minus) and 0 if firms are in the middle of ratings
y_0	Year (0) is defined as the fiscal year during which disaster occurred
+1y	Year (+1) is defined as the first year after the disaster occurred
+2y	Year (+2) is defined as the second year after the disaster occurred
$treatedTy_1$/$treatedFy_1$	Treatment group in year (+1) is dummy variable that takes the value of 1 in the countries which were hit by tsunami in 2005 or flooding in 2012 and 0, otherwise
$treatedTy_2$/$treatedFy_2$	Treatment group in year (+2) is dummy variable that takes the value of 1 in the countries which were hit by tsunami in 2006 or flooding in 2013 and 0, otherwise
$treatedTy_1$/$treatedFy_1$*em	Use to assess the consequences of earnings management in the first year after tsunami occurred in 2005 and flooding occurred in 2012 on deviations from expected credit rating
$treatedTy_2$/$treatedFy_2$*em	Use to assess the consequences of earnings management in the second year after the tsunami occurred in 2006 and flooding occurred in 2013 on deviations from expected credit rating
treatedT/treatedF*AEM	Use to assess the consequences of accruals earnings management on deviations from expected credit rating during natural disaster
treatedT/treatedF*REM	Use to assess the consequences of real earnings management on deviations from expected credit rating during natural disaster

Appendix 4.2: Summary the level of credit ratings

S&P credit ratings	Description	Score (Main analysis)	Score (Robust 1)		Score (Robust 2)	
		Both disasters	Tsunami 2004	Flooding 2011	Both disasters	
D	In default	1	1	1	-	
C	Default imminent with little prospect for recovery	2	1	1	2	Speculative-grade
CC		3	1	1	3	
CCC-		4	1	1	4	
CCC	Extremely speculative	5	2	1	5	
CCC+	Substantial risks	6	3	2	6	
B-	Highly speculative	7	4	3	7	
B		8	5	4	8	
B+		9	6	5	9	
BB-	Non-investment grade speculative	10	7	6	10	
BB		11	8	7	11	
BB+		***12***	**9**	**8**	***12***	
BBB-	Lower medium grade	***13***	**10**	**9**	***13***	Investment-grade
BBB		14	11	10	14	
BBB+		15	12	11	15	
A-	Upper medium grade	16	13	12	16	
A		17	14	13	17	
A+		18	15	14	18	
AA-	High grade	19	16	15	-	
AA		20	17	-	-	

Chapter 5

Conclusions, Limitations and Avenues for Future Research

1 The motivation of the research

There are at least two main reasons why it is interesting to study the effect of natural disaster on earnings management. Firstly, natural disasters can cause significant negative impacts on human lives, businesses, and the economy. Firms cannot fully avoid natural disasters risk. In other words, even if many firms have set plans to reduce the adverse impact of natural disasters, their ability to remain in business in the aftermath of the disaster may still be uncertain. Secondly, natural disasters are becoming more frequent and severe (World economic Forum, 2015; World Economic Forum, 2016; and World Economic Forum, 2018b). Hence shedding light on how firms manage earnings during natural disasters and the implications of such earnings management on credit ratings appears to be important.

We focus on two different disasters that hit the Asian continent: the 2004 tsunami and the 2011 flooding. We Choose Asia because it has faced more natural disasters than any other continent. The tsunami in 2004 is one of the deadliest natural disasters in recorded history and the flooding in 2011 caused disruptions to manufacturing supply chains affecting the regional automobile production, and also causing a global shortage of hard disk drives which last throughout 2012 (Sms Tsunami Warning, 2012; and Centre for research on the Epidemiology of Disasters, 2012). Moreover, two different disasters, and

samples of analysis, are useful to address concerns over the generalizability of the evidence obtained**.**

2 The objectives of the research

The thesis begins with a review of the literatures on earnings quality and earnings management to understand the conceptual underpinnings of earnings management research. This literature review serves as the basis to conduct the empirical studies. One focuses on natural disasters as the determinant of earnings management. The other focuses on the relationship between earnings management and credit ratings in the occurrence of a natural disaster.

The main objective of the first empirical study is to examine whether firms in countries that are hit by natural disaster are engaging more in earnings management. We expect companies to manage earnings during a disaster because of a significant loss of investor confidence in the survival of the firm or a significant decrease in the performance of firms or because they want to attract government help. Whether managers are managing earnings upwards or downwards depends on which incentive prevails (i.e. the market hypothesis or the political cost hypothesis).

The market incentive hypothesis for earnings management suggests that when a firm experiences poor performance due to exogenous shocks (like a financial crisis, or a natural disaster) managers may make adjustments to their policies (such as changing estimates of bad debt, reducing employee training expense, extending the credit term) to improve the look of financial statements. The political cost hypothesis instead suggests that when a firm is suffering from

exogenous shocks it manages earnings downwards to benefit from the government's help or lower the political costs to the firm.

In the second empirical study, the research question focuses on how the relation between earnings management and credit rating, established in prior literature, is affected by natural disasters. Firms are likely to affect credit rating by managing earnings and obtain a more favourable credit rating or avoid a downgrade during natural disaster. However, whether credit ratings are affected by earnings management practices during the disaster period will depend on the trade-off between the reputational and financial incentives of the credit rating agencies.

According to the reputational concerns hypothesis, if credit rating agencies recognize that firm manage earnings during the disasters, they should penalize those firms by lowering their credit rating. At the same time, however, credit rating agencies might be financially motivated not to penalize firms with earnings management during the disasters. This contradicting financial motive may arise because of a conflict of interest, i.e. credit rating agencies are paid by rated firms, so more lenient ratings may ensure client loyalty.

3 The main finding of the research

3.1 The first empirical study

With respect to the question whether natural disasters affect earnings management, we find during a natural disaster firms are more likely to use both accrual and real earnings management, although our results are sensitive to the measure of earnings management. All in all, we interpret our evidence as aligned with the idea that managers manage earnings upwards to boost market

confident in the firm's survival in the aftermath the disasters (i.e. support for the market incentive hypothesis). We also consider whether the increase in the level of earnings management depends on the intensity of the disaster. We find that the coefficient of interest in the flooding setting shows greater magnitude than in the tsunami group, suggesting that the more intense the disaster, the higher the level of earnings management.

3.2 The second empirical study

In the second empirical study, we hypothesize that the association between earnings management and deviations from expected credit rating is moderated by the occurrence of a natural disaster. Overall, our results suggest that earnings management negatively affects deviations of actual credit ratings from expected credit ratings during a natural disaster. This indicates that credit rating agencies can detect earnings management activities and penalize firms engaging in earnings management by lowering their credit rating as predicted by the reputation incentives hypothesis.

Next, we expand the results in the first empirical study (Chapter 3) and examine whether the effect of earnings management on the deviations from expected credit rating is conditional to the intensity of the disaster. The evidence shows that the moderation effect of natural disasters is statistically greater in the flooding group than in the tsunami group. Thus, we conclude that the higher the intensity of disaster, the more the credit rating agencies will adjust their credit rating for earnings management.

The third hypothesis focuses on whether credit rating agencies' response to earnings management of speculative grade firms differs from that of investment

grade firms during natural disaster. We test this by running two separate regressions, for the speculative and the investment grade groups. Consistent with the main analysis reported (non-separate between SG and IG groups), our results suggest that credit rating agencies penalize SG firms with earnings management by lowering their credit rating. Because of several constraints in earnings management for SG firms, it is not surprising that credit rating agencies are likely to detect earnings management in SG firms easily. However, in the IG group, there is no evidence that firms engaging in accruals and real earnings management during the tsunami and flooding periods are penalized by credit rating agencies. Hence, consistent with H3, the moderating role of a natural disaster in the relation between earnings management and deviations from expected credit rating is different between SG and IG.

4 The limitations of the research

This study is subject to certain limitations. Firstly, the exclusion of some specific firms (i.e. financial firms, and utility firms) and non-listed firms previously mentioned might reduce the generalizability of the study.

