Testing Accruals Based Earnings Management Models in an International Context

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ABSTRACT

The main purpose of this thesis is to extend the study by Dechow, Hutton, Kim and Sloan (2012) in two ways: firstly by comparing the specification and power of the McNichols (2002) model with a newer model, Dunmore (2013). Secondly, the Dechow et al. (2012) study is extended into an international context using data from China, Japan and the United Kingdom to examine the specification and power of the models as a result of institutional factors. Data was collected for the years 1993 to 2012 and comprises a total of 13,238 firm years from China, 44,005 firm years from Japan and 7,782 firm years from the United Kingdom. The study finds that both the McNichols (2002) and the Dunmore (2013) models are well specified and the test power is improved by the incorporation of reversals. However, the study also finds that the McNichols (2002) model outperforms the Dunmore (2013) model. Finally, the results are quite different for each country, but not in the way that is predicted by the institutional factors.

ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS

CEO   Chief Executive Officer

CFO   Chief Financial Officer

CSRC   China Securities Regulatory Commission

EPS   Earnings per Share

FASB   Financial Accounting Standards Board

GAAP   Generally Accepted Accounting Principles

IFRS   international Financial Reporting Standards

IPO   Initial Public Offering

MBO   Management Buyout

NZSO   New Zealand Symphony Orchestra

R&D   Research and Development

ROA   Return on Assets

SEC   Securities and Exchange Commission

SEO   Seasoned Equity Offering

SOE   State-Owned Enterprises

CHAPTER 1

INTRODUCTION

The purpose of this thesis is to build on the reversal based accruals model specified by Dechow, Hutton, Kim and Sloan (2012). This is achieved in two ways. Firstly, it compares the McNichols (2002) model with a new discretionary accruals model by Dunmore (2013) with using the Dechow et al. (2012) tests of specification and power. The McNichols model gave best results in the Dechow et al. (2012) study, and the Dunmore (2013) model is expected to be mathematically better specified.

Secondly, this thesis examines the generalizability of the models in an international setting where the institutional factors can affect the specification and power of the models. Data from three countries (China, Japan and the United Kingdom) are used.

Earnings management is an important area of academic research in accounting. In particular accruals models for detecting earnings management have received a lot of attention from research in the past. These include the works of Healy (1985), Jones (1991) and finally the Dechow et al. (2012), among others. Nonetheless, accruals based detection models suffer from an omitted variable problem and have low power (Dechow et al., 2012). This study therefore contributes to furthering the knowledge on discretionary accruals models by testing a new model against an existing one and testing the generalizability of the model across three countries that are very different from each other, from an institutional point of view.

The study finds that both models are well specified (with the exception of PPE in the McNichols model) and that adding reversals improves power of both the Dunmore and the McNichols models. The results also show that the McNichols model outperforms the Dunmore model in tests of power. Finally the results are different for each country, but not in the way predicted by institutional factors.

The thesis is organised into seven chapters. Chapter 2 places earnings management within the broader context of accounting theory and defines earnings management; Chapter 3 discusses the motivations and the international context for earnings management, Chapter 4 reviews the models used to detect earnings management; Chapter 5 sets out the research question and the methodology; Chapter 6 reports the results; and finally Chapter 7 discusses the results and concludes this study.

CHAPTER 2

EARNINGS MANAGEMENT

2.1 Theoretical Background

In order to understand earnings management and its implication, it is important to understand earnings management within the broader context of accounting choice and it also important to define earnings management in order to clarify its boundaries.

2.1.1 Accounting Choice

Earlier perspectives on accounting assumed that accounting choice, by itself, could not affect firm value (Watts & Zimmerman, 1986; Watts & Zimmerman, 1990). This perspective did not take into account the contracting costs approach to the theory of the firm and thus did not consider transaction costs, agency costs, information costs and renegotiation costs. When these costs and their respective magnitudes are taken into account, accounting choice becomes relevant to determining firm value (Watts & Zimmerman, 1990). These points were the inception of what is now defined as the positive approach to accounting theory.

The positive approach splits accounting choice into two categories: the efficiency perspective and the opportunistic perspective (Deegan, 2011). An efficiency perspective assumes that accounting choices are made ex ante; that is, the accounting choices are made before the fact with the aim of representing the true economic performance of the firm (Deegan, 2011)[1]. It is expected that efficient management actions will increase the total wealth of all the parties to the contracts that form the firm, after all contracting costs have been deducted (Christie & Zimmerman, 1994). On the other hand, an opportunistic perspective assumes that accounting choices are made ex post, and that managers use their discretion to transfer wealth effects to themselves and thus do not increase aggregate wealth for the firm's stakeholders.

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[1]Real activities management, as an exception, does occur *ex ante* but is still opportunistic. This is because in many instances of real activities management like advertising, any decision to change expenditure for the sake of managing earnings has to be done at the beginning of the financial year in order to be effective. However, not all real earnings management occurs *ex ante*. See section 2.3.2 for details.

Management may "possess information about the organisation that is not known to outsiders" (Gaa & Dunmore, 2007, p. 60) and may use this knowledge to choose accounting methods, estimates and levels of disclosure to better communicate and add value to accounting information (Healy & Wahlen, 1999). Discretion over accounting methods may also allow the managers to benefit themselves at the expense of other stakeholders. Stakeholders thus enact controls on managers' accounting discretion through monitoring by the board of directors, competition from product markets, the level of corporate control, and from other managers within the firm (Christie & Zimmerman, 1994).

2.1.2 Significance of Earnings in Accounting

Earnings "are the summary measure of firm performance produced under the accrual basis of accounting" (Dechow, 1994, p. 4). In order for earnings to be managed, it must be considered important enough to manipulate in the first place. The importance of earnings stems from its use in a wide range of accounting related contracts and documentation including executive compensation plans, debt covenants contracts, prospectuses of firms about to have a share-floatation, and use by investors and creditors (Dechow, 1994).

Accounting numbers, such as earnings, can also be used as a form of control over managerial performance. Accounting numbers can allow for the better measurement of future contingencies: this helps reduce the chances of a contract being incomplete and in turn reduces the need for costly contract renegotiations (Ronen & Yaari, 2008). Under a contractual theory of the firm, breaches in a contract need to be detected. Accounting numbers are a useful way of monitoring such contracts for breaches (Watts & Zimmerman, 1986).

There is also empirical evidence to support the importance of earnings. Studies have shown that earnings are a strong predictor of firm value (Collins, Maydew, & Weiss, 1997). The value relevance of a metric is the ability of that metric to explain the variability in the stock prices. The value relevance of earnings can help explain its importance. Bartov, Goldberg, and Kim (2001) investigated the value relevance of earnings and cash flows in the United States, the United Kingdom, Canada, Germany and Japan. Research has shown that, at least in Anglo Saxon countries earning has greater explanatory power over cash flows for stock market variance. Bepari, Rahman, and Mollik's (2013) research into the Australia market shows that earnings has higher information content than cash flows, and that the value relevance of earnings has increased since the global financial crisis. Francis, Schipper and Vincent (2003) analysed the value relevance of earnings as part of a study organised to examine the use of certain Generally Accepted Accounting Principles (GAAP) and non GAAP metrics. The study was organised on an industrial basis and found that earnings is used in the communications, computers, financial services, health care and durable goods industries. In fact, the use of earnings as a primary metric of firm performance far exceeded the use of earnings before interest, taxes, depreciation, and amortization (EBITDA) and cash flow from operations.

Earnings are also important because of the limitations of other performance measures. For example, in stable environments, earnings and cash flows are equally effective at conveying information about firm performance, but when the environment becomes more dynamic (as manifested by significant changes in the working capital, investment and financing requirements of the firm), earnings emerges as the more reliable measure (Dechow, 1994). Dechow (1994) also found that in industries with longer operating cycles, cash flow is a poorer measure of firm performance when compared with earnings.

Earnings also have information content. It does more than just reflect factors that affect stock prices; it can cause changes in the stock prices (Watts & Zimmerman, 1986). Finally, the importance of earnings can be inferred from attention given to earnings

declarations in the business press. Thus, as earnings is an important accounting number that decision makers and users of financial statements rely on, it can be expected that there will be significant motivation to manage earnings.

2.2 Earnings Management

2.2.1 Defining Earnings Management

Healy and Wahlen (1999, p. 368) define earnings management thus:

> Earnings management occurs when managers *use judgement* in financial reporting and in structuring transactions to alter financial reports to either *mislead some stakeholders* about the underlying economic performance of the company or to *influence contractual outcomes* that depend on reported accounting numbers (emphasis added).

However, there are some issues with definitions of earnings management. Firstly, as Dechow and Skinner (2000) point out, income smoothing, earnings management and fraud are on the same continuum of being misleading to stakeholders. It is thus hard to distinguish between each of the situations. Whether or not managerial actions conform to GAAP rules can be used as a demarcation between fraud and earnings management (Dechow & Skinner, 2000). Thus, if earnings manipulations are within GAAP rules, it can be considered earnings management; if outside of GAAP rules then it is considered fraud[2]. The authors emphasise the importance of managerial intent as the distinguishing feature between income smoothing and earnings management. Thus, for identical companies facing identical situations, the managerial intent is what would distinguish an action as either income smoothing or earnings management. However, managerial intent is very difficult to determine or measure.

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[2] However, this is not a rule, more of a guideline. In research, studies such as the Dechow, Sloan, and Sweeney (1996), use a sample of firms that have violated GAAP rules in order to investigate earnings management.

Secondly, as Ronen and Yaari (2008) point out, not all instances of earnings management are detrimental: earnings management can improve the informational value of financial reports when they allow firms to distinguish normal earnings from one time shocks.

Third, the different approaches to earnings management adopted by academics and practitioners add to the problems of defining earnings management (Dechow & Skinner, 2000). Academics assume that markets are efficient and rational; the implication being that the cost of accessing information is low and allows financial report users to ignore small gaps between actual and forecast earnings (Dechow & Skinner, 2000). However, this is not the case in practical settings. The consequences of missing expected earnings forecast, even if very small, means that a firm is likely to lose its stock premium position (Barth, Elliott, & Finn, 1999). On the other hand, meeting or beating expectations can lead to significant rewards in terms of stock market price premiums (Bartov, Givoly, & Hayn, 2002). Moreover, market reactions to a failure to meet expectations by growth companies are disproportionately negative (Skinner & Sloan, 2002). The difference in between the efficient and rational view of markets by academics and the actual sensitivity of market to gaps between actual and forecast earning complicates the study of earnings management.

Earnings management is therefore a form of accounting choice, which can be implemented both ex ante and ex post. In particular, the incentives for earnings management have to be studied in other to better explain the accounting choices made by managers. Examining motivations also helps create better models of detecting earnings management. For earning management to be used, irrespective of the type of earnings management, managers must believe that the end users of financial statements either cannot detect the manipulation, or that the cost of trying to detect the manipulation are higher than the benefits (Matsumoto, 2002).

Earnings management can be employed in several different ways, including the manipulation of (Fields, Lys, & Vincent, 2001; Healy & Wahlen, 1999; Schipper, 1989; Sweeney, 1994):

- residual values of non-current assets
- inventory valuations method (LIFO/FIFO adoptions or extensions)
- employment and pension benefits
- the treatment of deferred taxes and investment tax credits
- depreciation methods
- the estimation of bad debts
- decisions relating to working capital management
- decisions relating to discretionary expenditures
- reclassification of assets
- timing of asset sales
- type of leases negotiated (operating lease versus capital lease)
- revenue recognition method
- overhead allocation
- financial year-end timing

In defining earnings management it is also important to understand that even though most of the literature focuses on the private sector, the practice is not just limited to the private sector. Non-profit organisations have the incentive to manage earnings because they have the incentive to show a small surplus and avoid amassing large sums of cash (Gaa & Dunmore, 2007). A case in point is the New Zealand Symphony Orchestra (NZSO). As the NZSO depends on funding and sponsorships, in addition to concert sales for its revenues, too large a surplus may affect the organisation's future income as contributors may feel that the originations no longer needs their support. This may lead to donations being made to other non-profit organisations instead (Gaa & Dunmore, 2007). In a study of 288 Swedish municipalities between 2000 and 2004 Stalebrink (2007) found that municipalities increase write-off and depreciation expenses during years with large deficits, or during years with surpluses large enough to absorb additional write-offs and depreciation expenses.

Finally, it is also important to distinguish between earnings management and earnings quality. Earnings quality is defined as being able to "provide more information about the features of a firm's financial performance that are relevant to a specific decision made by a specific decision-maker" (Dechow, Ge, & Schrand, 2010, p. 344). To this definition of earnings quality, Dechow et al. (2010) add three conditions. Firstly, earnings quality has decision relevance. Schipper and Vincent (2003) define this as the decision's usefulness of the financial reporting. Secondly, the quality of earning is dependent on the ability of the information to communicate the financial performance of the firm. And thirdly, earnings quality is dependent on the relevance of the financial performance to the decision-making.

Schipper and Vincent (2003) further divide earnings quality into two thematic constructs. The first set of constructs is derived from the time-series characteristics of earnings and includes persistence, predictability and variability (Schipper & Vincent, 2003). Persistence is the ability of the firm to produce sustainable earnings, in that earnings are high auto-correlated. Mathematically, persistence is defined in equation (1) (Dechow et al., 2010):

$$\text{Earnings}_{t+1} = \beta_0 + \beta_1 \text{Earnings}_t + \varepsilon_t \qquad \text{(1)}$$

Predictability refers to the ability of past earnings figures to predict future earnings (Schipper & Vincent, 2003). While, variability refers to smoothness; which is the ability of earnings to even out the random fluctuations due to cash flow transactions (Dechow et al., 2010).

The second set of constructs based on earnings quality is derived from the relationship between income, accruals and cash (Schipper & Vincent, 2003). This part of earnings quality is calculated from the ratio cash from operations to income and changes in total

accruals. It is the changes in total accruals that correspond to earnings management. Overall, earnings quality is a broader concept that encompasses earnings management among other concepts.

2.2.2 Ethics of Earnings Management

In terms of the moral right or wrong of earnings management, the question has to do with the fiduciary duty of the managers. According to Berle (1931, p. 1049):

> [A]ll powers granted to a corporation or to the management of a corporation, or to any group within the corporation, whether derived from statute or charter or both, are necessarily and at all times exercisable *only for the ratable benefit of all the shareholders* as their interest appears. That, in consequence, the use of the power is subject to equitable limitation when the power has been exercised to the detriment of such interest, however absolute the grant of power may be in terms, and however correct the technical exercise of it may have been. (Emphasis added).

This view of the supremacy of the claims of the shareholders over that of all other stakeholders and the duty of managers to shareholders has remained strong over the years, especially in common law countries (Boatright, 1994). Under these assumptions, it would mean that any negative impact to the wealth position of shareholders is, at the very least, unethical.