Secondly, the empirical test results based on secondary analysis of data using discretionary accrual models should be treated with caution, since discretionary accrual models are only a statistical proxy of earnings management at the firm level. Moreover, our measures of accruals earnings management may not adequately capture the underlying construct. While we do find generally consistent results for only aggregated accruals or total accruals for accruals earnings management measurement, future studies may wish to examine other research designs for accruals earnings management such as the distribution of earnings after management, and specific accruals. To measure real earnings

management, we use cash flow from operations and discretionary expenses models following Roychowdhury (2006); whereas, future studies may replicate the results with performance-matching technique advocated by Kothari et al. (2005). All these may be an avenue to measure accruals and real earnings management in the future.

Thirdly, due to limitations on data availability from Bloomberg, our sample is relatively small compared to many archival studies examining abnormal accruals and real activities. Future studies could use larger sample sizes when and if more data becomes available. As mentioned above in Chapter 3, Philippines has a small sample size compared with other countries (Indonesia, Thailand, and Korea). We note that the small samples size in Philippines may cause problems for the associated econometrics (i.e. increases the likelihood of a Type II error skewing the results), which lead to decrease statistical power and increase the margin of error (Gujarati and Porter, 2009). However, including Philippines still ensures that the sample is large enough for conducting analyses on subsamples of interest by splitting the data into the separate categories and fitting separate models (i.e. high leverage and low leverage groups, high impact and low impact industries groups, and speculative grade and investment grade groups) (Lin et al., 2013).

Next, this research is limited to ratings that were issued only by Standard and Poor's and does not contain ratings from the other two large credit rating agencies, which are Moody's and Fitch. As a result, the findings may not be generalizable to the overall credit rating environment. Moreover, the sample is constrained to firms that have ratings available in Capital IQ, further reducing

the sample. Overcoming these limitations may be an avenue for future research.

Fifth, real earnings management tests should be interpreted with caution in light of the fact that they may actually be capturing actual disaster effects on the production and investment processes of firms rather than real activities manipulation. It is likely that the occurrence of a natural disaster impairs a firm's ability to invest in the near future. This can be due to a lack of funding that must be diverted to repair the damages of the natural disaster or to the fact that some investments must be postponed because after the disaster the firm can no longer operate at full capacity. For example, if the disaster destroyed part of a firm's plant and the production stopped for a period, it may be that the firm will not invest in advertising during that period. Alternatively, if a costly machinery has been destroyed during the disaster, it is likely that the management will have to divert funding from some discretionary expenditures to the investment in a new machinery. All these decisions clearly affect the real earnings management metrics used in the paper as they do not represent earnings management and would be against our arguments. However, firms may still have incentives to spend money to invest in discretionary expense after the disasters. For example, firms may still want to invest in advertising after the disaster to communicate with customers, encourage sales, and avoid a loss in the value of the brand. Further, if firms faced damages in equipment, they might spend money for maintenance or training of employees on how to use the new machineries and equipment. In this case, the abnormal discretionary expenses are capturing earnings management activities.

Finally, we note that the interpretation of results presented in Chapter 4 seems partially to contrast with Chapter 3. The interpretation of the negative relation between earnings management and credit rating provided in this study is that credit rating agencies recognize that the accounting process has been tempered after a natural disaster and thus they penalize firms that managed earnings. Accordingly, if external stakeholders can see through earnings management practices (as shown in Chapter 4) why should companies engage in earnings management after the disaster as documented in Chapter 3? This is interesting question to be addressed in the future. However, credit ratings agencies are only one stakeholder. In our view, in the presence of such disasters, the benefits from communicating to the market (i.e. shareholders) that the firm is confident about future prospects through the use of upward earnings management may have greater benefits than the costs that arise from a potential credit downgrading. However, the study has not tested this issue and may be an avenue to provide the supporting evidence in the future.

5 The implications for future research

This study gives new insights into the earnings management literature by viewing natural disasters as determinants of earnings management and as factors affecting the consequences of earnings management. The findings not only yield a more reliable picture of how natural disasters affect both accrual-based and real earnings management, but also, provide a better understanding on how credit ratings agencies rate firms engaging in earnings management in the aftermath of a natural disaster. Moreover, the study also supports the earlier findings on similar exogenous shocks, such as the financial crisis in Trombetta and Imperatore (2014), that the higher the impact from the natural disaster on

the firm, the more engagement in earnings management and the greater the effects from earnings management on the credit rating of the firm. The better understanding of how managers react to natural disasters and of credit rating agencies' response to earning management of firms during natural disaster may help investors in making investment decisions, practitioners in assessing risk, and regulators in formulating appropriate policies to protect investors.

References

Abbott, P. L., 1996. *Natural Disasters.* Wm. C. Brown Publishing Co., Dubuque, lowa.

Abernathy, J. L., Beyer, B., and Rapley. E. T. 2014. Earnings Management Constraints and Classification Shifting. *Journal of Business Finance and Accounting 41 (5-6):* 600-626.

Abolverdi, Z., and Kheradmand, A. 2017. A Survey of the Relationship between Earnings Management and Qualified Auditor Opinion in Tehran Stock Exchange. *International Journal of Economics and Financial Issues 7 (2)*: 723-729.

Aerts, W., and Zhang, S. 2014. Management's Causal Reasoning on Performance and Earnings Management. *European Management Journal 32 (5)*: 770-783.

Affleck-Graves, J., Callahan, C. M., and Chipalkatti, N. 2002. Earnings Predictability, Information Asymmetry, and Market Liquidity. *Journal of Accounting Research 40 (3)*: 561-583.

Ahmed, A. S., Takeda, C., and Thomas, S. 1999. Bank Loan Loss Provisions: A Reexamination of Capital Management, Earnings Management and Signaling Effects. *Journal of Accounting and Economics 28 (1)*: 1-25.

Ajinkya, B., Bhojraj, S., and Sengupta, P. 2005. The Association between Outside Directors, Institutional Investors and the Properties of Management Earnings Forecasts. *Journal of Accounting Research 43 (3)*: 343-376.

Alhadab, M., Clacher, I., and Keasey, K. 2016. A Comparative Analysis of Real and Accruals Earnings Management around Initial Public Offerings under Different Regulatory Environments. *Journal of Business Finance and Accounting 43 (7-8):* 849-871.

Alissa, W., Bonsal, S. B., Koharki, K., and Penn, M. W. 2013. Firms' use of Accounting Discretion to Influence their Credit Ratings. *Journal of Accounting and Economics 55 (2-3)*: 129-147.

Amy, P. H. 2005. Determinants of Managerial Earnings Guidance Prior to Regulation Fair Disclosure and Bias in Analysts' Earnings Forecasts. *Contemporary Accounting Research 22 (4)*: 867-914.

An, H., Lee, Y. W., and Zhang, T. 2014. Do Corporations Manage Earnings to Meet/Exceed Analyst Forecasts? Evidence from Pension Plan Assumption Changes. *Review of Accounting Studies 19 (2)*: 698-735.

Anh, N. H., and Linh, N. H. 2016. Using the M-score Model in Detecting Earnings Management: Evidence from Non-Financial Vietnamese Listed Companies. *VNU Journal of Science: Economics and Business 32 (2)*: 14-23.

Aono, J., and Guan, L. 2008. The Impact of Sarbanes-Oxley Act on Cosmetic Earnings Management. *Research in Accounting Regulation 20*: 205-215.

Ardison, K. M. M., Martinez, A. L., and Galdi, F. C. 2012. The Effect of Leverage on Earnings Management in Brazil. *Advance in Scientific and Applied Accounting 5 (3)*: 305-324.

Ariff, M., Loh, A. L., and Chew, P. M. 1997. The Impact of Accounting Earnings on Stock Prices in Singapore. *Asia Pacific Journal of Management 14 (1)*: 1-15.

Ashbaugh-Skaife, H., Collins, D. W., and LaFond, R. 2006. The Effects of Corporate Governance on Firms' Credit Ratings. *Journal of Accounting and Economics 42 (1-2)*: 203-243.

Ball, R., and Brown, P. 1968. An Empirical Evaluation of Accounting Income Numbers. *Journal of Accounting Research 6 (2)*: 159-178.

Ball, R., Kothari, S. P., and Robin, A. 2000. The Effect of International Institutional Factors on Properties of Accounting Earnings. *Journal of Accounting and Economics 29 (1)*: 1-54.

Ball, R., Robin, A., and Wu, J. S. 2003. Incentives Versus Standards: Properties of Accounting Income in Four East Asian Countries and Implications for Acceptance of IAS. *Journal of Accounting and Economics 36 (1-3)*: 235-270.