In fact, earnings management can have negative implications for the long term value of the firm; which in turn affects the wealth position of shareholders. One effect of the earnings management is that it makes managers focus on the short term at the detriment of the long term value creation of the firm. This in turn creates a situation where

managers have the incentive to reject positive net present value projects with longer pay back periods because managers want to reduce expenses in the short term (Smith & Watts, 1982).

It has been shown that firms that engage in earnings management in order to just meet or beat analyst forecasts benefit from a stock price increase as compared to those firms that do not engage in earnings management but miss analysts' expectations (Bhojraj, Hribar, Picconi, & McInnis, 2009). However, this benefit is only short term. In the long term (within a 3 year horizon), the operating performance and stock market performance of those firms that engaged in earnings management are much lower than firms that missed earnings targets (Bhojraj et al., 2009).

Research has also shown that firms that engage in real activities management have a higher incidence of equity issuance and insider selling (Bhojraj et al., 2009). This suggests that managers do understand that benefits of real activities management are only short term, and they expect the results to reserves over the long term.

Dechow and Sloan (1991) have shown that managers cut research and development (R&D) expenses in the final years of their tenure. The postponement of R&D may explain the lack international competiveness of American firms, whose managers are too concerned about delaying R&D expenses in order to manage earnings figures (Baber, Fairfield, and Haggard, 1991). Moreover, earnings management actions taken in one quarter can lead to reduced cash flow in later quarters. Roychowdhury (2006) cites the example of a firm using aggressive price discounts to push up sales volumes and thus opening the door to expectations of future discounts.

Earnings management is also unethical because it violates the trust that shareholders place on management. The disregard for the long term value of the firm is quite prevalent among managers. In a survey and interview of more than 400 executives

Graham, Harvey, and Rajgopal (2005) found that 78% of the executives admitted to sacrificing long-term value in order to manage earnings.

On the other hand, the view that managers owe a duty only to shareholder has also been questioned. First among to do this was Merrick Dodd (1932), who argued "not only that business has responsibilities to the community but that our corporate managers who control business should voluntarily and without waiting for legal compulsion manage it in such a way as to fulfil those responsibilities" (pp. 1153-1154) and that "industry owes to its employees not merely the negative duties of refraining from overworking or injuring them, but the affirmative duty of providing them so far as possible with economic security" (p. 1151). This notion forms the basis of much of the literature on corporate social responsibility.

Even if this broader view of the responsibilities of managers is taken into account then there are still ethical issues with earnings management. The main argument comes from the fact that the users of the financial statements, for example external stakeholders other than shareholders, face an information asymmetry problem and rely on the financial statements to make important investment decisions (Burns & Merchant, 1990). Thus earnings management leaves such users at a distinct disadvantage. Moreover, it can be argued that engaging in earnings management and thereby destroying firm value can negatively affect the future job security of employees and the ability to pay back creditors.

Earnings management also violates the professional code of practice in accounting. Accounting codes of conduct impose internal control on the professional and maintain the boundaries between ethical and unethical practice (Parker, 1994). Earnings management can violate the materiality concept of accounting. For instance, manipulations that are successful in hiding changes in earnings, hiding a failure to meet or beat analysts' expectations, changing a loss into income or the reverse, affecting compliance with regulatory requirements, affecting compliance with contractual

obligations can all violate materiality (Grant, Depree, & Grant, 2000). Furthermore, Dechow and Skinner (2000) explain that regulators such as the Securities & Exchange Commission (SEC) are concerned with creating equal access for all investors, thus if the investments require more sophisticated knowledge or analysis, it may be difficult for smaller investors to access the information. This adds to the unethical quality of earnings management.

2.3 Types of Earnings Management

Literature divides earnings management into three categories: accruals management, real activities management and changes to the accounting process. The next sections explain each of these methods of managing earnings.

2.3.1 Accruals Management

In order to understand earnings management through accruals, it is important to first examine the role of accruals in accounting. The main function of accruals is to solve the problems associated with information asymmetry and the noise associated in measuring firm performance over continuous time intervals (Dechow, 1994). Accruals are meant to reduce the timing and matching problems with realised cash flows while complying with revenue recognition and matching principles (Dechow, 1994). Accruals are often estimated using inputs from managerial judgement; this gives rise to managerial opportunism through earnings management and the chance to transfer wealth effects to the manager from other stakeholders.

In studying the accruals based earnings management, it is important to distinguish between discretionary and non-discretionary accruals. Non-discretionary accruals are the result of factors that are outside the control of managers, such as economic growth (Jones, 1991). For example, organic growth of a firm's sales will result in an increase in the total amount of accounts receivable as well as bad debts even if the proportions of credit offered and bad debts remain the same. In contrast, discretionary accruals are under the control of managers, and thus can be manipulated (Jones, 1991). An example

of accruals manipulation (discretionary accruals) is when a manager underestimates the proportion of bad debts while calculating provision for doubtful debts, with the intention of lowering current period expenses.

Discretionary accruals are the main focus of research on accruals based earnings management. The total accruals by a firm are observable in financial reports, but discretionary accruals are not observable. Thus it is very difficult to estimate the portion of accruals that are discretionary and nondiscretionary. Literature provides estimation models such as the Jones (1991) model, the modified Jones model (Dechow, Sloan, & Sweeney, 1995) and the performance based discretionary accruals model (Kothari, Leone, & Wasley, 2005) that permit discretionary accruals to be estimated. Each model has their own advantages and limitations (See Section 4, "Detecting Earnings Management").

Accruals can further be classified into two: current accruals involving adjustments to short term assets and liabilities used in the operations of a firm and long term accruals incorporating adjustments to long term assets and liabilities (Teoh, Welch, & Wong, 1998b). Examples of current accruals manipulation include over or underestimating the provisions for bad debts, while long term accruals can take the form of changes to the deferred taxes (Teoh et al., 1998b).

Literature on earnings management tends to focus on current accruals (for example Cahan, 1992; Gopalan & Jayaraman, 2012). One explanation is that researchers perceive managers to have more control over current accruals than long term accruals (Guenther, 1994). Furthermore, Kreutzfeldt and Wallace (1986) in their study of auditing errors found errors in judgement pertaining to accounts receivable, inventory, accounts payable, and accrued liabilities were most common. These errors (some of which may be manipulations) are all related to working (current) accruals.

The use of earnings management through accruals can be restricted in several ways. Ewert and Wagenhofer (2005) found that tightening accounting standards can lead to lower accruals based earnings management. On the other hand, tighter standards also increase the value relevance of earnings, and this in turn increases the incentives to engage in real activities management (Ewert & Wagenhofer, 2005). Research has also shown that the use of accruals to manage earnings can be restricted by the presence of scrutiny from regulators and other stakeholders (Cohen, Dey, & Lys, 2008). This was the case with firms in the US after the passing of the Sarbanes-Oxley Act 2002, where managers switched from accruals management to real activities management. The Cohen et al. (2008) claim that the time of the passing of the Sarbanes-Oxley Act was marked by increased scrutiny of financial reports, and this scrutiny limited managers' ability to use accruals management.

In a study of firms that have issued seasoned equity offerings (SEOs), Cohen and Zarowin (2010) found that firms shift between accruals based and real activities based earnings management methods. The authors also identified the costs of accruals management as being the presence of a reputable auditor, longer auditor tenure, the levels of litigation in the industry and the level of accruals management flexibility (the ability to engage in earnings management as evident from the level of net operating assets). All of these factors are positively associated with the cost of accruals management. The type of auditor employed by a firm also affects managers' ability to use accruals to manage earnings. Research by Zang (2012) also found that the presence of a reputable audit firm decreases the incidence of accruals management. This may be because the more reputable an audit firm is, the more it is at risk from any loss of reputation, it is therefore likely that the auditors will be more conservative in their approach and thus have more incentives to detect accruals based earnings management by managers.

The flexibility of a firm's accounting systems is also positively related to accruals based earnings management. The flexibility of the accounting system is determined by accounting choices that the firm made in past periods and the length of the firm's

operating cycles (Zang, 2012). If the firm has already engaged in accruals management in the past, then it may not be able to engage in more accruals without breaking GAAP rules or drawing attention of other stakeholders. Moreover, the accruals based earnings management of past periods also have to be reversed (Dechow, 1994), further limiting the ability to employ earnings management in the current period.

Zang (2012) also studied the effect of auditor tenure on the presence of accruals management, expecting it to be negatively correlated to the accruals management, but she did not find a statistically significant link. Zang (2012) reasoned that an auditor would be better able to detect accruals management the longer they work with the client. However, it may be that the longer an auditor works with a client, the more likely the management will be able to influence the auditors to seeing the managers' point of view.

2.3.2 Real Activities Management

Earnings management can be carried out by using real activities management[3]. This occurs when managers "change the timing or structuring of an operation, investment, and/or financing transaction in an effort to influence the output of the accounting system" (Gunny, 2010, p. 855) that results in "suboptimal business consequences" (Zang, 2012, p. 676). Real activities management "involves changing the firm's underlying operations in an effort to boost current-period earnings" (Gunny, 2010, p. 855) resulting in a deviation from normal business practices (Roychowdhury, 2006). Real activities management can be achieved by sales manipulation through offering price discounts or better credit terms; reducing discretionary operational expenses such as R&D and advertising; and overproducing in order to reduce the per unit cost and thus the cost of goods sold (Roychowdhury, 2006).

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[3] The terms real activities manipulation (Roychowdhury, 2006), real transaction management (Dechow & Shakespeare, 2009), real earnings management (Cohen & Zarowin, 2010) and real activities management (Zang, 2012) are used interchangeably in literature. For the sake of consistency only the term real activities management is used here.

Another example of a type of real activities management is the timing of transactions. Dechow and Shakespeare (2009) examined the timing decisions of firms that used a 'gain on sale' method of recording securitisation transactions. Under this method, assets such as accounts receivable are taken off the books and their place is taken by the cash a retained asset represents in the firm's claims to future cash flows. In order to balance the accounts, a gain or loss is calculated, but usually a gain is recorded (Dechow & Shakespeare, 2009). Dechow and Shakespeare (2009) found that most of the gains from securitisation were clustered in the third month of the quarter (41 per cent) and nearly 50 per cent occur in the last few days the quarter. This indicates an attempt by management to use transactions to manage earnings.

There are two key differences between accruals earnings management and real activities management: first, real activities management often affect cash flows directly (Roychowdhury, 2006). Second, the decision to use real activities management have to be made early in the financial year (ex ante) or during the financial year, while accruals management decisions occur ex post[4] (Zang, 2012). However, there are exceptions to the ex ante timing of real activities management; one example is the use of discounts at the end of the year to boost total sales.

There are several reasons why managers may choose to manage real activities rather than engaging in accruals management. Firstly, managing accruals is more likely to come to the attention of auditors (Gunny, 2010), and auditors may not permit accruals to be managed. This is especially true for firms that are facing financial hardships. Firms that face the going concern qualification from auditors are expected to come under further scrutiny in the form of lawsuits (DeFond & Jiambalvo, 1994) and in such cases it is expected that auditors will be even more conservative in their application of accounting rules.

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[4] There are exceptions to this; one example would be the use of discounts at the end of the year to boost total sales.

Secondly, managers have more control over operational decisions; whereas accounting decisions are more likely to be scrutinised by auditors (Gunny, 2010). Thus, a reduction in adverting spending is unlikely to arouse objections from an auditor, but an underestimation of the bad debts will. Thirdly, a firm may not be able to engage in accruals management as it may have used it to the maximum in the past (Gunny, 2010). Finally, managers perceive real activities management to be more ethical than accruals management (Burns & Merchant, 1990). The reasoning offered by managers for the view of real activities management as more ethical is that real activities management reflect what actually took place and is therefore closer to the truth (Burns & Merchant, 1990).

A common means of managing real activities is to manipulate the expenditure on R&D. GAAP rules require that intangible asset investments be recorded as expenses in the time period in which they have occurred (Financial Accounting Standards Board, 2010). However, the benefits from investments such as R&D can carry over for several future periods. Managers have strong incentives to meet earnings expectations, and reducing R&D expenses for the current period will result in an increase in earnings equal to the amount of cuts. In cases where earnings have to be manipulated downwards, management may decide to incur R&D expenses. One consequence of reducing R&D expenses is that the firm may lose its competitive advantage in the long run.

Baber et al. (1991) examined the R&D spending of 438 industrial firms between 1977 and 1987 and found R&D spending to be significantly lower in cases where spending has the ability to prevent positive or increasing income. Similarly, manipulation of R&D also takes place when a Chief Executive officer (CEO) is about to end his or her tenure. Dechow and Sloan (1991) examined firms whose CEO compensations incentives are based on earnings and the behaviour of their R&D expenditure in the final year in office. Dechow and Sloan (1991) found that CEOs in their final years do spend less on R&D.

Dechow and Sloan (1991) also examine alternate explanations for the relationship between R&D expenditure behaviour and CEO departure, and reject the alternatives The first alternative explanation is that CEOs often depart due to poor performance, and during such periods of poor performance all expenses, including R&D expenses, are reduced – the authors do not find any such poor performance in their sample as measured by stock price performance. The authors also find that the results of their tests are stronger in firms with mandatory CEO retirement ages. This is in keeping the horizon hypothesis, which predicts that CEOs that face a mandatory retirement age are more likely to cut R&D expenditures. The second alternate explanation has to do with CEOs leaving new investment to their successors. Dechow and Sloan (1991) reject this because they found that CEOs with larger stock-price based incentive are less likely to manipulate earnings and incentives that are capitalised do not decline in the final years of CEO tenures. Thus it can be concluded that R&D expenditure are in fact manipulated by managers.

Managers can also use the timing of disposal of long term assets and investments to manage earnings. Managers have greater flexibility in managing earnings through the disposal of assets because a surplus or loss in the sale of an asset has to be reported in the period that the sale has taken place (Bartov, 1993). A manager can simply choose the timing of the sale to carry out the income manipulation intended. Bartov (1993) found that firms that have negative earning changes are more likely to also report higher asset sale profits.

Real activities can be also be managed at the operational level. Roychowdhury (2006) studied the use of price discounts, overproduction, and reduction in discretionary expenses by firms to manipulate real activities. Roychowdhury (2006) expected that firms that manipulate earnings by undertaking activities such as price discounts, channel stuffing, and overproduction will have a negative effect on cash flow from operations. Whereas, reducing discretionary expenses is expected to positively affect cash flows from operations. The results also showed that firm years that are suspected of being manipulated have lower discretionary expense on average at 5.91% of assets at

statistically significant levels. The results also indicate that firms suspected of manipulating earnings have higher production cost at statistically significant levels.

There are instances that limit the use of real activities management. A higher incidence of stock ownership and access to stock options decreases the reduction of R&D in the final year of CEO tenure (Dechow & Sloan, 1991). This may be because having stock options increases the sensitivity of the CEOs wealth to the performance of the firm, and a CEO may not want to adversely affect the future competitiveness of the firm by engaging in real activities management. Another means of mitigating real activities management at the time of CEO turnover is to use a relay succession process (Dechow & Sloan, 1991). This is a CEO succession process that allows the new CEO to train under the old CEO for several months or years in an official capacity. It also allows the old CEO to stay within the insider loop of the organisation in a different capacity such as a Chairperson after succession. Finally, the presence of institutional investors also reduces instances of real activities management (Roychowdhury, 2006). This corresponds with the finding that managers are less likely to cut R&D when the level of institutional ownership is high, indicating that intuitional managers understand the importance of long terms investments and discourage myopic behaviour (Bushee, 1998).

The use of real earnings management is restricted by the level of competition in an industry, the financial health of the firm, attention received from institutional investors, and the tax effects of the manipulation (Zang, 2012). Firms that had higher market shares and better financial health were found to have higher levels of real activities at statistically significant levels, thus indicating that managers that see themselves as having a competitive advantage and being financially better off have more flexibility to deviate away from normal business practices (Zang, 2012). The presence of institutional investors is negatively related to real activities management as institutional owners may pressure managers into avoiding real activities management (Zang, 2012).

2.3.3 Changes to the Accounting Process

GAAP allows managers certain discretions when deciding the accounting processes that are best suited to reporting the true economic performance of a firm. Managers can use these discretions in choosing the accounting processes to engage in earnings management. The accounting processes that are changed most often in order to manage earnings are depreciation method and inventory valuation, although earnings can also be managed though changes in the amortisation period of pension costs and investment tax credits (Sweeney, 1994).

The first question is whether changes to accounting process can in fact affect earnings, and thus be used to manage earnings. The empirical evidence is mixed. Sunder (1975) claimed changes to the Last In, First Out (LIFO) method are expected to decrease earnings for firms; and if investors are in fact relying on the information signals from earnings to value stocks, this will result in a fall in the price of stocks. On the other hand, if investors rely on the economic value of the firm then a change to the LIFO method will result in an increase in stock prices. Sunder (1975) found, after controlling for risks, that prior to change to LIFO firms displayed an abnormal increase in stock prices, but no changes to stock prices of the firms after the change. This leads Sunder (1975) to hypothesize that the changes in the stock prices cannot be as a result of the change in inventory valuation method, rather it is the better performance of the firm that brings about the change in accounting method.

Ricks (1982) examined the switch to LIFO methodology in the 1974-1975 periods when firms had to disclose in footnotes the earnings and inventory amounts that would have been reported using previous inventory methods. Ricks (1982) found that a change to LIFO was associated with lower reported earnings and reported inventory amounts. Ricks (1982) also found that the firms that did change had higher earnings in previous periods, as compared to firms that did not change inventory valuation methods. However, both the study by Ricks (1982) and Sunder (1975) had issues with sample clustering (Watts & Zimmerman, 1986). However, Hughes and Schwartz (1988) found that a switch to LIFO can render tax savings for a firm.

Healy (1985) performed contingency tests to examine the effects of changes in accounting processes on management bonuses; the results showed that during the years that bonus plans are adopted and modified there is also a high occurrence voluntary changes to accounting processes. Healy (1985) also found that managers do not change accounting processes when bonus plans have upper or lower limits. Sweeney (1994) examined voluntary changes in accounting processes related to in pension accounting assumptions and costs, depreciation methods and tax credit treatment among firms that violated debt covenants compared to a set of control firms in the same industry that did not face liquidity issues. Sweeney (1994) found that firms that violated debt covenants make two or three times as many income increasing changes to accounting processes in the two years before and after violating debt covenants.

There are several reasons why changes to accounting processes are less common than other earnings management methods. Firstly, unlike accruals which have discretionary and non-discretionary components, voluntary changes in accounting process "reflect purely discretionary accounting procedure decisions" (Healy, 1985, p. 103). The implication being that the earnings manipulation motivation of such changes is likely to be more obvious to stakeholders. In fact, changes to accounting processes can easily be identified through financial statements; unlike accounting accruals which are not observable and the calculation of which requires proxies to be identified (Neill, Pourciau, & Schaefer, 1995). Secondly, it is usually easier to manipulate accruals as opposed to changing the accounting processes in order to manage earnings; after all accounting processes such as depreciation cannot be changed every year (Healy, 1985). Finally, changing accounting processes are difficult because such changes are likely to be questioned by auditors and boards of directors (Matsumoto, 2002).

2.3.4 Choosing between Earnings Management Types

As research often focuses on narrower topics to elucidate specific aspects in more detail, it may be easy to forget that in actual accounting settings, managers may employ several

types of earnings management all at once. For example, a manager may use an accrual method as well as making changes to the accounting procedure. Moreover a manager may also employ different methods within one type of earnings management. For example, a manager may change from a LIFO to a FIFO inventory valuation method and at the same time choose a certain type of lease to managing earnings. Fields et al. (2001) have identified the tendency of research literature to focus on very specific and narrow problems as a weakness and the reason for a lack of progress in this area. Some researches on earnings management even focus on one type of method within an earnings management, for example McNichols and Wilson (1988) focused on the use of provision for bad debts.

Recent research on earnings management has tried to address this gap. Cohen et al. (2008) investigated the use of accruals and real activities based earnings management methods before and after the passing of the Sarbanes-Oxley Act 2002. Research showed that the use of accruals management by firms increased up to the point of the implementation of the Act and declined afterwards (Cohen et al., 2008). On the other hand, the use of real activities management had been in decline up to the implementation of the Act, but increased after the implementation of the Act. Cohen et al. (2008) contend that this is mainly due to the fact that real activities management are harder to detect, and as the time of the Sarbanes-Oxley Act was marked by increased scrutiny on financial reports, it makes sense that managers would prefer to manage earnings through method that are harder to detect.

The most important finding is the relative effect of accruals management versus real activities management. Cohen and Zarowin (2010) found that real earnings management is more likely to be associated with earnings decline than discretionary accruals. This is based on examination of the effect on post SEO return on assets (ROA) on one standard deviation of each type of earnings management method.

Moreover, in cases where meeting certain earnings expectations are of higher priority, managers can engage in both accruals management and real earnings management. Cohen and Zarowin (2010) found that before an SEO managers engage in both types of earnings management.

Badertscher (2011) studied the earnings management choices of managers trying to sustain overvalued stock prices. The motivation to manage earnings in the case of an overvalued stock is based on the work of Jensen (2005). Jensen (2005) hypothesised that many of the problems related to the ethics of financial reporting was related to the systems in place in firms: once a firm had a significantly overvalued stock price (between 100 to 1000 per cent) managers come under increasing pressure to maintain this stock price.

In such cases, managers resort to ever more aggressive forms of earnings management in order to sustain the overvalued price. Badertscher (2011) found longer periods of over valuation correlated with greater total earnings management. Firms begin with the use of accruals management, and then move on to the use of real activities management, and finally resort to non-GAAP earnings management in order to maintain an overvalued stock price (Badertscher, 2011).

However, as Zang (2012) points out, the research by Cohen et al. (2008) and Cohen and Zarowin (2010) do not consider the timing of the two types of earnings management. Zang (2012) addresses this issue using a Hausman test and finds the earnings management are sequential: real activities precede accruals management, and that accruals are partially determined by real activities management. Zang (2012) quantifies the costs for each type of earning management: the costs of accruals management are positively related to the presence of reputable auditing firms, the auditor tenure, flexibility of the accountings systems and negatively associated with operating cycle. In terms of real activities management the cost to the firm are positively related to market leadership position and financial health, and negatively related to institutional

ownership and marginal tax rates. Zang (2012) finds that firms carry out a cost benefit analysis when choosing between the two types of earnings management.

CHAPTER 3

MOTIVATIONS FOR EARNINGS MANAGEMENT

From a research perspective, it is important to examine motivations for earnings management because it allows the researcher to better identify the factors (and the proxies) that drive the decision to engage in earnings management; this in turn leads to better specified models for detecting earnings management (Guay, Kothari, & Watts, 1996). Motivations for earnings management can be organised thematically into contractual obligations, asset pricing and influencing external parties. This section also examines the international institutional factors of earnings management.

3.1 Contracts

One way to reduce problems associated with internal (owner-manager) and external (shareholder and debt holders) agency conflicts is to have contracts (Fields et al., 2001). Contracts usually rely on accounting numbers, and this gives managers the incentive to choose between accounting methods to manipulate accounting numbers (Fields et al., 2001). Research that aggregated results across studies found that managerial compensation and leverage have the highest statistical significance in explaining accounting choice (Christie, 1990). Watts and Zimmerman (1986) have pointed out that there may be many other contracts within a firm, both formal and informal, that are affected by earnings but the data for such contracts are not so easily available; this may be why research focuses on debt and management contracts.

3.1.1 Debt Covenants

A firm may incur two types of debt, public or private debt. In the case of public debt, the sources are usually public bonds with relatively loose covenants, and limited chances of renegotiations. In contrast, private loans usually from banks or a consortium of banks have numerous covenants, and are often renegotiable (Ronen & Yaari, 2008).

Debt is complicated by the fact that there are three main parties involved (viz. creditors, shareholders and managers) who have conflicting aims (Ronen & Yaari, 2008). Mainly,

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there is the conflict between creditors and shareholder; creditors usually have higher liquidation rights when compared to shareholders. This means that shareholders have an incentive to be paid dividends before debt reaches maturity (Ronen & Yaari, 2008). A corollary to this fact is that shareholders often prefer riskier investment with higher potential returns, while lenders prefer safer investments. The conflict between managers and creditors is that creditors do not have a say in how the funds lent to the firm are spent (Ronen & Yaari, 2008).

A violation of debt covenants may result in what is known as a technical default. Typically debt covenants have terms covering restrictions on dividends and share purchases, minimum levels of working capital, restrictions on mergers, restrictions on investments in other firms, restriction on asset disposals and restrictions on adding more debt (Watts & Zimmerman, 1986). A technical default will result in the company having to repay debts or renegotiate the debt contract. This can potentially result in extra costs for the company in the form of renegotiation costs or a higher interest rate (Watts & Zimmerman, 1986). Beneish and Press (1993) investigated the costs associated with technical defaults; they found that on average the increased interest cost due to refinancing range between 0.84% and 1.63% of the market value of firm's equity. In addition firms that needed to restructure their debt incurred costs of an average of 0.37% of market value of equity. Finally, firms that violated debt covenant also faced increased control from the lenders (Beneish and Press, 1993).

A violation of debt is also likely to result in a loss of reputation, which may affect share prices (Matsumoto, 2002). Finally, even in the case of firms that are not successful in avoiding debt covenant violations, higher earnings through management place the firms in better bargaining position for the renegotiation and restructuring (DeFond & Jiambalvo, 1994). All these substantial costs mean that a firm and its management have strong incentives to manage earnings in order to avoid a covenant violation.

This motivation to manipulate earnings to avoid the costs associated with a debt covenant violation is referred to as the debt hypothesis in literature. Watts and Zimmerman (1986) explain the debt hypothesis thus: other things being equal, the larger a debt-equity ratio (indicating a larger debt), the more likely it is that a firm will use accounting choices to shift earnings from future periods to current periods.

DeFond and Jiambalvo (1994) examined the accruals of 94 firms that had violated debt covenants between 1985 and 1988 in order to detect the manipulation of accruals. DeFond and Jiambalvo (1994) excluded firms with management changes and going concern qualifications from their sample. The exclusions are justified by the arguments that new managers are likely to take a big bath and firms with going concern qualifications are likely to be scrutinised more closely by auditors due to litigation risks.

DeFond and Jiambalvo (1994) used the Jones model to examine the levels of total and working capital accruals[5]. A time series analysis found statistically significant evidence of both total and working capital accrual manipulation. A cross-section analysis also proved the presence of earnings manipulation. These results do not include the controls for management change and going concern qualifications. With the control measures there was statistically significant evidence of manipulation in working capital accruals, but the results for total accruals were not statistically significant. This shows that firms engage in earnings management to avoid violating debt covenants, but are more likely to rely on working capital accruals rather than long term accruals. However, DeFond and Jiambalvo (1994) also warn that unless a firm is critically close to violation debt constraints are unlikely to affect the accounting choices.

Sweeney (1994) examined accounting changes as a managerial response to debt covenant violations (she focused on the violation of affirmative covenants including minimum net worth and working capital). Unlike previous studies that focus on accruals

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[5] The total abnormal accruals use the Jones model in its entirety, while working capital accrual estimation drops PPE from the equation (DeFond & Jiambalvo, 1994).

management, Sweeney (1994) examines changes to the accounting process. She found that firms that have violated debt covenants are twice or three times more likely to make income increasing accounting changes than the control firms in the year prior and after the violation event.

Both the DeFond and Jiambalvo (1994) and Sweeney (1994) studies have a selection bias: they focus on the firms that have already violated debt covenants. Sweeney (1994) points out that examination of firms that have successfully avoided covenant violation would have made for the most powerful tests; however it is nearly impossible to identify such firms. The Securities and Exchange Commission (SEC) also allows firms that were able to renegotiate their covenant violation to not disclose such violation in financial statements (DeFond & Jiambalvo, 1994); this further skews the data as only firms with very significant covenant issues were analysed. Also of concern are the relatively small sample sizes of the two studies: DeFond and Jiambalvo (1994) used 94 firms, while Sweeney (1994) used 130 firms. Another criticism early research on debt covenant hypothesis (like that of DeFond and Jiambalvo (1994), and Sweeney (1994)) face is that they did not have access to actual figures on how close to debt violation firms actually are; this meant a that a proxy like leverage was used. Dichev and Skinnner (2002) have found leverage to be a noisy estimator of the closeness to covenant violation.

On the other hand, there have also been studies that have found no evidence to support the debt hypothesis. DeAngelo, DeAngelo and Skinner (1994) examined the accruals of 75 firms with and without binding debt covenants that reported at least three annual losses between 1980 and 1985. The results showed that were only marginal differences between the accruals of firms that had binding debt covenants and those that did not. This led DeAngelo et al. (1994) to believe that the accounting choices of the firms that were in financial trouble reflected said financial troubles rather than an attempt by managers to manipulate earnings.

Dichev and Skinner (2002) conducted a study on the debt hypothesis by using a much larger sample size (about 30,000 private debt agreements) and used histograms to compare reported account measures and the covenant thresholds. This approach is different from earlier studies in that it did not try to detect accruals using a model such as the Jones model. Dichev and Skinner (2002) found a very small number of firms per quarter just below covenant thresholds and an unusually large number of firms that just meet or beat the threshold requirements. This indicates the presence of manipulation by managers of firms facing debt covenant violation.