Ball, R., and Shivakumar, L. 2006. The Role of Accruals in Asymmetrically Timely Gain and Loss Recognition. *Journal of Accounting Research 44 (2)*: 207-242.

Ball, R., and Shivakumar, L. 2008. Earnings Quality at Initial Public Offerings. *Journal of Accounting and Economics 45 (2-3):* 324-349.

Bangkokpost. 2017. Flood Aid at the Ready. Retrieved from http://www.bangkokpost.com/business/news/1297519/flood-aid-at-the-ready [Accessed date: 16 July 2017].

Barth, M. E., Elliott, J. A., and Finn, M. W. 1999. Market Rewards Associated with Patterns of Increasing Earnings. *Journal of Accounting Research 37(2)*: 387-413.

Barth, M. E., Landsman, W. R., and Lang, M. H. 2008. International Accounting Standards and Accounting Quality. *Journal of Accounting Research 46 (3)*: 467-498.

Bartov, E. 1993. The Timing of Asset Sales and Earnings Manipulation. *The Accounting Review 68 (4)*: 840-855.

Bartov, E. S., Givoly, D., and Hayn, C. 2002. The Rewards to Meeting or Beating Earnings Expectations. *Journal of Accounting and Economics 33 (2)*: 173-204.

Bartov, E. S., Gul, F. A., and Tsui, J. S. L. 2001. Discretionary-Accruals Models and Audit Qualifications. *Journal of Accounting and Economics 30 (3)*: 421-452.

Basel Committee for Banking Supervision. 1999. *A New Capital Adequacy Framework.* Basel, Switzerland: BIS.

Basel Committee for Banking Supervision. 2004. *International Convergence of Capital Measurement and Capital Standards a Revised Framework.* Basel, Switzerland: BIS.

Basu, S. 1997. The Conservatism Principle and Asymmetric Timeliness of Earnings. *Journal of Accounting and Economics 24 (1)*: 3-37.

Beaver, W., McNichols, M., and Nelson, K. 2003. Management of the Loss Reserve Accrual and the Distribution of Earnings in the Property-Casualty Insurance Industry. *Journal of Accounting and Economics 35 (3)*: 347-376.

Beneish, M. D. 1999. The Detection of Earnings Manipulation. *Financial Analyst Journal* 55 *(5)*: 24-36.

Bergstresser, D., and Philippon, T. 2006. CEO Incentives and Earnings Management. *Journal of Financial Economics 80 (3)*: 511-529.

Beyer, A., Guttman, I., and Marinovic, I. 2014. Earnings Management and Earnings Quality: Theory and Evidence. *Stanford Graduate School of Business Research Paper Series*: 14-44.

Bhattacharya, U., Daouk, H., and Welker, M. 2003. The World Price of Earnings Opacity. *The Accounting Review 78 (3)*: 641-678.

Bonner, S. E., Palmrose, Z., and Young, S. M. 1998. Fraud Type and Auditor Litigation: An Analysis of SEC Accounting and Auditing Enforcement Releases. *The Accounting Review 73 (4)*: 503-532.

Bowen, R., Rajgopal, S., and Venkatachalam, M. 2008. Accounting Discretion, Corporate Governance, and Firm Performance. *Contemporary Accounting Research 25 (2)*: 351–405.

Bozzolan, S., Fabrizi, M., Mallin, C., and Michelon, G. 2015. Corporate Social Responsibility and Earnings Quality: International Evidence. *The International Journal of accounting 50 (4)*: 361-396.

Brazel, J. F., Jones, K. L., and Zimbelman, M. F. 2009. Using Nonfinancial Measures to Assess Fraud Risk. *Journal of Accounting Research 47 (5)*: 1135-1166.

Brown, L., and Caylor, M. 2005. A Temporal Analysis of Thresholds: Propensities and Valuation Consequences. *The Accounting Review 80 (2)*: 423-440.

Brown, L., and Pinello, A. 2007. To What Extent does the Financial Reporting Process Curb Earnings Surprise Games? *Journal of Accounting Research 45 (5)*: 947-981.

Burgstahler, D., and Dichev, I. D. 1997. Earnings Management to Avoid Earnings Decreases and Losses. *Journal of Accounting and Economics 24 (1)*: 99–126.

Burgstahler, D., and Eames, M. 2006. Management of Earnings and Analysts' Forecasts to Achieve Zero and Small Positive Earnings Surprises. *Journal of Business Finance and Accounting 33 (5) & (6)*: 633-652.

Burgstahler, D., Hail, L., and Leuz, C. 2006. The Importance of Reporting Incentives: Earnings Management in European Private and Public Firms. *The Accounting Review 81 (5)*: 983-1016.

Burns, N., and Kedia, S. 2006. The Impact of Performance-based Compensation on Misreporting. *Journal of Financial Economics 79 (1)*: 35–67.

Butler, M., Leone, A. J., and Willenborg, M. 2004. An Empirical Analysis of Auditor Reporting and its Association with Abnormal Accruals. *Journal of Accounting and Economics 37 (2)*: 139-165.

Byard, D., Hossain, M., and Mitra, S. 2007. US Oil Companies' Earning Management in Response to Hurricanes Katrina and Rita. *Journal of Accounting and Public Policy 26 (6)*: 733-748.

Cahan, S. 1992. The Effect of Antitrust Investigation on Discretionary Accruals: A Refined Test of the Political Cost Hypothesis. *The Accounting Review 67 (1)*: 77-96.

Cahan, S. F., Emanuel, D., and Sun, J. 2009. The Effect of Earnings Quality and Country-level Institutions on the Value Relevance if Earnings. *Review of Quantitative Finance and Accounting 33 (4)*: 371-391.

Callao, S., Cuellar, B., and Jarne, J. I. 2006. International Differences in Value Relevance of Accounting Data and Explaining Country Factors. *International Journal of Accounting, Auditing and Performance Evaluation 3(4)*: 387-408.

Carter, K. E. 2015. The Joint Effect of Sarbanes-Oxley Act and Earnings Management on Credit Ratings. *Journal of Accounting and Finance 15 (4):* 77-94.

Centre for Research on the Epidemiology of Disasters. 2012. *Annual Disaster Statistical Review 2011.* Université catholique de Louvain – Brussels, Belgium.

Chan, K., Chan, L. K., Jegadeesh, N., and Lakonishok, J. 2006. Earnings Quality and Stock Returns. *The Journal of Business 79 (3)*: 1041-1082.

Chand, P. V., Hussain, F. F., and Rani, P. 2013. Managerial Incentives for Earnings Management among Listed Firms: Evidence from Fiji. *Global Journal of Business Research 7 (1)*: 21-31.

Charoenwong, C., and Jiraporn, P. 2009. Earnings Management to Exceed Thresholds: Evidence from Singapore and Thailand. *Journal of Multinational Financial Management 19 (3)*: 221-236.

Chen, D., Li, J., Liang, S., and Wang, G. 2011. Macroeconomic Control, Political Costs and Earnings Management: Evidence from Chinese Listed Real Estate Companies. *China Journal of Accounting Research 4 (3)*: 91-106.

Chen, P. F., He, S., Ma, Z., and Stice, D. E. 2013. Qualified Audit Opinions and Debt Contracting. *The 2013 AAA Annual Meeting.* Anaheim, California.

Chen, T., Tseng, Y., and Hsieh, Y. 2015. Real Earnings Management Uncertainty and Corporate Credit Risk. *European Accounting Review 24 (3)*: 413-440.

Cheng, Q., and Warfield, T. D. 2005. Equity Incentives and Earnings Management. *The Accounting Review 80 (2)*: 441-476.

Chin, M. 2015. Accounting Quality and Credit Ratings' Ability to Predict Default. *Publicly Accessible Penn Dissertations, University of Pennsylvania.* Retrieved from http://repository.upenn.edu/edissertations/1028/ [Accessed date: 6 July 2017].

Cho, S., and Sachs, K. 2012. Earnings Management and Deregulation: The Case of Motor Carriers. *Journal of Accounting and Public Policy 31(5)*: 451-470.

Choi, J. H., Kim, J. B., and Lee, J. J. 2011. Value Relevance of Discretionary Accruals in the Asian Financial Crisis of 1997-1998. *Journal of Accounting Public Policy 30 (2)*: 166-187.

Christie, A. A., and Zimmennan, J. L. 1994. Efficient vs. Opportunistic Choice of Accounting Procedures: Corporate Control Contests. *The Accounting Review 69 (4)*: 539-566.

Cohen, D., Dey, A., and Lys, T. 2008. Real and Accrual-Based Earnings Management in the Pre- and Post-Sarbanes-Oxley Periods. *Accounting Review 83 (3)*: 757-787.

Cohen, D., and Zarowin, P. 2010. Accrual-Based and Real Earnings Management Activities around Seasoned Equity Offerings. *Journal of Accounting and Economics 50 (1)*: 2-19.

Cormier, D., Houle, S., and Ledoux, M. 2013. The Incidence of Earnings Management on Information Asymmetry in an Uncertain Environment: Some Canadian Evidence. *Journal of International Accounting, Auditing and Taxation 22 (1)*: 26-38.

Costello, A. M., and Wittenberg-Moerman, R. 2011. The Impact of Financial Reporting Quality on Debt Contracting: Evidence from Internal Control Weakness Reports. *Journal of Accounting Research 49 (1)*: 97-136.

Cotter, J., Tuna, I., and Wysocki, P. D. 2006. Expectations Management and Beatable Targets: How Do Analysts React to Explicit Earnings Guidance? *Contemporary Accounting Research 23 (3)*: 593-624.

Covitz, D., and Harrison, P. 2003. Testing Conflicts of Interest at Bond Ratings Agencies with Market Anticipation: Evidence that Reputation Incentives Dominate. *Finance and Economics Discussion Series 2003-68.* Board of Governors of the Federal Reserve System, United State.

Cupertino, C. M., Martinez, A. L., and Affonso da Costa Jr, N. C. 2016. Consequence for Future Return with Earnings Management through Real Operating Activities. *Revista Contabilidade & Financas 27 (71)*: 232-242.

Daniel, N. D., Denis, D. J., and Naveen, L. 2008. Do Firms Manage Earnings to Meet Dividend Thresholds? *Journal of Accounting and Economics 45 (1)*: 2-26.

Darjezi, J. I. Z., Khansalar, E., and Holt, A. 2015. The Role of Working Capital Accruals on Earnings Quality and Stock Return. *International Journal of Economics and Finance 7(9)*: 1-14.

Das, S., Levine, C. B., and Sivaramakrishnan, K. 1998. Earnings Predictability and Bias in Analysts' Earnings Forecasts. *The Accounting Review 73 (2)*: 277-294.

Davis, L. R., Soo, B. S., and Gregory, M. T. 2009. Audit Tenure and the Ability to Meet or Beat Earnings Forecasts. *Contemporary Accounting Research 26 (2)*: 517-548.

DeAngelo, H., DeAngelo, L., and Skinner, D. J. 1994. Accounting Choice in Troubled Companies. *Journal of Accounting and Economics 17 (1-2)*: 113-143.

DeAngelo, L. E. 1986. Accounting Numbers as Market Valuation Substitutes: A Study of Management Buyouts of Public Stockholders. *The Accounting Review 61 (3)*: 400-420.

Dechow, P. M. 1994. Accounting Earnings and Cash Flows as Measures of Firm Performance: The Role of Accounting Accruals. *Journal of Accounting and Economics 18 (1)*: 3-42.

Dechow, P. M., and Dichev, I. D. 2002. The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors. *The Accounting Review 77 (s-1)*: 35-59.

Dechow, P. M., Ge, W., Larson, C. R., and Sloan, R. G. 2011. Predicting Material Accounting Misstatements*. Contemporary Accounting Research 28 (1)*: 17 – 82.

Dechow, P. M., Ge, W., and Schrand, C. M. 2010. Understanding Earnings Quality: A Review of the Proxies, their Determinants and their Consequences*. Journal of Accounting and Economics 50 (2-3)*: 344 – 401.

Dechow, P., Richardson, S., and Tuna, I. 2003. Why are Earnings Kinky? An Examination of the Earnings Management Explanation. *Review of Accounting Studies 8 (2-3)*: 355-384.

Dechow, P., and Skinner, D. 2000. Earnings Management: Reconciling the Views of Accounting Academics, Practitioners, and Regulators. *Accounting Horizons 14 (2)*: 235-250.

Dechow, P., Sloan, M., and Sweeney, A. 1995. Detecting Earnings Management. *The Accounting Review 70 (2):* 193 – 225.

Dechow, P., Sloan, M., and Sweeney, A. 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.

Defond, M. L. 2010. Earnings Quality Research: Advances, Challenges and Future Research. *Journal of Accounting and Economics 50 (2-3):* 402-409.

Defond, M. L., and Jiambalvo, J. 1994. Debt Covenant Violations and Manipulation of Accruals. *Journal of Accounting and Economics 17 (1-2):* 145-176.

Defond, M. L., and Park, C. W. 1997. Smoothing Income in Anticipation of Future Earnings. *Journal of Accounting and Economics 23 (2)*: 115-139.

Degeorge, F., Patel, J., and Zeckhauser, R. 1999. Earnings Management to Exceed Thresholds. *Journal of Business 72 (1)*: 1-33.

Demers, E., and Wang, C. 2010. The Impact of CEO Career Concerns on Accruals Based and Real Earnings Management. *Finance and Corporate Governance Conference 2011 Paper.* Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1716535 [Accessed date: 29 September 2016].

Demirtas, K. O., and Cornaggia, K. R. 2013. Initial Credit Ratings and Earnings Management. *Review of Financial Economics 22 (4)*: 135-145.

Dewi, D. M. 2015. The Role of CSRD on Company's Financial Performance and Earnings Response Coefficient (ERC). *Procedia-Social and Behavioral Sciences 211*: 541-549.

Dichev, I. D., Graham, J. R., Harvey, C. R., and Rajgopal, S. 2013. Earnings quality: Evidence from the Field. *Journal of Accounting and Economics 56 (2-3)*: 1-33.

Dichev, I. D., and Piotroski, J. D. 2001. The Long-run Stock Returns following Bond Ratings Changes. *The Journal of Finance 56 (1)*: 173-203.

Dichev, I. D., and Tang, V. W. 2009. Earnings Volatility and Earnings Predictability. *Journal of Accounting and Economics 47 (1-2)*: 160-181.

Down to Earth. 2015. Asia has Faced more Disasters than any Other Continent since 1970. Retrieved from http://www.downtoearth.org.in/news/since-1970-asia-has-faced-a-higher-number-of-disasters-than-any-other-continent-51811 [Accessed date: 25 June 2018].

Doyle, J. T., Ge, W., and McVay, S. 2007. Accruals Quality and Internal Control over Financial Reporting. *The Accounting Review 82 (5)*: 1141-1170.

DuCharme, L. L., Malatesta, P. H., and Sefcik, S. E. 2001. Earnings Management: IPO Valuation and Subsequent Performance. *Journal of Accounting, Auditing & Finance 16 (4)*: 369-396.

DuCharme, L. L., Malatesta, P. H., and Sefcik, S. E. 2004. Earnings Management, Stock Issues, and Shareholder Lawsuits. *Journal of Financial Economics 71 (1)*: 27-49.

Eastman, E. M., Eckles, D. L., and Halek, M. 2017. Asymmetry in Earnings Management Surrounding Targeted Ratings. *Working Paper.* University of Georgia, US.

Economist. 2011. Counting the Cost. Retrieved from http://www.economist.com/blogs/dailychart/2011/03/natural_disasters [Accessed date: 21 April 2016].

Efendi, J., Srivastava, A., and Swanson, E. P. 2007. Why do Corporate Managers Misstate Financial Statements? The Role of Option Compensation and Other Factors. *Journal of Financial Economics 85 (3)*: 667–708.

Erickson, M., and Wang, S. 1999. Earnings Management by Acquiring Firms in Stock for Stock Mergers. *Journal of Accounting and Economics 27 (2)*: 149-176.

Esteban, L. P., and Garcia, C. F. 2014. The Influence of Firm Characteristics on Earnings Quality. *International Journal of Hospitality Management 42*: 50-60.

Ewert, R., and Wagenhofer, A. 2005. Economic Effects of Tightening Accounting Standards to Restrict Earnings Management. *The Accounting Review 80 (4)*: 1101-1124.