Debt covenants affect other aspects of accounting decisions; there is evidence that the management of debt and leverage is a motivation for the revaluation of assets. Nearly 40% of Australian Chief Financial Officers (CFOs) admitted to revaluing asset with the aim of lowering the debt-to-equity ratio (Easton, Eddey, & Harris, 1993). Research also found statistically significant results showing firms that were experiencing shrinking cash flows while at the same time being highly leveraged were more likely to revalue assets (Cotter & Zimmer, 1995).

Most of the literature on the debt hypothesis focuses on private debt this leaves a gap in the literature on the effects of public debt. However, this does not negate the effect of private debt on earnings management incentives. This is because there are many negative consequences of debt covenant violation, thus a firm will focus its energies trying to avoid these costs.

3.1.2 Executive Compensation

Management incentives are designed to extract the best performance from managers, which will lead to firm value being maximised. Earnings are seen as a cost effective measure of a firm's value; especially given the fact that debt is not tradable and thus it is difficult to get an accurate total value of a firm (the total of shares and debt) (Watts & Zimmerman, 1986). Thus earnings serve as a proxy for the value that the executive has been able to add to the firm's value. Puffer and Weintrop (1991) studied analyst

expectation of firm performance in terms of earnings per share (EPS) as a proxy for the performance indicators used by the board of directors. Puffer and Weintrop (1991) examined 408 CEOs and found that CEO turnovers occur when the reported annual EPS falls short of analyst expectations.

Another reason for the use of earnings as proxy of managerial performance is the inability to disaggregate performance (Watts & Zimmerman, 1986). Even if firm value could be easily calculated, it would difficult to attribute the contribution of the value to each of the subunits of the firm, whereas earnings can be calculated for each of the subunits quite easily. Taxes are another reason for management performance to depend on earnings. Watts and Zimmerman (1986) explain that tying a part of management compensation to earnings can reduce the present value of total taxes paid by the firm. Finally, top management compensation usually takes two forms: an annual bonus plan dependent on the accounting earnings performance and a stock option plan dependent on the stock price performance (Dechow & Sloan, 1991).

Bonus schemes as a form of CEO compensation are dependent on earnings performance. Bonus scheme contracts usually specify that earning before tax have to be above a certain threshold before bonuses can be paid out (Healy, 1985). In addition, Matsunaga and Park (2001) found that failing to meet or beat analysts' quarterly earnings forecasts has a negative impact on the annual cash bonus of CEOs. This effect endures even after controlling for other performance factors such as changes in return on assets and stock return of the firm. This forms the basis of the economic incentive for managers to manage earnings upwards in order to maximise bonuses.

Healy (1985) found evidence of a strong association between accruals and bonus schemes. Healy (1985) also found that managers also engage in income decreasing accruals – known as 'taking a bath'. The author also examined the use of changes to accounting procedures to affect earnings, but was unable to find statistically significant

evidence. Healy (1985) attributes this difference to changes in accounting policies being more costly than accruals.

The executive compensation incentive to manage earnings extends to other countries as well. Shuto (2007) examined the relationship between earnings management and executive compensation in Japanese firms. Unlike US firms, Japanese firms are not obligated to report detailed information on executive compensation, thus Shuto (2007) used the total compensation figure as a proxy for individual executive compensation figures. According to Shuto (2007), the use of total compensation data does not pose a problem because the Japanese governance systems are more consensus driven as opposed to the CEO-dominated systems in US corporations: in Japan, a shortfall in performance of the firm or a scandal can lead to bonuses being withheld for all the executives. This led Shuto (2007) to hypothesise that Japanese firms that do not receive bonuses engage in income decreasing earnings management in order to maximise future bonuses. The results indicate that the discretionary accruals are negatively and significantly related to a no bonus situation (Shuto, 2007). Shuto (2007) also found that discretionary accruals increase executive compensation.

The second type of CEO compensation is delivered through stock options. One of the main arguments for granting this type of incentive is that it aligns the incentives of top management with that of the shareholders (Bergstresser & Philippon, 2006). However, Dechow and Skinner (2000) argue that the presence of stock based management compensations will create incentives for earnings management as managers try to meet analysts' expectations in order to protect their own personal wealth. Bergstresser and Philippon (2006) modified the Jones model to test for earnings management associated with CEO stock holding and options. Bergstresser and Philippon (2006) found that firms that have CEOs with higher exposure to share prices through stock holdings and options also have higher earnings management. Moreover, periods during which top management exercised stock options and unloading of shares also had high levels of accruals (Bergstresser & Philippon, 2006).

3.1.3 Implicit Claims

Stakeholders of a firm have both explicit and implicit claims over an organisation. At an initial stage of dealings, contract are usually discrete, in that almost all relations and expiations are explicitly stated, however as relationships become more frequent there exists a relational contract that creates room for implicit claims (Bowen, DuCharme, & Shores, 1995). Implicit claims cannot be enforced by the law, but breaking them can lead to significant damage to the relationship between the firm and its stakeholders. The implicit claims and terms of trade in term respective to each stakeholder are shown below (Bowen et al., 1995):

- customers have claims over specific quality, price, payment terms and warranties
- suppliers have claims that entail timely payment, continued business through demand, fair prices, credit limits and discounts
- employees claims include working conditions, future prospects, wages and benefits
- short term creditors have claims to timely payment, demand for funding, interest rates and payment terms.

Bowen et al. (1995) argue that the financial performance is important to these stakeholders, because a poor performance may be a signal to the stakeholders of the firms' inability to carry out implicit commitments. Bowen et al., (1995) used proxies to estimate the implicit claims of each of the stakeholders. They found a statistically significant positive correlation between the importance of implicit claims by stakeholders and the managers use of income increasing accounting methods (including changing depreciation and inventory valuation methods), when controlling for leverage, bonus plans, taxes and firm size.

3.2 Asset Pricing

This category of motivations to earnings management is caused by the information asymmetries that exist between management and external stakeholders (Fields et al., 2001). The information perspective states that managers enjoy an advantage when disclosing firm specific information and that accounting numbers are able to provide information about the future cash flows of the firm (Holthausen & Leftwich, 1983). However, managers are able to opportunistically use this information in order to manipulate asset prices for their own gains.

3.2.1 Initial Public Offerings (IPOs)

Initial public offerings present managers with both the motivation as well as the opportunity to manage earnings. In terms of motivation, research has shown that earnings management at the time of IPOs take place in order to boost issue price, increase insider profits and help inflate executive compensation (Armstrong, Foster & Taylor, 2009). The motivation to manage earnings upwards may also come from firm founders who may want to get the highest possible valuation for their shares and continue to maintain these values till at least the end of the lock up period so that the entrepreneurs are able to off load some of their share holdings (Teoh, Welch, & Wong, 1998a). At the same time, there is limited information available publicly just before the IPOs (Rao, 1993). Nonetheless, IPO firms do have to provide audited financial statements (Neill et al., 1995).

Most of the research around earnings management and IPOs focus on the value of the accruals at the time of the offering and the future underperformance of the stock price (Armstrong et al., 2009). Neill et al. (1995) found a positive relationship between the proceeds from an IPO and income increasing accounting methods. However, Neill et al. (1995) put forward the argument that the choice of accounting methods cannot be purely opportunistic, because if it were, it would become apparent to the underwriters and this would mean that the IPO would not lead to higher valuations. Nonetheless, Ritter (1991) found that post IPO stock returns were much lower (on average -27% with

a median of -55%) for 1,526 IPOs between 1975 and 1984. This indicates an over-valuation of IPOs.

Further research has found that IPOs have working capital accruals much higher than non-IPO firms and after a three year period the IPO issuers in aftermarket stock return of approximately 20 per cent than the initial public offering (Teoh et al., 1998a). Teoh et al (1998a) hypothesise that IPO firms use income increasing accruals to opportunistically inflate earnings, and when investors value IPO shares based on the inflated earnings, they end up with overpriced shares. The eventual reversals of the accruals in subsequent periods bring down earnings and thus lead to negative performance of the stock.

On the other hand, Ball and Shivakumar (2008) have argued that the earnings of IPOs are more conservatively estimated due to the fact that the audited financial statement produced by IPO firms are scrutinised by financial statement users and also monitored by auditors, boards of directors, analysts, ratings agencies and the business press. Moreover, the Ball and Shivakumar (2008) argue that the findings of Teoh et al (1998a) are biased upwards due to the use of the Jones model and the Teoh et al (1998a) data was also likely to be affected by the number of firms that have had an acquisition or divestiture in the IPO years.

3.2.2 Seasoned Equity Offerings (SEOs)

Managers are motivated to engage in earnings management during the issuance of seasoned equity offerings (SEOs). There are several possible reasons for engaging in upwards earnings management. First, higher earnings results in higher valuation of the firms; this helps existing shareholders (Rangan, 1998). Existing shareholders include the managers who own shares through stock options and are thus motivated to maintain or increase personal wealth by managing earnings. Second, higher earnings at the time of SEOs means a higher share price which in turn translates to the firm being able to attain better terms when raising capital (Rangan, 1998).

Rangan (1998) investigated the relationship between earnings management and the SEOs and hypothesised that the difference between the poor stock price performances of firms that raise capital through SEOs in subsequent years can be explained by earnings management. Essentially, investors are unable to detect earnings management in individual firms, and stocks are overvalued. However, as any upward earnings management have to be reversed in subsequent time periods, the earnings of companies engaging in earnings management are lower, leading to lower stock prices.

Rangan (1998) found that one standard deviation increase in earnings management led to a 10% decline in performance. Rangan (1998) ran tests to determine that the results are not due to an alternative explanation: that firms time their SEO issues after high accrual periods. However, Rangan (1998) found evidence that the discretionary accruals were not a result of a timing decision. These findings are supported by research by Teoh et al., (1998b). Based on study of 1265 SEO issuers between 1976 to 1989, Teoh et al., (1998b), found higher income growth in the issue year for issuing firms compared to similar firms within the industry that did not issue shares. Teoh et al., (1998b) found that SEO issuers underperformed significantly in subsequent years. However, Shivakumar (2000) contends that the findings in both Rangan (1998) and Teoh et al. (1998b) are due to severe misspecification errors caused due to skewness in long-horizon returns data.

Shivakumar (2000) takes the findings of Teoh et al. (1998b) and Ragan (1998) as a starting point in the analysis and claims that the findings on SEOs in previous literature are due to misspecification errors. The main claim is that investors are in fact not as naïve as the previous literature (such as Teoh et al. (1998b) and Ragan (1998)) suggests. Shivakumar (2000) hypothesised that even though managers engage in earnings management, investors expect it and discount the information on financial the reports accordingly. Thus the incentives for earnings management are turned over its head in this scenario: the managers engage in earnings management because investors expect

managers to engage in earnings management. As there is no way for managers to signal that no earnings management has taken place; a manager has to apply earnings management because investors will discount all financial reports expecting earnings management to be present. Shivakumar (2000) describes this as a Nash equilibrium in a prisoner's dilemma game between issuers and investors (referred to as the managerial response hypothesis). Nevertheless, Shivakumar (2000) found that consistent with earnings management taking place, accruals are abnormally high before equity offerings. The study also shows that the investor reactions to unexpected earnings management after offerings are significantly weaker.

Earlier research on earnings management (such as Ragan (1998), Shivakumar (2000) Teoh et al. (1998b)) focus on accruals based earnings manipulation. However, managers also have the option of managing earnings through real activities management. Cohen & Zarowin (2010) found that before SEOs managers engage in both real earnings management and accruals management; thus the post SEO underperformance is as a result of both accruals reversals and the negative effects of real earnings management. Roychowdhury, Kothari, & Mizik (2012) found strong evidence that the overvaluation at the time of SEOs is due to firms engaging in real activities management, but not due to accruals management. Therefore, the under performance in periods subsequent to the SEOs is related to the use of real activities management. Roychowdhury, Kothari, & Mizik (2012) also posit that because it is more difficult to detect real activities management, investors will not be able to detect the overvaluations at the time of SEOs

3.2.3 Stock for Stock Acquisitions and Mergers

When firms acquire or merge with another using a stock swap option, it is in the interest of the acquiring firm to maintain a high share price. According to Erickson and Wang (1999) there are three reasons behind this: firstly, it minimises the likelihood of earnings dilution. Secondly, a higher stock price will also avoid a dilution of voting rights. Finally the purchasing cost of the acquisition or merger will be lower. In a sample of 55 firms, Erickson and Wang (1999) found that in the period prior to merger announcement, the acquiring companies did engage in upwards earnings management.

Moreover, the size of the earnings management was proportional to the size of the merger deal. On the other hand, firms with cash merger did not have any earnings management (Erickson & Wang, 1999). Luis (2004) found that that acquiring firms overstate their earnings in the quarter before a stock for stock merger announcement. Louis (2004) also found that over the three years after the merger period the performance of stock-for-stock acquirers is worse than those firms that had made cash acquisitions. Therefore, Louis (2004) suggests that the low performance of post-merger firms is due to the earnings management.

Earnings management before a stock for stock merger also lead to lawsuits. Gong, Louis and Sun (2008) found a relationship between the level of pre-merger abnormal accruals and post-merger lawsuits. There are two negative effects of a lawsuit: a direct effect is from the payoffs that have to be made to class action lawsuits. The indirect effect is that the lawsuits will distract management from the tasks that need their attention at the time of acquisition.

3.2.4 Management Buyouts (MBOs)

Management buyouts can create opportunities to benefit from earnings management. MBOs constitute a conflict of interest on the part of managers: on the one hand they have the fiduciary duty to shareholders; on the other hand they are motivated to secure the best prices as they themselves are the purchasers of shares (DeAngelo, 1986). Theoretically, there are strong economic incentives for managing earnings downwards. Lower earnings lead to lower share prices, thus making the buyout cost less. However, MBOs do result in litigation from aggrieved shareholders and the engaging of investment banker does not mitigate this threat (DeAngelo, 1986). In such instances, both investment banks and courts uses earnings based valuations methods in their calculation, managers have further incentive to manage earnings (DeAngelo, 1986).

However, DeAngelo (1986) did not find any conclusive evidence of earnings management before buyouts, a result she surmised to be due to a lack of opportunity on

the part of management to manipulate earnings due to increased scrutiny during the buyout process. Perry and Williams (1999) agued a small sample size and the inclusion of firms in trouble may be behind DeAngelo's (1986) inconclusive results. Perry and Williams (1999) examined a much larger sample of 175 firms between 1981 and 1988 and found statistically significant evidence that managers did in fact manipulate accruals to decrease earnings in the year before a management buyout. Li, Qian, & Zhu, (2013) found that during the year before the announcement of an MBO, shows abnormally high discretionary expenses particularly in selling, general and administration, and also realize losses from asset sales. This indicates that the managers engage in income decreasing earnings management.