Fairfield, P., Kitching, K., and Tang, V. 2009. Are Special Items Informative about Future Profit Margins? *Review of Accounting Studies 14 (2-3)*: 204-236.

Fang, V. W., Noe, T. H., and Tice, S. 2009. Stock Market Liquidity and Firm Value. *Journal of Financial Economics 94 (1)*: 150-169.

Filip, A., and Raffournier, B. 2014. Financial Crisis and Earnings Management: The European Evidence. *The International Journal of Accounting 49 (4)*: 455-478.

Francis, J., and Krishnan, J. 1999. Accounting Accruals and Auditor Reporting Conservatism. *Contemporary Accounting Research 16 (1)*: 135-165.

Francis, J., Lafond, R., Olsson, P., and Schipper, K. 2003. Earnings Quality and the Pricing effects of Earnings Patterns. *Working Paper.* Duke University, University of Wisconsin and the FASB. Retrieved from https://ssrn.com/abstract=414142 [Accessed date: 25 September 2016].

Francis, J., Lafond, R., Olsson, P., and Schipper, K. 2004. Costs of Equality and Earnings Attributes. *The Accounting Review 79 (4)*: 967-1010.

Francis, J., Lafond, R., Olsson, P., and Schipper, K. 2005. The Market Pricing of Accruals Quality. *Journal Accounting and of Economics 39 (2)*: 295-327.

Francis, J., and Schipper, K. 1999. Have Financial Statements Lost their Relevance? *Journal of Accounting Research 37(2)*: 319-352.

Francis, J., Schipper, K., and Vincent, L. 2003. The Relative and Incremental Explanatory Power of Earnings and Alternative (to earnings) Performance Measures for Returns. *Contemporary Accounting Research 20 (1)*: 121-164.

Frankel, R. M., Johnson, M. F., and Nelson, K. K. 2002. The Relation between Auditors' Fees for Nonaudit Services and Earnings Management. *The Accounting Review 77 (s-1)*: 71-105.

Ghosh, D., and Olsen, L. 2009. Environmental Uncertainty and Managers' use of Discretionary Accruals. *Accounting Organizations and Society 34 (2)*: 188-205.

Gill, A., Biger, N., Mand, H. S., and Mathur, N. 2013. Earnings Management, Firm Performance, and the Value of Indian Manufacturing Firms. *International Research Journal of Finance and Economics 116*: 120-132.

Givoly, D., and Hayn, C. 2000. The Changing Time-series Properties of Earnings, Cash Flows and Accruals: Has Financial Reporting become more Conservative? *Journal of Accounting and Economics 29 (3)*: 287-320.

Gong, G., Louis, H., and Sun, A. 2008. Earnings Management, Lawsuits, and Stock-for-Stock Acquirers' Market Performance. *Journal of Accounting and Economic 46 (1)*: 62-77.

Gounopoulos, D., and Pham, H. 2017. Credit Ratings and Earnings Management around IPOs. *Journal of Business Finance and Accounting 44 (1) & (2)*: 154-195.

Graham, J. R., and Harvey, C. R. 2001. The Theory and Practice of Corporate Finance: Evidence from the Field. *Journal of Financial Economics 60 (2-3)*: 187-243.

Graham, J. R., Harvey, C. R., and Rajgopal, S. 2005. The Economic Implications of Corporate Financial Reporting. *Journal of Accounting and Economic 40 (1-3)*: 3-73.

Guidry, F., Leone, A. J., and Rock, S. 1999. Earnings-based Bonus Plans and Earnings Management by Business-unit Managers. *Journal of Accounting and Economic 26 (1-3)*: 113–142.

Gujarati, D. N., and Porter, D. C. 2009. Basic Econometrics. 5th Edition, McGraw Hill Inc., New York.

Gul, F. A., Chen, C. J. P., and Tsui, J. S. L. 2003. Discretionary Accounting Accruals, Managers' Incentives, and Audit Fees. *Contemporary Accounting Research 20 (3)*: 441-464.

Gunny, K. 2010. The Relation between Earnings Management using Real Activities Manipulation and Future Performance: Evidence from Meeting Earnings Benchmarks. *Contemporary Accounting Research 27 (3)*: 855-888.

Gupta, P. P., Krishnan, G. V., and Yu, W. 2012. Do Auditors allow Earnings Management when Audit Fees are Low? Retrieved from http://ssrn.com/abstract=1836829 [Accessed date: 27 April 2017].

Hail, L., and Leuz, C. 2006. International Differences in the Cost of Equity Capital: Do Legal Institutions and Securities Regulation Matter? *Journal of Accounting Research 44 (3)*: 485-531.

Hall, S. C. 1993. Political Scrutiny and Earnings Management in the Oil Refining Industry. *Journal of Account Public Policy 12 (4)*: 325–351.

Hall, S. C., and Stammerjohan, W. W. 1997. Damage Awards and Earnings Management in the Oil Industry. *The Accounting Review 72 (1)*: 47-65.

Han, J. C. Y., and Wang, S. 1998. Political Costs and Earnings Management of Oil Companies during the 1990 Persian Gulf Crisis. *The Accounting Review 73 (1)*: 103-117.

Haw, I., Qi, D., Wu, D., and Wu, W. 2005. Market Consequences of Earnings Management in response to Security Regulations in China. *Contemporary Accounting Research 22 (1)*: 95-140.

Healy, P. 1985. The Effect of Bonus Schemes on Accounting Decisions. *Journal of Accounting and Economic 7 (April)*: 85-107.

Healy, P. M., and Krishna, P. G. 1993. The Effect of Firms' Financial Disclosure Strategies on Stock Prices. *Accounting Horizons 7 (1)*: 1-11.

Healy, P. M., and Palepu, K. G. 1990. The Effectiveness of Accounting-based Dividend Constraints. *Journal of Accounting and Economics 12 (1-3)*: 97 – 123.

Healy, P. M., and Wahlem, J. M. 1999. A Review of the Earnings Management Literature and its Implications for Standard Setting. *Accounting Horizons 13 (4)*: 365 – 383.

Herbohn, K., and Ragunathan, V. 2008. Auditor Reporting and Earnings Management: Some Additional Evidence. *Accounting and Finance 48 (4)*: 575-601.

Herrmann, D., Hope, O., Payne, J. L., and Thomas, W. B. 2011. The Market's Reaction to Unexpected Earnings Thresholds. *Journal of Business Finance & Accounting 38 (1-2)*: 34-57.

Holthausen, R. W., Larcker, D. F., and Sloan, R. G. 1995. Annual Bonus Schemes and the Manipulation of Earnings. *Journal of Accounting and Economic 19 (1)*: 29–74.

Hovakimian, A., Kayhan, A., and Titman, S. 2009. How do Managers Target their Credit Ratings? A Study of Credit Ratings and Managerial Discretion. *Working Paper.* University of Texas at Austin and NBER, US. Retrieved from https://ssrn.com/abstract=1396726 [Accessed date: 24 January 2017].

Hribar, P., and Collines, D. W. 2002. Errors in Estimating Accruals: Implications for Empirical Research. *Journal of Accounting Research 40 (1)*: 105-134.

Iatridis, G., and Dimitras, A. I. 2013. Financial Crisis and Accounting Quality: Evidence from Five European Countries. *Advances in Accounting 29 (1)*: 154–160.

Irani, R. M., and Oesch, D. 2016. Analyst Coverage and Real Earnings Management: Quasi-Experimental Evidence. *Journal of Financial and Quantitative Analysts 51 (2):* 589-627.

Jansen, I. P., Ramnath, S., and Yohn, T. L. 2012. A Diagnostic for Earnings Management using Changes in Asset Turnover and Profit Margin. *Contemporary Accounting Research 29 (1)*: 221-251.

Jiang, J. X. 2008. Beating Earnings Benchmarks and the Cost of Debt. *The Accounting Review 83 (2):* 377-416.

Jiang, J. X., Petroni, K. R., and Wang, I. Y. 2010. CFOs and CEOs: Who have the most Influence on Earnings Management? *Journal of Financial Economics 96 (3)*: 513-526.

Johnson, E., Khurana, I. K., and Reynolds, J. K. 2002. Audit-Firm Tenure and the Quality of Financial Reports. *Contemporary Accounting Research 19 (4)*: 637-660.

Jones, J. 1991. Earning Management during Import Relief Investigation. *Journal of Accounting Research 29 (2)*: 193-228.

Jorion, P., Shi, C., and Zhang, S. 2009. Tightening Credit Standards: The Role of Accounting Quality. *Review of Accounting Studies 14 (1):* 123-160.

Jung, B., Soderstrom, N., and Yang, Y. S. 2013. Earning Smoothing Activities of Firms to manage Credit Ratings. *Contemporary Accounting Research 30 (2):* 645-676.

Karamanou, I., and Vafeas, N. 2005. The Association between Corporate Boards, Audit Committees, and Management Earnings Forecasts: An Empirical Analysis. *Journal of Accounting Research 43 (3)*: 453-486.

Kerstein, J., and Rai, A. 2007. Intra-year Shifts in the Earnings Distribution and their Implications for Earnings Management. *Journal of Accounting and Economics 44 (3)*: 399-419.

Key, K. G. 1997. Political Cost Incentives for Earnings Management in the Cable Television Industry. *Journal of Account Economics 23 (3)*: 309–337.

Kim, J. B., Li, Y., and Zhang, L. 2011. Corporate Tax Avoidance and Stock Price Crash Risk: Firm-Level Analysis. *Journal of Financial Economics 100 (3)*: 639-662.

Kim, Y. S., Kim, Y., and Song, K. R. 2013. Credit Rating Changes and Earnings Management. *Asia pacific Journal of Financial Studies 42 (1)*: 109-140.

Kirschenheiter, M., and Melumad, N. D. 2002. Can "Big Bath" and Earnings smoothing Co-exist as Equilibrium Financial Reporting Strategies? *Journal of Accounting Research 40 (3)*: 761-796.

Kisgen, D. S. 2006. Credit Rating and Capital Structure. *Journal of Finance 61 (3)*: 1035-1072.

Kisgen, D., and Strahan, P. 2010. Do Regulations based on Credit Ratings affect a Firm's Cost of Capital? *Review of Financial Studies 23 (12)*: 4324-4347.

Klein, A. 2002. Audit Committee, Board of Director Characteristics, and Earnings Management. *Journal of Accounting and Economics 33 (3)*: 375-400.

Kliesen, K. L. 1994. *The Economics of Natural Disasters.* Retrieved from https://www.stlouisfed.org/publications/regional-economist/april-1994/the-economics-of-natural-disasters [Accessed date: 7 December 2018].

Koehler, D. A., and Hespenheide, E. J. 2013. Finding the Value in Environmental, Social, and Governance Performance. Deloitte Insights. Retrieved from https://www2.deloitte.com/insights/us/en/deloitte-review/issue-12/finding-the-value-in-environmental-social-and-governance-performance.html [Accessed date: 15 December 2017].

Konigsgruber, R., and Windisch, D. 2014. Does European Union Policy Making Explain Accounting Choices? An Empirical Analysis of the Effects of Investigations by the Directorate General for Competition on Accounting Choices. *Journal of Management and Governance 18 (3)*: 717-731.

Kormendi, R., and Lipe, R. 1987. Earnings Innovations, Earnings Persistence, and Stock Returns. *Journal of Business 60 (3)*: 323-345.

Kothari, S., Leone, A., and Wasley, C. 2005. Performance Matched Discretionary Accruals Measures. *Journal of Accounting and Economics 39 (1)*: 163-197.

Koumanakos, E. 2008. Auditor Awareness of Earnings Management. *Accounting, Auditing and Performance Evaluation 5 (1)*: 50-65.

Kousenidis, D. V., Ladas, A. C., and Negakis, C. I. 2013. The Effects of the European Debt Crisis on Earnings Quality. *International Review of Financial Analysis 30*: 351-362.

Krichene, F., and Khoufi, W. 2016. Do Managers Target their Credit Ratings? *Journal of Business Studies Quarterly 7 (4)*: 64-77.

Lambert, R., Leuz, C., and Verrecchia, R. E. 2007. Accounting Information, Disclosure, and the Cost of Capital. *Journal of Accounting Research 45 (2)*: 385-420.

Lang, M., and Maffett, M. 2011. Transparency and Liquidity Uncertainly in Crisis Periods. *Journal of Accounting and Economics 52 (2-3)*: 101-125.

Lang, M., Raedy, J., and Yetman, M. 2003. How Representative are Firms that are Cross Listed in the United States? An Analysis of Accounting Quality. *Journal of Accounting Research 41 (2)*: 363-386.

Latridis, G., and Dimitras, A. I. 2013. Financial Crisis and Accounting Quality: Evidence from five European countries. *Advance in Accounting, Incorporating Advances in International Accounting 29 (1)*: 154-160.

Lennox, C., and Li, B. 2014. Accounting Misstatements following Lawsuits against Auditors. *Journal of Accounting and Economics 57 (1)*: 58-75.

Lennox, C. S., and Pittman, J. A. 2011. Voluntary Audits versus Mandatory Audits. The *Accounting Review 86 (5)*: 1655-1678.

Leuz, C., Nanda, D., and Wysocki, P. 2003. Earnings Management and Investor Protection: An International Comparison. *Journal of Financial Economics 69 (3)*: 505-527.

Leuz, C., and Schrand, C. 2009. Disclosure and Cost of Capital: Evidence from Firms' responses to Enron Shock. *Chicago Booth School of Business Research Paper No. 08-26.* Chicago Booth School of Business, Chicago. Retrieved from http://www.sfbtr15.de/uploads/media/Leuz.pdf [Accessed date: 28 July 2015].

Lev, B., and Zarowin, P. 1999. The Boundaries of Financial Reporting and How to extend Them. *Journal of Accounting Research 37 (2)*: 353-385.

Li, F. 2008. Annual Report Readability, Current Earnings, and Earnings Persistence. *Journal of Accounting and Economics 45 (2-3)*: 221-247.

Lin, M., Lucas, Jr. H. C., and Shmueli, G. 2013. Too Big to Fail: Large Samples and the p-Value Problem. *Information Systems Research, Article in Advance*: 1-12.

Lin, S., Radhakrishnan, S., and Su, L. 2006. Earnings Management and Guidance for Meeting or Beating Analysts' Earnings Forecasts. Retrieved from https://ssrn.com/abstract=928182 or http://dx.doi.org/10.2139/ssrn.928182 [Accessed date: 17 July 2017].

Lin, Y., and Shen, C. 2015. Family Firms' Credit Rating. Idiosyncratic Risk, and Earnings Management. *Journal of Business Research 68 (4)*: 872-877.

Lin, Z., Liu, M., and Noronha, C. 2016. The Impact of Corporate Governance on Informative Earnings Management in the Chinese Market. *Abacus 52 (3)*: 568-609.

Liu, J., and Thomus, J. 2000. Stock Returns and Accounting Earnings. *Journal of Accounting Research 38*: 71-101.

Lo, K. 2008. Earning Management and Earnings Quality. *Journal of Accounting and Economics 45 (2-3)*: 350-357.

Loana, P. S. 2014. Credit Rating Agencies and their Influence on Crisis. *Annals of the University of Oradea, Economic Science Series 23 (2)*: 271-278.

Louis, H. 2004. Earning Management and Market Performance of Acquiring Firms. *Journal of Financial Economics 74 (1)*: 121-148.

Mahama, M. 2015. Detecting Corporate Fraud and Financial Distress using the Atman and Beneish Models. *International Journal of Economics, Commerce and Management 3 (1)*: 1-18.

Marquardt, C. A., and Wiedman, C. I. 2004. How are Earnings Managed? An Examination of Specific Accruals. *Contemporary Accounting Research 21 (2)*: 461-491.

Matsumoto, D. A. 2002. Management's Incentive to avoid Negative Earnings Surprises. *The Accounting Review 77 (3)*: 483-514.

Mazumder, M. M. M. 2016. Exploring the Impact of Ownership Structure on Earnings Predictability: Insights from Japan. *Indian Journal of Corporate Governance 9 (2)*: 97-121.

McNichols, M. F. 2000. Research Design issues in Earnings Management Studies. *Journal of Accounting and Public Policy 19 (4-5)*: 313-345.

McNichols, M. F. 2002. Discussion of the Quality of Accruals and Earnings: The Role of Accruals Estimation Errors. *The Accounting Review 77 (s-1)*: 61-69.