3.3 Influencing External Parties

External parties can influence the motivations for earnings management. This section examines two types of external influence: political costs and achieving earnings prices.

3.3.1 Political Costs

Watts and Zimmerman (1986) postulate that the when a firm is subject to wealth transfers due to the political process it will use accounting choices to reduce such transfers. Firms have been known to alter accounting choices based on the need to reduce the attention to it when faced with political problems (Brown, Izan, & Loh, 1992). In such cases the unwelcome attention from regulators or government managers may motivate managers to lower earnings.

Cahan (1992) studied the accruals of 48 firms that were investigated for monopoly related violations by the Department of Justice and the Federal Trade Commission; both these governmental entities use accounting profits as evidence to pursue cases against monopolists. Cahan (1992) found that discretionary accruals were lower for the firms at the time they were being investigated. Thus firms were engaging in income reducing earnings management. In addition, in a study of the cable television industry, Key (1997) found that as the industry was being investigated by Congress, the firms were

more likely to engage in income decreasing accruals. As the television cable industry in the US was facing scrutiny from government regulators and Key (1997) identified the years where the scrutiny was the highest (1989 and 1990) as the event periods. Key (997) also found that the magnitude of income decreasing earnings management was highest is firms that had a higher exposure to cable industry as part of their total operations.

There is further evidence of manipulation as a response to political costs in literature. In the 1980s the New Zealand government offered two types of export incentives: a tax reduction method and an export tax credit to sales method (Wong, 1988). The first method reduced the total tax, while the second method credited the export subsidy directly to sales. Thus the credit export tax to sales did not decrease the total tax of the firm. As New Zealand firms faced increasing criticisms from the media accused of tax avoidance, Wong (1988) found that larger firms increased their tax levels to that of other firms by using the export tax credit method.

3.3.2 Achieving Earnings Prices

Research has shown that meeting earnings expectation matters: Kasznik and McNichols (2002) found that firms that meet expectations have abnormal returns greater than firms than other firms. These results are observable even after controlling for current performance. Bartov et al. (2002) also found that firms that meet or beat earnings expectations enjoy a market premium.

Moreover, Skinner and Sloan (2002) found that the underperformance of growth stocks relative to other stocks can be explained by the disproportionate reaction of stock prices to negative earnings as compared to positive earnings. Thus Skinner and Sloan (2002) have found empirical evidence that show the asymmetric reaction in terms of stock prices to bad earnings news to the extent that the underperformance of growth stock can be explained by this asymmetric reaction. This provides a significant incentive for

managers of growth firms to manage earnings in order to safeguard against sharp drops in stock prices.

However, not all firms react the same way to analyst expectations. Managers of certain types of firms may be under higher pressure to meet analyst expectations than others. This is certainly the case for firms that have a higher percentage of institutional ownership. Matsumoto (2002) found statistically significant results that firms with higher institutional ownership are more likely to meet or exceed analyst expectations. It is argued that the institutional owners may be able to exercise more pressure on management to meet analysts' forecasts.

Matsumoto (2002) brings up the issue that an institutional investor may have the resources at its disposal, in terms of time and expertise, to be able to detect earnings management. As a counterpoint Bushee (1998) found that most institutional owners engage in momentum-trading strategies and thus it is likely that research costs dedicated to analysis are cut, making it harder to detect earnings management. However, an alternate explanation may be that even if the institutional investor does detect earnings management, there is no incentive for it to act on it; as the other investors who are unable to detect earnings management may actually bring up the stock prices and benefit all shareholders alike.

On the other hand, Matsumoto (2002) also found that a firm is less likely to meet analyst expectations, and as a consequence less likely to engage in earnings management, if it has low value relevance of earnings. This is because the current earnings of a low value relevance firm is not a good predictor of future earnings and stock prices, thus the managers of a low value relevance firm may not have enough incentives to meet or exceed analyst expectations.

The type of analyst expectation also affects the levels of earnings management. Payne and Robb (2000) found that managers' use of discretionary accruals is inversely proportional to the level of dispersion of the analysts' forecasts for the firm.

However, it must be noted that another way to meet or beat analysts' forecast is to lower analyst expectations. Koh, Matsumoto, Rajgopal (2008) found that during the post Enron scandal increased scrutiny from regulators led to more use of forecast guidance. The implication being that there are other means of meet or beating analysts' expectations. The choice is often a result of cost benefit analysis and the likelihood of being found out.

3.4. Earnings Management in an International Context

Differences in international accounting are often attributed to differences in accounting standards and the enforcement of such standards (Bhattacharya, Daouk, & Welker, 2003). However, despite the fact that the International Financial Reporting Standards (IFRS) has been adopted in nearly 100 countries, international accounting differences have not disappeared (Nobes, 2013). The IFRS is not required in several major markets (for instance, Japan), or in some cases the IFRS is not allowed for domestic reporters (for example, the registrants of the SEC in the US) (Nobes, 2013). Even when required or allowed, the adaptation of IFRS can be limited to certain types of companies; and in some cases local or regional versions are used instead. The quality of audit and the monitoring of compliance can determine the extent to which IFRS are adopted, not just between countries but also within countries (Nobes, 2013). And finally, linguistic differences among countries can also cause key accounting terminology to be interpreted in different ways (Nobes, 2013).

Although differences in accounting standards can explain international accounting differences, Ball, Kothari, and Robin (2000) point out the following drawbacks to using standards for comparisons: accounting standards often lag accounting practice, accounting practice is more detailed than standards, firms do not always implement standards, and incentives for implementing standards and the penalties for not doing so

vary according to jurisdiction. For these reasons, international accounting differences may be better explained by institutional factors (Ball et al., 2000). Moreover, institutional factors have been shown to affect the levels of earnings management in countries (Leuz, Nanda, & Wysocki, 2003). The next sections examine the institutional factors that are likely to affect the level of earnings management and the data those institutional factors.

3.4.1 Institutional Factors

Literature on earnings management in individual and cross-country studies forms a starting point to exploring institutional factors. In addition, in their study of earnings management across countries, Leuz et al., (2003) identify the concentration of ownership, level of investor protection and enforcement, the development of the stock markets and the level of disclosure as institutional factors that affect earnings management. Ball et al. (2000) find the level of political interference also affects the institutional environment. The origin of a country's legal system has been shown to strongly related to the institutional factors (Ball et al., 2000).

Concentration of Ownership

The concentration of ownership is an institutional factor that affects earnings management. Concentrated ownership allows majority owners to enjoy control in excess of their cash-flow rights (Gopalan & Jayaraman, 2012). In their study of 22 countries, Gopalan and Jayaraman (2012) found that, in countries with weak investor protection, firms with highly concentrated ownership have higher levels of earnings management. Another consequence of a highly concentrated ownership is that it leads to tunnelling. Tunnelling is defined as the transfer of resources out of firms for the benefit of majority shareholders (Johnson, La Porta, Lopez-de-Silanes, & Shleifer, 2000). Tunnelling can occur if the controlling shareholder transfers resources from the firm they control through theft or fraud, asset sales, transfer pricing that accumulates advantages to the controlling shareholder, excessive executive compensation and loan guarantees. Tunnelling also occurs when the majority shareholder increases their share of the firm without transferring any assets through practices such as dilutive share issues, minority freeze-outs and insider trading (Johnson et al., 2000).

One example of a country with a high concentration of ownership is China. On average, the largest shareholder holds more than 42 per cent of total shares for an average listed company (Ding, Zhang, & Zhang, 2007). Also, minority shareholders cannot take majority shareholders to court if they feel that they have been wronged (Liu & Lu, 2007). The implication of this is that there is a conflict of interest between the controlling shareholders and the minority shareholders, and that the majority shareholders are able to pursue their private benefit at a cost to minority shareholders (Ding et al., 2007). Liu and Lu (2007) found that conflicts between majority and minority shareholders can explain a significant part of the earnings management among Chinese firms.

Level of Investor Protection

The level of investor protection is an important institutional factor. La Porta, Lopes-de-Silanes, Schliefer and Vishny (1998) studied the level of investor and creditor protection in countries: shareholder protection includes voting powers, ease of participating in voting, and legal protection against expropriation; while creditor protection includes collateral for loans, ability to get hold of assets in default and the inability of management to seek unilateral protection from creditors (La Porta et al., 1998). The legal system and the level of enforcement afforded by that system affects investor rights (La Porta et al., 1998); this in turn affects the ability to engage in earnings management (Ball et al., 2000).

Using the La Porta et al. (1998) definitions, the Leuz et al. (2003) study found that earnings management is higher in those countries that have weak legal protection for outside investors. This is because countries with weaker investor protection allow insiders shareholders to enjoy private control benefits in excess of their shareholding proportions and thus these investors have stronger incentives to manipulate performance measures. Leuz et al. (2003) point out that legal systems can allow investors protection by giving them the right to discipline firm insiders and the right to enforce contracts meant to limit insiders' control over benefits. Leuz et al. (2003) investigated earnings management in 31 countries using a broader definition of earnings management which

included tests for earnings smoothing, the correlation between accounting accruals and operating cash flows, the magnitude of accruals, and ratio of small loss avoidance. All these factors were aggregated into one measure of earnings management.

Hung (2001) found that the accounting accruals (as opposed to cash accounting) negatively affects value relevance (in terms of earnings and return on equity) in countries with weaker shareholder protection. The study was conducted over 21 countries. The definition of accruals was based on an index of 11 standards related to the differences between cash receipt and disbursement and the recognition of revenue and expenses. As an example of how the index works, Hung (2001) explains a country that allows R&D expenditures to be capitalised and amortised would have a higher accrual index than a country that requires R&D to be expensed. The 11 measures that are examined to arrive at the index of accruals include the treatment of goodwill, equity calculation, depreciation method, R&D expenditure, interest capitalisation, finance lease, percentage of completion, pension costs and post-retirement benefits. The level of investor protection for the study was based on the anti-director index developed by La Porta et al. (1998).

Level of Disclosure

The level of disclosure required in a country also affects earnings management: earnings management is negatively related to the level of disclosure (Leuz et al., 2003). Managers have access to information that outside stakeholders do not; managers can use this knowledge to engage in earnings management. A higher degree of disclosure likely reduces the means by which earnings can be managed without detection. For example, if transfers to and from reserves do not have to be disclosed, such methods can be used to move accounting income and expenses from one period to another (Alford, Jones, Leftwich, & Zmijewski, 1993).

Alford et al. (1993) investigated whether the differences in capital markets (defined as differences in accounting standards, disclosure practices and corporate governance) can affect informativeness of accounting numbers in different countries using the US as a benchmark. The results show that there are significant differences in the timeliness and

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information content of accounting earnings among countries (Alford et al., 1993). In particular, annual accounting earnings in Australia, France, the Netherlands, and the United Kingdom were found to be more informative or more timely than U.S. accounting earnings. On the other hand, annual accounting earnings from Denmark, Germany, Italy, Singapore, and Sweden were less timely or less informative than U.S. accounting earnings (Alford et al., 1993).

The UK is an example of a country with high disclosure requirements. The law in the UK prohibits insiders (such as a majority shareholder or directors) from engaging in transactions that have conflicts of interest (Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2008). However, certain transaction may be allowed if shareholder approval is gained. In order to gain approval there has to extensive mandatory disclosure to make sure that minority shareholders have the chance to know about the transaction before a vote is taken on it (Djankov et al., 2008). Finally, such transactions have to be disclosed in full in the next annual report; the report has to include details such as the name of the director, his/her interest and the value of the transaction (Djankov et al., 2008).

Level of Political Interference
The level of political interference can affect the overall financial environment: China is a case in point. The stock market in China is quite different from that of other developed countries. Firstly, most of the listed firms in China were originally State Owned Enterprises (SOEs) in which the state still commands a large percentage shares – through direct and indirect means the government own nearly 70% of all the shares of listed companies in China (Liu & Lu, 2007). The implication of such an ownership system is that wealth maximisation is the not the only goal of the firm: firm goals may also include creating jobs, maintaining control of industries deemed important such as banking, energy and communications and political job placements (Liu & Lu, 2007).

Secondly, the China Securities Regulatory Committee (CSRC), the main regulatory body of the Chinese stock market, adopts an administrative approach to governing the stock market (Liu & Lu, 2007). This means that the CSRC depends on accounting

numbers to assess firms listed on the stock market. The CSRC ruled in 1994 that for a firm to be permitted a rights issue, the firm has to have an ROE of at least 10 % for the previous 3 years (Yu, Du, & Sun, 2006). This rule was modified in 1999, and then finally again in 2001 reducing the minimum ROE to 6% to be eligible for a rights issue (Yu et al., 2006). The minimum levels or ROE creates an incentive for Chinese firms to manage earnings. Chen & Yuan (2004) found a concentration of firms that showed an ROE just above the 10 per cent mark between 1996 and 1998. Yu et al (2006) also found that a higher concentration of firms with ROE just over the 10% mark for the year 1994 to 1998. The earnings management continued when regulations reduced the minimum ROE to six per cent (Yu et al., 2006).

In addition, the CSRC also has introduced a system of de-listing firms that do not perform; the performance being judged by accounting numbers (Liu & Lu, 2007). When firms are unprofitable for two consecutive years they are assigned the special treatment (ST) status, and if the firm fail to turn itself around within one year it is designated a particular transfer (PT) status – this leads to suspension of the trading of the company (Liu & Lu, 2007). Thus there is a strong incentive to manage earnings in order to prevent being de-listed. Liu and Lu (2007) compared the total accruals and discretionary accruals of firms in the ST and PT categories with the rest of the listed firms, and found that firms in the ST and PT categories did manage earnings.

Legal Origin

An important institutional factor in international accounting is the origin of the legal system. Legal scholars divide countries into two groups: common law and code law (La Porta et al., 1998). Common law countries base their legal system on the jurisprudence system of English law. The common law tradition has spread to the former colonies of England and includes Australia, India, New Zealand, South Africa and the United States; in total the La Porta et al. (1998) study identified 42 common law countries. On the other hand, the legal system in code law countries are based on the Roman system of using statues and codes and depends on the interpretation of the law by legal scholars (La Porta et al., 1998). La Porta et al (1998) have shown that legal differences can be a

function of the origin of the legal system, that other institutional factors affect are associated with the origins of the legal system.

The classification of legal systems into a common and code law dichotomy is not without its critics. Spamann (2010) has identified several problems with the La Porta et al. (1998) study. According to Spamann (2010) , La Porta et al. (1998) did not involve any lawyers from the respective countries that were studied, and most of the data was collected from secondary sources. This has led to errors in recording details from specific countries. Secondly, Spamann (2010) claims that the variable definitions used by La Porta et al. (1998) are ambiguous in many ways. After correcting for these weaknesses, Spamann (2010) tests the hypothesis and found no link between legal origin and investor protection.