McNichols, M. F., and Stubben, S. R. 2008. Does Earnings Management affect Firms' Investment Decisions? *The Accounting Review 83 (6)*: 1571-1603.

McVay, S. E. 2006. Earning Management using Classification Shifting: An Examination of Core Earnings and Special Items. *The Accounting Review 81 (3)*: 501-531.

Mendes, C. A., Rodrigues, L. L., and Esteban, L. P. 2012. Evidence of Earnings Management using Accruals as a Measure of Accounting Discretion. *Tekhne-Review of Applied Management Studies 10 (1)*: 3-14.

Milikan, A., and Mukti, A. H. 2015. The Influence of Financial Performance towards Income Smoothing in Property, Real Estate, and Building Construction Industry Listed in Indonesia Stock Exchange. *International Journal of Administration and Governance 1 (13)*: 1-9.

Nelson, S. A., 2018. *Natural Disasters and Assessing Hazards and Risk*. Retrieved from https://www.tulane.edu/~sanelson/Natural_Disasters/introduction.htm [Accessed date: 7 December 2018].

Odders-White, E. R., and Ready, M. J. 2006. Credit Ratings and Stock Liquidity. *Review of Financial Studies 19 (1)*: 119-157.

Okolie, A. O. 2014. Auditor Tenure, Auditor Independence and Accruals-based Earnings Management of Quoted Companies in Nigeria. *European Journal of Accounting Auditing and Finance Research 2 (2)*: 63-90.

Ohlson, J. A. 1995. Earnings, Book Values, and Dividends in Equity Valuation. *Contemporary Accounting Research 11 (2)*: 661-687.

Omid, A. M. 2015. Qualified Audit Opinion, Accounting Earnings Management and Real Earnings Management: Evidence from Iran. *Asian Economic and Financial Review 5 (1)*: 46-57.

Ortega, W. R., and Grant, G. H. 2003. Maynard Manufacturing: An Analysis of GAPP-based and Operational Earnings Management Techniques. *Strategic Finance 85 (1)*: 50-56.

Patten, D. M., and Trompeter, G. 2003. Corporate Responses to Political Costs: An Examination of the Relation between Environmental Disclosure and Earnings Management. *Journal of Accounting and Public Policy 22 (1)*: 83-94.

Payne, J. L., and Robb, S. W. G. 2000. Earnings Management: The Effect of Ex Ante Earnings Expectations. *Journal of Accounting, Auditing & Finance 15 (4)*: 371-392.

Penman, S. H., and Zhang, X. 2002. Accounting Conservatism, the Quality of Earnings, and Stock Returns. *The Accounting Review 77 (2)*: 237-264.

Perotti, P., and Wagenhofer, A. 2014. Earnings Quality Measures and Excess Returns. *Journal of Business Finance and accounting 41 (5&6)*: 545-571.

Pham, H. M. 2016. The Impact of Credit Ratings and CEOs' Work Experience on Earnings Management and Post-Issue Performance of U.S. *IPOs. Doctoral thesis (PhD), University of Sussex.*

Pincus, M., and Rajgopal, S. 2002. The Interaction between Accruals Management and Hedging: Evidence from Oil and Gas Firms. *The Accounting Review 77 (1)*: 127-160.

Plummer, E., and Mest, D. P. 2001. Evidence on the Management of Earnings Components. *Journal of Accounting, Auditing & Finance 16 (4)*: 301-323.

Pornupatham, S. 2007. Do Auditors report Earnings Management? *Journal of Accounting Profession 3 (6)*: 114-126.

Pourciau, S. 1993. Earnings Management and Nonroutine Executive Changes. *Journal of Accounting and Economics 16 (1-3)*: 317-336.

Prawitt, D. F., Smith, J. L., and Wood, D. A. 2009. Internal Audit Quality and Earnings Management. *The Accounting Review 84 (4)*: 1255-1280.

Price, R. A., Sharp, N. Y., and Wood, D. A. 2011. Detecting and Predicting Accounting Irregularities: A Comparison of Commercial and Academic Risk Measures. *The Accounting Horizons 25 (4)*: 755-780.

Queensland Government, 2014. *Environmental Risks to your Business.* Retrieved from https://www.business.qld.gov.au/running-

business/environment/environment-business/risks [Accessed date: 20 December 2018].

Rangan, S. 1998. Earnings Management and the Performance of Seasoned Equity Offerings. *Journal of Financial Economics 50 (1)*: 101-122.

Revsine, L., Collins, D., and Johnson, B. 1999. *Financial Reporting and Analysis.* Prentice Hall, Upper Saddles River, New Jersey.

Rezaee, Z. 2005. Causes, Consequences, and Deterrence of Financial Statement Fraud. *Critical Perspectives on Accounting 16 (3)*: 277-298.

Richard, A. P. L., Sharp, N. Y., and Wood, D. 2011. Detecting and Predicting Accounting Irregularities: A Comparison of Commercial and Academic Risk Measures. Retrieved from http://ssrn.com/abstract=1546675 [Accessed date: 29 June 2016].

Richardson, S. A. 2003. Earnings Quality and Short Sellers. *Accounting Horizons 17 (s-1)*: 49-61.

Richardson, S. A., Sloan, R. G., Soliman, M. T., and Tuna, I. 2005. Accrual Reliability, Earnings Persistence and Stock Prices. *Journal of Accounting and Economics 39 (3)*: 437-485.

Riedl, E. J., and Srinivasan, S. 2010. Signaling Firm Performance through Financial Statement Presentation: An Analysis using Special Items. *Contemporary Accounting Research 27 (1)*: 289-332.

Ronen, J., and Yaari, V. 2008. *Earnings Management: Emerging insights in Theory, Practice, and Research.* Springer: New York.

Rountree, B., Weston, J. P., and Allayannis, G. 2008. Do Investors Value Smooth Performance? *Journal of Financial Economics 90 (3)*: 237-251.

Roychowdhury, S. 2006. Earnings Management through Real Activities Manipulation. *Journal of Accounting and Economics 42 (3)*: 335-370.

Schipper, K. 1989. Commentary on Earnings Management. *Accounting Horizon 3 (4)*: 91-102.

Schipper, K., and Vincent, L. 2003. Earnings Quality. *Accounting Horizons 17(Supplement)*: 97-110.

SEC. 2013. The ABCs of Credit Ratings. Retrieved from https://www.sec.gov/files/ib_creditratings.pdf [Accessed date: 21 May 2017].

Shi, L., and Zhou, N. 2013. A Modified Dechow and Dichev (2002) Model with Cash Flow Forecasts. Retrieved from http://ssrn.com/abstract=2144239 or http://dx.doi.org/10.2139/ssrn.2144239 [Accessed date: 30 July 2015].

Shuto, A. 2007. Executive Compensation and Earnings Management: Empirical Evidence from Japan. *Journal of International Accounting, Auditing and Taxation 16 (1):* 1-26.

Siddharth, K. 2009. *Statistical Significance and Sample Size.* Retrieved from https://explorable.com/statistical-significance-sample-size [Accessed date: 24 December 2018].

Sloan, R. 1996. Do Stock Prices fully feflect Information in Accruals and Cash Flows about Future Earnings? *The Accounting Review 71 (3)*: 289-315.

Smith, K., 1992. *Environmental Hazards.* Routledge, London.

Smith, C., and Watts, R. 1992. The Investment Opportunity set and corporate Financing Dividend and Compensation Policies. *Journal of Finance Economics 32 (3)*: 263-292.

Sms Tsunami Warning, 2012. Tsunami Sumatra 2004, Andaman Indonesia. Retrieved from http://www.sms-tsunami-warning.com/pages/tsunami-sumatra-2004#.WsuVfdTwaM8 [Accessed date: 14 March 2018].

Spiegel, P. B., Le, P., Ververs, M., and Salama, P. 2007. Occurrence and Overlap of Natural Disasters, Complex Emergencies and Epidemics during the Past Decade (1995–2004). *Conflict and Health 1*: 2.

Standard and Poor's. 2003. *Corporate Ratings Criteria.* Standard and Poor's: New York.

Standard and Poor's. 2006. *Corporate Ratings Criteria.* Standard and Poor's: New York.

Standard and Poor's. 2011. *Guide to Credit Rating Essentials: What are Credit Ratings and How do they Work?* Standard and Poor's: New York.