Furthermore, other research has found that there are significant differences within common law countries caused by differences in the regulation, taxation and litigations (Ball et al., 2000). This shows that despite similar origins, a country's legal system may evolve in different ways as well as at a different pace and thus making it move away from the original legal system. Ball et al. (2000) concede that the classification of code and common law may not always be valid and countries may show significant differences among each other.

Nonetheless, there is also research that has shown the legal origin to be correlated with other institutional factors. La Porta et al's (1998) analysis show a statistically significant difference between code law and common law countries: common law countries have higher investor and creditor protection laws when compared to code law countries. It can be assumed from the findings that common law countries (which have higher investor and creditor protection) will be able to monitor management more effectively, and this means that the scope for management discretion, and therefore earnings management, will be lower in common law countries.

Conversely, code law countries (which have lower investor and creditor protection) will have more earnings management. In a more recent study of the self-dealing index (see section 5.1 for details), Djankov et al. (2008) found that requirement of making full disclosure was found in 57% of common law countries while only 25% of code law countries required full disclosures.

The level of political interference is also a point for difference between the code and common law countries. Code law countries receive significant political interference (from banks, labour unions and business associations) at national and firm levels (Ball et al., 2000). At the firm level, this political interference takes place through the agents of major stakeholders contracting with the firms. Thus the need for information is determined more by the specific needs of the major stakeholders (including shareholders, government bodies that collect tax, management and employees) rather than public disclosures. This is because the major stakeholder groups are also represented in the corporate governance processes and resolve issues of information asymmetry through insider communication (Ball et al., 2000). This is in contrast to common law countries that use public disclosure to address the information asymmetry problem.

Ball et al. (2000) examined the timeliness and conservatism of the financial statements across common and code law countries. In this context, timeliness refers to the extent that current period economic income is incorporated into current period accounting income and conservatism refers to the asymmetrical recording of economic losses over economic gains. Timeliness and conservatism are important because it makes it easier to monitor managers and the contractual obligations of firms (Ball et al., 2000).

Ball et al. (2000) found that accounting income is significantly more timely in common-law countries than in code-law countries. This is attributable to quicker incorporation of

economic losses (income conservatism) in common law countries (Ball et al., 2000). On the other hand, code law countries rely more on closer relationships between with significant stakeholders to resolve issues of timeliness and conservatism. The classification of countries by legal origin holds true when examining the accruals anomaly; Pincus, Rajgopal and Venkatachalam (2007) found that the accruals anomaly is more likely to occur in common law countries than code law countries.

CHAPTER 4

DETECTING EARNINGS MANAGEMENT

McNichols (2000) categorises accruals based[6] earnings management methodologies into those methodologies that are based on specific accruals, methodologies that are based on the distribution of earnings after management and finally, methodologies that are based on aggregate accruals. Research that adopt the specific accruals methodology usually focus on particular industrial sectors where the researchers employ their knowledge of those specific industries' institutional arrangements to separate the nondiscretionary from the discretionary accruals (McNichols, 2000). On the other hand, methodologies that are based on the distribution of earnings after management examine the statistical properties of earnings at specified benchmarks (such as zero earnings) to test for earnings management (McNichols, 2000). Finally, earnings management detection methodologies based on aggregate accruals attempt to identify discretionary accruals based on the relation between total accruals and hypothesized explanatory factors; it is this type of detection methodology that is the main focus of this study.

4.1 Generalised Accruals Based Earnings Management Detection Models

Dechow et al. (1995) point out that a generalised version of the accruals based earnings management detection model can be presented as in equation (2) (based on McNichols & Wilson, 1998):

$$DA_t = \beta_0 + \beta_1 PART_t + \sum_{k=1}^{k} \gamma_k \, X_{k,t} + \varepsilon_t \qquad (\,2\,)$$

Where
DA_t = discretionary accruals (normally scaled by lagged total assets)
$PART_t$ = dummy variable that separates data sets into two groups for which earnings management is specified by the researcher
$X_{k,t}$ = (for k=1,.., K) all other variables that affect discretionary accruals
ε_t = an error term that is independently and identically normally distributed.

Researchers generally set the variable *PART* to one when earnings management is hypothesized as being present. For example, in the Jones model this is the event period - the year when the firm applied for protection from the ITC (see section 4.3 below). The

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[6] As this study focuses on accruals based earnings management, the methodology for detecting real earnings management and changes to accounting process are not covered here, details for each type of methodology can be found in Roychowdhury (2006) and Fields et al. (2001), respectively.

variable *PART* is set to zero when it is assumed that there is no systematic earnings management (the estimation period). The null hypothesis of no earnings management will be rejected when the estimated coefficient for *PART*, $\hat{B}_1$, has the predicted signs at statistically significant levels.

Dechow et al. (1995) point out that earnings management researchers are unable to identify the other relevant variables (represented by the Xs) affecting discretionary accruals and thus these variables are dropped altogether. Moreover, as discretionary accruals are not naturally observable (these are dependent on managerial intention, which is very difficult to determine), proxies are used instead. Thus, a proxy, *DAP*, is used to represent the estimates of discretionary accruals. Equation (3) is the generalised version of the equation used to estimate the discretionary accruals (using a proxy).

$$DAP_t = \beta_0 + \beta_1 PART_t + \sum_{k=1}^{k} \gamma_k \, X_{k,t} + v_t + \varepsilon_t \qquad (3)$$

Where
DAP_t = proxy for discretionary accruals *DA* (normally scaled by lagged total assets)
$PART_t$ = dummy variable that separates data sets into two groups for which earnings management is specified by the researcher
$X_{k,t}$ = (for k=1,.., K) all other variables that affect discretionary accruals
v_t = error term due to the use of proxy *DAP* instead of *DA*
ε_t = an error term that is independently and identically normally distributed.

The variable v_t in equation (3) represents the error in calculating the discretionary accruals (DA) when using the proxy DAP. As the variables *X* and *v* in equation (3) cannot be accurately estimated, researchers drop the two variables and the final generalised equation appears in equation (4):

$$DAP_t = \widehat{\beta_0} + \widehat{\beta_1} \, PART_t + \varepsilon_t \qquad (4)$$

Where
DAP_t = proxy for discretionary accruals *DA* (normally scaled by lagged total assets)
$PART_t$ = dummy variable that separates data sets into two groups for which earnings management is specified by the researcher
ε_t = an error term that is independently and identically normally distributed.

According to Dechow et al. (1995) this final version in equation (4) is misspecified due to omitted variables (viz. the measurement error caused by using the proxy DAP and the relevant variables that affect discretionary accruals). It is this omission that leads to three problems. The first problem is that the model incorrectly attributes earning management to the variable *PART*. This occurs when the true coefficient of *PART* is

zero, and the variable representing error due to use of a proxy (v_t) is correlated with *PART*, the estimated coefficient of PART ($\hat{B}_1$) will be biased away from zero and thus increase the chances of generating Type I errors. The second problem occurs if the hypothesized effect of *PART* does in fact take place but *PART* and the omitted variables have the opposite signs, it will make the *PART* variable biased towards zero thus increasing the chances of generating Type II errors. Finally, even if the omitted variables are not correlated with *PART*, the fact that relevant variables are omitted means that the standard error of the estimated coefficient of PART will increase the chances of generating Type II errors. Thus discretionary accruals models are misspecified and lacking in power (Dechow et al., 2012).

Models estimating discretionary accruals also make assumptions on the relationship between discretionary and non-discretionary accruals. The type of relationship between discretionary and non-discretionary accruals is fundamental to defining models that can accurately detect earnings management (McNichols, 2000). Most accruals models assume that the relationship between discretionary and nondiscretionary is orthogonal[7]. In some circumstances the relationship between discretionary and non-discretionary accruals can be negative (for example, in cases when a firm experiences significant changes in non-discretionary changes in accruals, it may use discretionary accruals to smooth income) (McNichols, 2000). On the other hand, Dechow et al. (1995) have shown that discretionary accruals are correlated to the earning performance of a firm. Thus the assumption of an orthogonal relationship between discretionary and non-discretionary accruals may not hold, and in general, this further weakens the accruals models.

4.2 Healy Model

The Healy model is based on the methodology of the study conducted on executive compensation and earnings management by Healy (1985). In this model nondiscretionary accruals can be defined as in equation (5) as presented by Ronen and Yaari (2008):

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[7] Here, orthogonality implies that the two variables, discretionary and non-discretionary accruals, are uncorrelated.

$$NDA_{t+1} = \frac{1}{n}\sum \frac{TA_i}{A_{t-1}} \hspace{3cm} (5)$$

Where:

NDA_{t+1} = nondiscretionary accruals for period t+1

TA_i = total accruals for firm i

A_{t-1} = total assets in year $t-1$ for the firm i

n = number of years defined as estimation period

According to Dechow et al. (1995), the Healy (1985) model calculates the mean total accruals and designates it as non-discretionary (as shown in equation (5)). The difference the total accruals of the period being predicted (event period) and the non-discretionary accruals is the discretionary accruals.

4.3 Jones Model

The earnings management model put forward by Jones (1991), (referred to as the Jones model) is possibly the most applied earnings management model. The Jones model and modified versions of it have been used to detect earnings management in other research (DeFond & Jiambalvo, 1994; Teoh et al., 1998b).

$$TA_{i,t} = \beta_0(1/A_{i,t-1}) + \beta_1 \Delta REV_{i,t} + \beta_2 PPE_{i,t} + \varepsilon_{i,t} \hspace{2cm} (6)$$

Where:

$TA_{i,t}$ = total accruals in year t for firm i Calculated as [(ΔCurrent Assets$_t$−ΔCash$_t$) − (ΔCurrent Liabilities$_t$−ΔCurrent Maturities of Long Term Debt$_t$−ΔIncome Tax Payable$_t$−ΔDepreciation and Amortisation Expense$_t$)]/A$_{i,t-1}$)

$\Delta REV_{i,t}$ = revenues in the year t less revenue in year $t-1$ for firm i scaled by $A_{i,t-1}$

$PPE_{i,t}$ = gross property, plant and equipment in the year t for the firm i scaled by $A_{i,t-1}$

$A_{i,t-1}$ = total assets in year $t-1$ for the firm i

$\varepsilon_{i,t}$ = error term in the year t for firm i

As can be seen in equation (6), the Jones model is a linearly related regression approach with change in revenue and the gross property, plant and equipment as independent variables representing the control for non-discretionary accruals and total accruals as the dependent variable.

There are several issues with the Jones model. The Jones model assumes earnings are not managed through revenues, that is, all revenues are nondiscretionary. This is why the model only takes account of the changes in revenue as a nondiscretionary accrual. Thus if managers do manipulate revenues, the jones model will not be able to detect it.

This shortcoming can be backed up by empirical evidence: for example, Ronen and Yaari (2008) demonstrate that the model can accurately capture the manipulation of bad debts expense, but underestimates discretionary accruals when revenues are manipulated[8]. Another assumption by the Jones model is that the relationship between non-discretionary accruals and the explanatory variables (change in revenue and gross PPE) is stationary (Jones, 1991). The Jones model suffers from a simultaneity problem as accounts receivable is both a regressor (contained within revenues) and regressand (contained within total accruals) (Ronen & Yaari, 2008).

Heteroskedasticity remains an issue with the model. The Jones model divides all variables by lagged assets to control for heteroskedasticity. However, Kothari, et al. (2005) cited White (1980) in claiming that deflation by a variable is able to reduce heteroskedasticity, but does not eliminate it. Sweeney (1994) believes models using abnormal accruals to detect earnings management (such as the Jones model) have the following drawbacks:

- there are issues with negative serial correlation
- it is difficult to separate the discretionary accruals from the nondiscretionary accruals (caused by economic circumstances)
- certain changes like LIFO liquidations may be misclassified.

However, research has shown that the Jones model has lower standard error in a time series test of accruals detection when compared with the Healy model, DeAngelo model, and the industry model[9], thus suggesting that the model is in fact better at generating nondiscretionary accruals and thus less susceptible to misspecifications from omitted variables (Dechow et al., 1995).

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[8] Ronen and Yaari (2008 p. 436), use two types of known quantities of earnings management to demonstrate the ability of accrual models to detect earnings management.

[9] The DeAngelo (1986) model starts with the assumption that the changes in nondiscretionary accruals are nearly zero. The model then identifies discretionary accruals as the difference in total accruals. The Industry model was developed by Dechow and Sloan (1991) assumes that firms across an industry share similar characteristics, and thus similar determinants of nondiscretionary accruals; it uses the median value of total accruals scaled by lagged assets for all non-sample firms in the same 2 digit SIC code.

The Jones model is based on the Jones (1991) event study of income decreasing accruals in firms that applied for import relief to the US International Trade Commission (ITC). The ITC is a US government agency that investigates firms that are facing severe difficulty due to imports. If imports are indeed affecting the firm quite severely, the ITC is able to remedy the situation through various protection measures. The ITC primarily uses accounting numbers, in particular accounting earnings, to evaluate the impact of imports (Jones, 1991). Therefore, it was assumed that a firm that applies for import relief to the ITC has significant incentives to employ income decreasing earnings management. The study analysed 23 firms that applied for protection found average estimated coefficient for PPE to be statistically significant and negative (– 0.33) while average estimated coefficient for the change in revenues is positive and statistically significant (0.035) (Jones, 1991). The average adjusted R^2 for the 23 regressions was 0.232.

The Jones (1991) study divided accruals into two components: discretionary and nondiscretionary accruals. The nondiscretionary accruals are expected to be caused by the factors outside the control of the manager; for instance economic circumstances or organic growth of the firm. The coefficients of the change in revenue and the gross property, plant and equipment (PPE) comprise the nondiscretionary component of the total accruals. Discretionary accruals are within the control of managers. The Jones study ran a regression for the estimate period, and then plugged in coefficient estimates into the event model to calculate non-discretionary accruals. The discretionary accrual was calculated as the difference between the total accruals in the event period and the estimated non-discretionary accruals.

The study also assumes that the estimation period does not have any earnings management. The study assumes that the nondiscretionary accruals in the estimation period are equal to the total accruals. There are many reasons why managers may manage earnings including debt obligations, meeting analysts' expectations, tax

obligations and manager compensation during the estimation period. Given this fact, it is unlikely that firms will not have any earnings management in the previous years as the study assumes. Ronen and Yaari (2008) ran a simulation of the Jones model, and found that the earnings management during the estimation period does affect the tests.

Finally, international studies using the Jones model have had unexpected results. Yoon and Miller (2002) found that applying the modified Jones model to data from Korean firms suggests that the model is misspecified. In the case of the gross property plant and equipment only 40 per cent of the regressions show the expected sign at statistically significant values. The results are based on 2033 firm-year observations from 1994 to 1997. Islam, Ali and Ahmed (2011) in their study of firms in Bangladesh also found that the Jones model to be misspecified, but the addition of depreciation expenses, retirement benefit expenses, asset disposal gains/losses with the modified Jones model showed significant improvements.

4.4 Modified Jones Model

Dechow et al. (1995) modified the Jones model in order to address some of its issues. The Dechow et al. (1995) model (hereafter referred to as the modified Jones model) is specified below in equation (7).

$$TA_{i,t} = \beta_0(1/A_{i,t-1}) + \beta_1(\Delta REV_{i,t} - \Delta REC_{i,t}) + \beta_2 PPE_{i,t} + \varepsilon_{i,t} \qquad (7)$$

Where:
$TA_{i,t}$ = total accruals in year t for firm i Calculated as [(ΔCurrent Assets$_t$ − ΔCurrent Liabilities$_t$ − ΔCash$_t$ + ΔShort Term Debt$_t$ − Depreciation and Amortisation Expense$_t$)/A$_{i,t-1}$]
$\Delta REV_{i,t}$ = revenues in the year t less revenue in year t-1 for firm i scaled by $A_{i,t-1}$
$\Delta REC_{i,t}$ = receivables in the year t less receivables in year t-1 for firm i scaled by $A_{i,t-1}$
$PPE_{i,t}$ = gross property, plant and equipment in the year t for the firm i scaled by $A_{i,t-1}$
$A_{i,t-1}$ = total assets in year t-1 for the firm i
$\varepsilon_{i,t}$ = error term in the year t for firm i

The first modification is the use of change in accounts receivable to account for the changes in revenue due to manipulation. Another effect of the modification to the model

by including the changes in accounts receivable is that the model now uses cash sales, and this addresses the simultaneity problem found in the Jones model.

Beneish (1997) assessed if the modified Jones model could detect GAAP violators in either the year or violation or in previous years. The model did not perform well: it was only able to detect 11 out of 64 GAAP violators at a 5% significance rule in the year of violation. This detection rate improved only slightly when the detection conditions were relaxed to include both the year of violation and the prior years, the model was able to detect 15 out of 64 GAAP violators.

McNichols (2000) points out the modified Jones model would not reject earnings management that are less than 5% of the total assets. However, the median net income before extraordinary earnings between the years of 1988 to 1998 was 3.8% of beginning total assets, thus earnings management that is even one per cent of total assets would be material in most cases. This therefore represents a significant lack of power in the model.

In order to test the modified Jones model, Dechow et al. (1995) conducted a study which used random samples of firm years as event years and then selected those firms that have at least ten years of data. This methodology allows for a much bigger sample, and also randomises the incentives for earnings management (Dechow et al., 1995). The study only applied equation (7) to the event year, while the estimation years are based on the original Jones model.

4.5 Performance Matched Discretionary Accruals

Kothari, Leone, and Wasley (2005) suggest a performance matching model as further improvement to the Jones and modified Jones models. This model aims to address the relationship between performance and accruals in the detection of discretionary accruals.

The main contribution of the Kothari et al. (2005) performance matching model is the incorporation of firm performance into the estimation of discretionary accruals. Kothari et al. (2005) argue that according to models of earnings, cash flows, and accruals (as described by Dechow, Kothari, and Watts (1998)), when sales are forecast to grow, working capital accruals also increase as a result of the firm's investment to sustain that growth. Thus, Kothari et al. (2005) believe that accruals of firms experiencing extreme performance can be expected to be non-zero. Further, the two most commonly used earnings management detection models, Jones and modified Jones models, are unable to capture the relationship between performance and accruals because they are misspecified when it comes to firms with extreme performance (Dechow et al., 1995). This is why Kothari et al. (2005) believe that firm performance should be included in the estimation of discretionary accruals.

Kothari et al. (2005) propose two approaches to control for performance. The first approach involves matching firms based on industry and return on assets (ROA). It is ROA that controls for the effects of performance in the model. Essentially, this modification is a control sample approach. The second approach is to add an intercept and the lagged ROA as a control variable directly to the regression equation (see equation (8)). The lagged ROA controls for performance. The reasons for adding the intercept are threefold: to further control for heteroskedasticity, to reduce problems caused by omitting scale variables, and in order to make the discretionary accruals more symmetric (higher symmetry around zero discretionary accruals) and thus making it easier to compare models. Kothari et al. (2005) admit that an alternate solution would be to develop existing models into a nonlinear model; however, a lack of theoretical basis for such a model makes it difficult to create such a model. The performance matched model has an advantage in that the approach does not attempt to capture the relationship between performance and accruals; rather it assumes that both the control and treatment firms have the same non-event discretionary accruals.

$$TA_{i,t} = \beta_0 + \beta_1 (1/A_{i,t-1}) + \beta_2 \Delta REV_{i,t} + \beta_3 PPE_{i,t} + \beta_4 ROA_{i,t} + \varepsilon_{i,t} \qquad (8)$$

Where:

$TA_{i,t}$ = total accruals in year t for firm i Calculated as ((ΔCurrent Assets-ΔCurrent Liabilities-ΔCash+ΔShort Term Debt-Depreciation and Amortisation Expense$_t$)/$A_{i,t-1}$)

$\Delta REV_{i,t}$ = revenues in the year t less revenue in year t-1 for firm i scaled by $A_{i,t-1}$

$PPE_{i,t}$ = gross property, plant and equipment in the year t for the firm i scaled by $A_{i,t-1}$

$ROA_{i,t}$ = return on assets in the year t for firm i scaled by $A_{i,t-1}$

$A_{i,t-1}$ = total assets in year t-1 for the firm i

$\varepsilon_{i,t}$ = error term in the year t for firm i

Adding the ROA as a control variable into the regression brings up the issues of stationarity (in both time series and cross-section). Secondly, the regression model confines the relationship between performance and accruals, which is essentially non-linear, into a linear equation. The relationship between performance and accruals is expected to be nonlinear. The main arguments are based on statistics and economics. Economically, the relationship is non-linear because of accounting conservatism and the incentives for earnings management (Kothari et al., 2005). Accounting conservatism results in loss being anticipated rather than gains; thus resulting in earnings capitalising losses and treating gains as flow amounts. As capitalised amounts are more persistent than gains they are responsible for the non-linearity of the relationship between performance and accruals. The incentive to take a big bath when making a loss also contributes to the nonlinear relationship between current and future performance.

Statistically, Kothari et al. (2005) claims that extreme performance is mean reverting, but average performance is persistent. This means that the relationship between current and future is non-linear. This is acknowledgement of the non-linearity is important to control of the effects of performance on accruals.

Kothari et al. (2005) raise the question of whether the approach of matching industry and performance will remove more than just the part of discretionary accruals due to industry and performance; that is whether the matched performance model over corrects. The authors contend this is not a problem as most research on earnings management focuses on event studies, that is, the effect of a particular event on discretionary accruals. Thus the researcher is only interested in the abnormal discretionary accrual rather than total discretionary accruals. This is a weakness in the

model, in that, it can only detect earnings management caused by an event rather than total earnings management.

The performance matched model was found to be the best estimator of discretionary accruals. As the discretionary accruals are residuals, the average is expected to be zero. Both the Jones and the modified Jones versions of the performance matched models produced results closest to zero; thus better than the original models. However, using ROA as a control variable in a regression yields "erratic performance improvement" (Kothari et al., 2005, p. 178). Ronen and Yaari (2008) report that the performance matched model yielded an R^2 of 11.13% compared to 8.09%.

The performance matching model also has a few shortcomings. The performance matching cannot completely eliminate model misspecification (Dechow et al., 2012). In fact, the matching process reduces misspecification in some cases (such as extreme earnings to price and book to market ratios) but at the same time increase misspecification (in samples which have extreme performance in terms of size and operating cash flow) (Dechow et al., 2012).

In order to test the performance matching model Kothari et al. (2005) conducted a study using both the Jones and the modified Jones models. In the case of both approaches Kothari et al. (2005) ran a cross-sectional regression instead of a time series regression. The problem with a time series regression is that it requires the use of data from a long period, thus automatically introduces into data the structural changes that a business has to undergo in order to survive (Ronen & Yaari, 2008). These changes in turn are likely to affect business plans and as a consequence accruals. However, a cross sectional analysis makes the assumption that all the firms in an industry have the same operating cycle and are at the same phase of the cycle; this problem is not present in time series analysis estimates are firm specific (Ronen & Yaari, 2008).

4.6 Dechow and Dichev Model: Cash Flows and Working Accruals

Dechow and Dichev (2002) indicate that even without managerial intention to manipulate earnings the quality of accruals will be related to the firm and industry. This model focuses on working capital accruals and operating cash flow in the interest of being able to track the measures: both measures are short term and therefore can be reasonably expected to reverse within one year. The final model is as follows:

$$\Delta WC_{i,t} = \beta_0 + \beta_1 CFO_{i,t-1} + \beta_2 CFO_{i,t} + \beta_3 CFO_{i,t+1} + \varepsilon_{i,t} \qquad (9)$$

Where:

$\Delta WC_{i,t}$ = change in working capital in the year t for firm i. Calculated as [(ΔAccounts Receivable$_t$+ΔInventory$_t$−ΔAccounts Payable$_t$−ΔTax Payable$_t$+ΔOther Assets$_t$ (Net))/A_{it-1}]

$CFO_{i,t-1}$ = cash flow from operation for the year $t-1$ for firm i scaled by $A_{i,t-1}$

$CFO_{i,t}$ = cash flow from operation for the year t for firm i scaled by $A_{i,t-1}$

$CFO_{i,t+1}$ = cash flow from operation for the year $t+1$ for firm i scaled by $A_{i,t-1}$

$A_{i,t-1}$ = total assets in year $t-1$ for the firm i

$\varepsilon_{i,t}$ = error term in the year t for firm i

The model essentially examines earnings quality as relationship between accruals and cash flows, the earnings quality is represented by the standard deviation of residuals. The model makes the following assumptions:

- accruals are temporary adjustments, their function is to either delay or anticipate future cash flows plus an estimation error term;
- accruals and current cash flows are negatively related, and accruals and the past and future cash flows are positively related
- the error term captures accruals

There are several limitations of the model. Dechow and Dichev (2002) point out that independent variables have a measurement error; this leads the coefficients to be biased downwards. The model also assumes that accruals and adjustments to earnings are reflected in period prior and subsequent to the current period; this limits the applicability of the model to only firms that have a relatively short operating cycle (McNichols, 2002). McNichols (2002) indicates that this model does not examine how discretionary accruals may affect total accruals; the problem arises due to the research that indicates that estimation errors due to management discretion are not related to each

other and cash flow realisations. This limits the generalizability of the model. Finally, the presence of mergers, acquisitions and divestures may introduce further errors due to the fact that accruals in one period may not match the cash flows in subsequent periods (McNichols, 2002).

4.7 McNichols Model: An Integrated Approach

The model proposed by McNichols (2002) appears in equation (10):

$$\Delta WC_{i,t} = \beta_0 + \beta_1 \Delta REV_{i,t} + \beta_2 PPE_{i,t} + \beta_3 CFO_{i,t-1} + \beta_4 CFO_{i,t} \quad (10)$$
$$+ \beta_3 CFO_{i,t+1} + \varepsilon_{i,t}$$

Where:
$\Delta WC_{i,t}$ = change in working capital in the year t for firm i. Calculated as $((\Delta$Accounts Receivable$_t$+ΔInventory$_t$−ΔAccounts Payable$_t$−ΔTax Payable$_t$+ΔOther Assets$_t$ (Net))$/ A_{i,t-1})$
$\Delta REV_{i,t}$ = revenues in the year t less revenue in year $t-1$ for firm i scaled by $A_{i,t-1}$
$PPE_{i,t}$ = gross property, plant and equipment in the year t for the firm i scaled by $A_{i,t-1}$
$CFO_{i,t-1}$ = cash flow from operation in the year $t-1$ for firm i scaled by $A_{i,t-1}$
$CFO_{i,t}$ = cash flow from operation in the year t for firm i scaled by $A_{i,t-1}$
$CFO_{i,t+1}$ = cash flow from operation in the year $t+1$ for firm i scaled by $A_{i,t-1}$
$A_{i,t-1}$ = total assets in year $t-1$ for the firm i
$\varepsilon_{i,t}$ = error term in the year t for firm i

Equation (10) is essentially a combination of the Jones model and the Dechow and Dichev model. McNichols (2002) points out that the Jones model sought to separate discretionary accruals from non-discretionary accruals, while the Dechow and Dichev model examines accruals as a whole, thus combining both models can combine the strengths of both models. Specifically, the integrated model is expected to improve the model by reducing the omitted variable problem in the Jones model, and functioning as a check for the measurement errors in the Dechow and Dichev model.

McNichols (2002) points out that the tests of the models also provide evidence of the misspecification of the Jones and the Dechow and Dichev models. She finds that in the Dechow and Dichev model the residuals are significantly correlated with change in sales and also shows that cash from operations is a noisy estimator of the cash flows in accruals. The analysis also shows that the Jones model is significantly associated with prior, current and future cash flows.

McNichols (2002) tested the Jones model, Dechow and Dichev model and the integrated McNichols model with a regression of 15,015 firm years between 1988 to 1998. The results revealed that the integrated model had the highest adjusted R^2 (0.3009). The signs of the coefficient in the integrated model are consistent with both the Jones and the Dechow and Dichev model; like the Dechow and Dichev model, the cash flows in prior and subsequent periods have positive coefficients. Further, like the Jones model, the coefficient for PPE was negative and change in revenue was positive and all coefficients were statistically significant, in the integrated McNichols model.

4.8 Dechow, Hutton, Kim and Sloan Model: A Reversals Approach

Dechow et al. (2012) propose the incorporation of reversals into the accruals models with the aim to improve the specification and the power of tests. The model (equation (11)) is a regression where the dependent variable is working capital accruals; independent variables are explanatory variables for expected accruals, and the inclusion of dummy partition variables. The improvement here is that dummy partition variables are added to reflect reversal in the subsequent years. The generalised version of the accruals model proposed by Dechow et al. (2012) is in equation (11).

$$WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \sum_k f_h X_{k,i,t} + \varepsilon_{i,t} \qquad (11)$$

Where:
$WC\_ACC_{i,t}$ = noncash working capital accruals in the year t for firm i scaled by A_{it-1} calculated as (ΔCurrent Assets$_{i,t}$ − ΔCurrent Liabilitites$_{i,t}$ − ΔCash$_{i,t}$ + ΔShort Term Debt$_{i,t}$)/$A_{i,t-1}$
$PART_{i,t}$ = a dummy partition variable that is set to 1 when earnings management is expected to be present, 0 otherwise, in the year t for firm i
$PARTP1_{i,t}$ = a dummy partition variable to represent reversals set to 1 in the first year following an earnings management year and 0 otherwise, in the year t for firm i
$PARTP2_{i,t}$ = a dummy partition variable to represent reversals set to 1 in the second year following an earnings management year and 0 otherwise, in the year t for firm i
$X_{k,i,t}$ = controls variables for nondiscretionary accruals in the year t for firm i scaled by $A_{i,t-1}$
$A_{i,t-1}$ = total assets in year t-1 for the firm i
$\varepsilon_{i,t}$ = error term in the year t for firm i

The basis of the improvement proposed by Dechow et al. (2012) is that accruals based earnings management in one period have to be reversed in the next period. According to the authors, the problems of omitted variables in the accruals models can be circumvented by the addition of reversals.