Standard and Poor's. 2015. *Climate Change will Likely Test the Resilience of Corporates' Creditworthiness to Natural Catastrophes.* McGraw Hill Financial. Retrieved from http://img.en25.com/Web/StandardandPoors/SP_CreditRatingsGuide.pdf [Accessed date: 2 October 2016].

Stanley, J. D., and DeZoort, F. T. 2007. Audit Firm Tenure and Financial Restatements: An Analysis of Industry Specialization and Fee Effects. *Journal of Accounting and Public Policy 26 (2)*: 131-159.

Stolowy, H., and Breton, G. 2004. Accounts Manipulation: A Literature Review and Proposed Conceptual Framework. *Review of Accounting and Finance 3 (1)*: 5-92.

Stubben, S. R. 2010. Discretionary Revenues as a Measure of Earnings Management. *The Accounting Review 85 (2)*: 695-717.

Subramanyam, K. R., and Wild, J. J. 1996. Going-Concern Status, Earnings Persistence, and Informativeness of Earnings. *Contemporary Accounting Research 13 (1)*: 251-273.

Sun, L., and Rath, S. 2008. Fundamental Determinants, Opportunistic Behavior and Signaling Mechanism: An Integration of Earnings Management Perspectives. *International Review of Business Research Papers 4 (4)*: 406-420.

Sweeney, A. P. 1994. Debt-Covenant Violations and Managers' Accounting Responses. *Journal of Accounting and Economics 17 (3)*: 281-308.

Tabassum, N., Kaleem, A., and Nazir, M. S. 2015. Real Earnings Management and Future Performance. *Global Business review 16 (1)*: 1-14.

Tang, D., Tian, F., and Yan, H. 2015. Internal Control Quality and Credit Default Swap Spreads. *Accounting Horizons 29 (3)*: 603-629.

Teoh, S. H., Welch, I., and Wong, T. J. 1998. Earnings Management and the Underperformance of Seasoned Equity Offerings. *Journal of Financial Economics 50 (1)*: 63-99.

Teoh, S. H., and Wong, T. J. 1993. Perceived Auditor Quality and the Earnings Response Coefficient. *The Accounting Review 68 (2)*: 346-366.

ThaiWebsites.com. 2005. Tsunami Five Months on: Tourists Still keep Distance. Retrieved from http://www.thaiwebsites.com/tourism-tsunami.asp [Accessed date: 14 May 2016].

The Global Risks Report, 2018. 13th Edition. *World Economic Forum, New York.* Retrieved from http://wef.ch/risks2018 [Accessed date: 4 March 2018].

The Guardian. 2009. After the 2004 Tsunami: Rebuilding Live, Salvaging Communities. Retrieved from https://www.theguardian.com/world/2009/dec/23/2004-tsunami-five-years-on [Accessed date: 22 July 2017].

The Guardian. 2014. The Human and Financial Cost of the Indian Ocean Tsunami – Interactive. Retrieved from http://www.theguardian.com/world/2014/dec/25/-sp-boxing-day-tsunami-scar-aceh-village-nusa-indonesia [Accessed date: 22 April 2016].

The Weather Gamut, 2018. *Why Heavy Rain Events are Becoming More Common.* Retrieved from http://www.weathergamut.com/2018/04/17/why-heavy-rain-events-are-becoming-more-common/ [Accessed date: 9 December 2018].

Trombetta, M., and Imperatore, C. 2014. The Dynamic of Financial Crises and its Non-Monotonic effects on Earnings Quality. *Journal Accounting Public Policy 33 (3)*: 205-232.

Tucker, J. W., and Zarowin, P. A. 2006. Does Income Smoothing improve Earnings Informativeness? *The Accounting Review 81 (1)*: 251-270.

Turner, M. J., and Guilding, C. 2011. An Investigation of the Motivation of Hotel Owners and Operators to engage in Earnings Management. *Qualitative Research in Accounting and Management 8 (4)*: 358-381.

Union of Concerned Scientists, 2018. *Climate Change, Extreme Precipitation and Flooding: The Latest Science (2018).* Retrieved from https://www.ucsusa.org/global-warming/global-warming-impacts/floods#.XAs86YszZdg [Accessed date: 6 December 2018].

Union of Concerned Scientists, 2018. *Global Warming Impacts: The Consequences of Climate Change are already here.* Retrieved from

https://www.ucsusa.org/our-work/global-warming/science-and-impacts/global-warming-impacts#.XAvGfoszZdg [Accessed date: 6 December 2018].

Walker, M. 2013. How Far can We trust Earnings Numbers? What Research tells us about Earnings Management? *Accounting and Business Research 43 (4)*: 445-481.

Walsh, P., Craig, R., and Clarke, F. 1991. "Big Bath Accounting" Using Extraordinary Items Adjustments: Australian Empirical Evidence. *Journal of Business Finance & Accounting 18 (2)*: 173-189.

Watrin, C., and Ullmann, R. 2012. Improving Earnings Quality: The Effect of Reporting Incentives and Accounting Standards. *Advances in Accounting, Incorporating Advances in International Accounting 28 (1)*: 179-188.

Watts, R., and Zimmerman. J. 1978. Toward a Positive Theory of Determination of Accounting Standards. *The Accounting Review 53 (1)*: 112-134.

WordPress. 2010. Earthquakes Caused the Deadliest Disasters in 2000-09 Decade. Retrieved from https://feww.wordpress.com/category/natural-disasters/ [Accessed date: 28 June 2018.

World Bank. 2011. The World Bank Supports Thailand's Post-Floods Recovery Effort. Retrieved from http://www.worldbank.org/en/news/feature/2011/12/13/world-bank-supports-thailands-post-floods-recovery-effort [Accessed date: 18 April 2016].

World Economic Forum, 2015. How do Natural Disasters affect the Economy? Retrieved from http://www.weforum.org/agenda/2015/02/how-do-natural-disasters-affect-the-economy/ [Accessed date: 1 March 2018].

World Economic Forum, 2016. Which Natural Disasters hit most Frequently? Retrieved from http://www.weforum.org/agenda/2016/01/which-natural-disasters-hit-most-frequently [Accessed date: 1 March 2018].

World Economic Forum, 2018a. The Global Risks Report 2018. Retrieved from http://www.weforum.org/reports/the-global-risks-report-2018 [Accessed date: 1 March 2018].

World Economic Forum, 2018b. These Are the Biggest Risks for Business in 2018, According to the World Economics Forum. Retrieved from http://fortune.com/2018/01/17/american-business-risks-wef-davos/ [Accessed date: 2 March 2018].

Xie, H. 2001. The Mispricing of Abnormal Accruals. *The Accounting Review 76 (3)*: 357-373.

Yoon, S. S., and Miller, G. 2002. Earnings Management of Seasoned Equity Offering Firms in Korea. *The International Journal of Accounting 37 (1)*: 57-78.

Young, S. 1999. Systematic Measurement Error in the Estimation of Discretionary Accruals: An Evaluation of Alternative Modelling Procedures. *Journal of Business Finance and Accounting 26 (7)*: 833-862.

Yu, F. 2005. Accounting Transparency and the Term Structure of Credit Spreads. *Journal of Financial Economics 75 (1)*: 53-84.

Zamri, N., Rahman. R. A., and Isa, N. S. M. 2013. The Impact of Leverage on Real Earnings Management. *Procedia Economics and Finance 7*: 86-95.

Zang, A. Y. 2012. Evidence on the Trade-off between Real Activities Manipulation and Accruals-based Earnings Management. *The Accounting Review 87 (2)*: 675-703.

Zeff, S. A. 2014. Book Reviews. *The Accounting Review 89 (2)*: 791-801.

Zhang, X., Bartol, K., Smith, K. G., Pfarrer, M. D., and Khanin, D. M. 2008. CEOS on the Edge: Earnings Manipulation and Stock-Based Incentive Misalignment. *Academy of Management Journal 51 (2)*: 241-258.

Zhao, Q. 2002. Do Managers Manipulate Earnings to Influence Credit Rating Agencies' Decisions? Evidence from Watchlish. *Review of Accounting and Finance 16 (3)*: 366-384. Retrieved from https://doi.org/10.1108/RAF-05-2016-0078 [Accessed date: 3 July 2017].