Dechow et al. (2012) conducted a study using the Healy, Jones, modified Jones, Dechow and Dichev, McNichols and the performance matched models. The results show incorporation of reversals improves test power improves by at least 40%.

4.9 Dunmore Model: An Alternate Solution

Dunmore (2013) proposes a mathematically better specified model that uses the logarithms of non-negative accounting variables that evolve as a vector process as shown in equation (12). In this equation, Γ is a square matrix whose rows each sum to 0. The final generalised version of the model is shown in equation (12):

$$y_{i,t} = \beta_0 + (\Gamma + I)y_{i,t-1} + \varepsilon_{i,t} \qquad (12)$$

$y_{i,t}$ = vector of logged variables for firm i year t
β = a vector of intercepts.
Γ = a square matrix of coefficients
I = identity matrix
$y_{(i,t-1)}$= vector of lagged values of variables $y_{i,t}$
$\varepsilon_{i,t}$ = residual for firm i, and year t

The model allows the values of the account variables for time period t to be predicted from the variables in the period t-1. The values of expected accruals can be calculated using relevant variables. The expected variables are the non-discretionary accruals (before any management of accruals in year t). This means that the expected variables can be used in the place of the control variables ($X_{k,i,t}$) in equation (11) of the Dechow et al. (2012) model. If the actual accruals are on average equal to the expected accruals, then the corresponding regression coefficient in equation (11) should be 1.

The Dunmore model requires non negative numbers; this means that the accounting numbers have to be calculated in a special way. Dunmore (2013) proposes breaking down the accruals into their component forms, for example, the difference between income and cash flow from operations. However, these numbers may themselves be negative. Dunmore (2013) further proposes the following solution: as cash inflows of a firm are derived largely from the revenues, the inflows can be substituted by revenues. Therefore cash out flows can be calculated as revenues minus cash flow from operations. Similarly, expenses can be calculated as revenues minus net income. The difference between cash flow out and expenses leads to total accruals. For the purposes of this study working capital accruals can be broken into their component forms. Thus

the following two variables are defined: first, as current assets except cash and the second as current liabilities except short term debt.

In addition, the Dunmore model specifies that a set of accounting variables be used, rather than listing those exact variables that are used. Thus the exact variables must be chosen for testing the model. The main criterion is that the variables are the relevant to accruals as suggested in extant theory and literature. The next step was to test the suitability and the combination of the variables. (For the results of some of the trials see Appendix B Tables B1-B3).

CHAPTER 5
RESEARCH

5.1 Research Questions

Over time, accruals based earnings management models have been improved and modified (as discussed in in Chapter 4). The McNichols model with the addition of reversals as used in the Dechow et al. (2012) study represents the model with the greatest power and specification to date. At the same time Dunmore (2013) proposes a mathematically better model than existing accounting models. It is thus important to compare the specification and power of the Dunmore model against the McNichols model. Therefore the first research question for this study is:

> **Q1:** Is the Dunmore model really an improvement over the McNichols model, in terms of specification and power?

The institutional factors can have an effect on the motivations and the opportunities to manage earnings and it thus important to test for the generalizability of the accruals detection models. Therefore the second question of this study is:

> **Q2:** How do the models fare in terms of generalizability across countries with very different institutional factors (namely China, Japan and the United Kingdom)?

In order to compare countries based on institutional factors it is important to have a data that is derived from the same source. Djankov et al. (2008) developed a self-dealing index as a means of ranking countries based on institutional factors based on the level of disclosure required by majority shareholders. The study is based on 72 countries using data is gathered from a questionnaire survey of Lex Mundi law firms. The self-dealing index calculates the extent to which minority shareholders are protected using two

measures: The ex ante and ex post private control measure disclosure requirements before and after transactions between related parties.

The Djankov et al. (2008) study provided lawyers with a hypothetical scenario where a person who is the majority shareholder (owning 60 per cent of shares) and board member of a company ('Buyer') instigates the process of acquiring assets from another company ('Seller') where the same person owns 90 per cent of the shares. The lawyers had to respond with answers about laws pertaining to approval required by the other minority shareholders, independent review, disclosure requirements in periodic financial statements, ability to rescind a bad faith transaction, ability sue the majority shareholder and those responsible for governance, and ease of access to information and proving wrongdoing. Table 1 shows data on the self-dealing index for China, Japan, and the United Kingdom. Table 1 also shows information on the legal origin, the ownership concentration rights, and the enforceability of contracts.

Table 1

Data on Institutional Factors

Country	Legal Origin	Anti-self-dealing index	Ownership concentration	Creditor rights	Enforceability of contracts
China	Code Law	0.76	N/A	2	5.00
Japan	Code Law	0.50	0.18	2	7.57
UK	Common Law	0.95	0.19	4	8.50

Legal origin data from La Porta et al. (1998). Anti-self-dealing index data derived from Djankov et al. (2008); a higher score indicates higher disclosure and approval requirements for self-dealing transactions. The ownership concentration data is derived from La Porta, Lopez-de-Dilanes, and Shleifer (2006); average percentage of common shares not owned by the top three shareholders. Creditor rights data derived from Djankov, McLiesh, and Shleifer (2007); higher score indicates greater rights. Enforceability of contracts data derived from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2003); a higher score indicates higher enforceability[10].

As can be seen from Table 1, the institutional factors that correspond to each country are quite different from each other. Although the legal origin of China and Japan are the same, China has a higher self-dealing index compared to Japan. UK has the highest

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[10] The data in each study is aggregated, however country-wise data for the institutional factors is available from the data sheets made available at the personal website of Prof Rafael La Porta, Tuck School, Dartmouth College and can be retrieved from http://faculty.tuck.dartmouth.edu/rafael-laporta/research-publications.

level of creditor rights, enforceability of contracts and the highest self-dealing index. The countries represent each type of legal origin: UK (a common law country) and Japan (a developed code law country) and China (an emerging market code law country) will be used. In addition, despite the growing importance of the Chinese economy over the past decades, earlier cross country studies (such as Ball et al. (2000); Leuz et al. (2003)) do not include China. One reason may be due to unavailability of Chinese data (see Appendix A for a discussion on missing data).

China is expected to have higher levels of earnings management. Studies have shown that earnings management is quite pervasive among Chinese listed firms (Chen & Yuan, 2004; Yu et al., 2006). Also it has a high degree of political interference, a high concentration of ownership (Liu & Lu, 2007), lower self-dealing index (compared to the UK). Therefore the detection results for the two models are expected to be noisy for China. The UK is a common law country with lower ownership concentration and a high self-dealing index. The results for the UK are expected to be the opposite to that of China. Results for Japan are expected to be in between the UK and China.

The differences in the institutional factors for China, Japan and the UK are varied enough to suggest that using data from the three countries will give a robust measure of generalizability of the McNichols and Dunmore models. Therefore it is the aim of this study to investigate if the findings of the Dechow et al. (2012) generalises to other countries and whether findings can be explained by country institutional factors.

This study aims to replicate the Dechow et al. (2012) study to test the specification and power of the McNichols and the Dunmore models using data from China, Japan and the United Kingdom.

5.2 Models

5.2.1 McNichols Model with Reversals

Dechow et al. (2012) use seven models in their study: Healy, Jones, modified Jones, Dechow and Dichev, McNichols and the performance matching model. Of these, the McNichols model incorporates improvements from all other previous non-performance matched models (except for the modified Jones model which deducts change in accounts receivables from change in revenues). Moreover, among all the models examined in the Dechow et al. (2012) study, the McNichols model with reversal showed the highest explanatory power with an adjusted R^2 of 0.28. Finally, all the signs of the coefficients of explanatory variables match predictions from literature (Dechow et al., 2012). The McNichols model with the incorporation of reversals appears in equation (13):

$$WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t} \quad (13)$$
$$+ \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1} + \varepsilon_{i,t}$$

Where:
$WC\_ACC_{i,t}$ = the noncash working capital accrual for firm i, period t divided by $A_{i,t-1}$. See equation (14) for formula.
$PART_{i,t}$ = partitioning dummy variable set to 1 for 100 randomly selected firm years to represent earnings management or 0 otherwise, in inducement and non-inducement tests.
$PARTP1_{i,t}$ = partitioning dummy variable that is set to 1 in the year following the 100 randomly selected firm years to represent reversals or 0 otherwise, in inducement and non-inducement tests.
$PARTP2_{i,t}$ = partitioning dummy variable set to 1 in the second year after 100 randomly selected firm years to represent reversals or 0 otherwise, in non-inducement tests only.
$\Delta REV_{i,t}$ = (Revenue$_{i,t}$ – Revenue$_{i,t-1}$)/A$_{i,t-1}$
$PPE_{i,t}$ = gross property plant and equipment$_{i,t}$/A$_{i,t-1}$
$CF_{i,t}$ = current year cash flow (calculated as earnings before extraordinary items$_{i,t}$ – working capital accruals$_{i,t}$) scaled by $A_{i,t-1}$
$CF_{i,t-1}$ = cash flow for year $t-1$ scaled by $A_{i,t-1}$
$CF_{i,t+1}$ = cash flow for year $t+1$ scaled by $A_{i,t-1}$
$A_{i,t-1}$ = the total assets for firm i during period $t-1$

Equation (13) models the actual working capital accruals as a function of variables that are meant to predict the expected accruals (explanatory variables) plus a partition variable for the years that have earnings management and partition variables from reversal in the consecutive years. Working capital accruals are calculated as equation (14).

$$WC\_ACC_{i,t} = (\Delta CA_{i,t} - \Delta CL_{i,t} - \Delta CASH_{i,t} + \Delta STD_{i,t})/A_{i,t-1} \quad (14)$$

Where:
$\Delta CA_{i,t}$ = (Current Assets$_{i,t}$ – Current Assets$_{i,t-1}$) for firm i
$\Delta CL_{i,t}$ = (Current Liabilities$_{i,t}$ – Current Liabilities$_{i,t-1}$) for firm i
$\Delta CASH_{i,t}$ = (Cash$_{i,t}$ – Cash$_{i,t-1}$) for firm i
$\Delta STD_{i,t}$ = (short-term debt$_t$ - short-term debt$_{t-1}$) for firm i
$A_{i,t-1}$ = the total assets for firm i during period $t-1$

5.2.2 Dunmore Model

Dunmore (2013) has argued that conventional accounting models are mathematically misspecified, and proposes a mathematically better model, which is worth testing against the McNichols model. A special form of the Dunmore model is used to test for earnings management. The model in its generic form is shown in equation (15).

$$y_{i,t} = \beta_0 + (\Gamma + I)y_{i,t-1} + \varepsilon_{i,t} \tag{15}$$

Where:
$y_{i,t}$ = vector of logged variables for firm i year t
β = a vector of intercepts.
Γ = a square matrix of coefficients
I = identity matrix
$y_{(i,t-1)}$ = vector of lagged values of variables $y_{i,t}$
$\varepsilon_{i,t}$ = residual for firm i, and year t

In order to detect earnings management the Dunmore model employs a linear regression with the natural log of selected accounting variables as dependent variables and independent variables the constitute the natural log of lagged values of the dependent variables. As discussed earlier (section 4.9) expected variables represent the non-discretionary accruals so that they can take the place control variables ($X_{k,i,t}$) in equation (11) of the Dechow et al. (2012) model. The final version of the Dunmore model for adapted for this study is equation (16).

$$AWCA_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 PWCA_{i,t} + \varepsilon_{i,t} \tag{16}$$

$AWCA_{i,t}$ = the actual working capital accruals for firm i, period t calculated as [(exp (actual current assets$_{i,t}$) − exp (actual cash$_{i,t}$)) − (exp (actual current liabilities$_{i,t}$) − exp (actual short term debt$_{i,t}$))] scaled by $A_{i,t-1}$
$PWCA_{i,t}$ = the predicted working capital accruals for firm i in year t calculated as [(exp(predicted current assets$_{i,t}$) − exp(predicted cash$_{i,t}$)) − (exp (predicted current liabilities$_{i,t}$) − (predicted short term debt$_{i,t}$))] scaled by $A_{i,t-1}$
$PART_{i,t}$ = partitioning variable set to 1 for 100 randomly selected firm year to represent earnings management or 0 otherwise, in non-inducement and inducement tests.
$PARTP1_{i,t}$ = partitioning variable that is set to 1 in the year following 100 randomly selected firm years to represent reversals or 0 otherwise, in non-inducement and inducement tests.
$PARTP2_{i,t}$ = partitioning variable set to 1 in the second year after 100 randomly selected firm years to represent reversals or 0 otherwise, in non-inducement tests only.
$A_{i,t-1}$ = the total assets for firm i during period $t-1$
$\varepsilon_{i,t}$ = residual for firm i, and year t

As equation (16) illustrates, the actual accruals are the dependent variable while the predicted accruals along with the partition variables for earnings management and reversals are the independent variables. In order to match the Dechow et al. (2012) study, actual and predicted accruals are scaled by lagged assets.

The variables chosen for this study are current assets, current liabilities, revenues, gross PPE, current assets except cash, and current liabilities except short-term debt. The predicted variables are calculated by plugging in the coefficients to the original lagged variables ($y_{i,t-1}$). The exponentials of the variables are then are taken to predict the accruals.

5.3 Tests

Dechow et al. (2012) evaluated the models in two ways:

- the first involved testing the specification of the models by trying to detect the earnings management in randomly selected firm-years where accruals adjustments were not induced (from this point forward this test is referred to as 'non-inducement tests'),
- the second test involved testing the power of the model where a known amount of discretionary accruals is induced and reversed (this test is referred to as 'inducement tests').

5.3.1 Non-inducement Tests

For the non-inducement tests, the following process is followed:

1. The earnings management year is randomly selected for 100 firm years that are assumed to have engaged in earnings management, while remaining firms are assumed to be without earnings management, provided that data are available for two consecutive years.
2. The dummy variable *PART* is designated as one for the 100 firm years assumed to have earning management and zero for the others.
3. For the 100 chosen firm years assumed to have earnings management, the variable *PARTP*1 is set to one for the following year and *PARTP*2 is set to one for the second year. This represents the reversal of the earnings management in two consecutive years, otherwise the *PARTP*1 and *PARTP*2 is zero.
4. A pooled regression is run using all the data.
5. The steps 1-4 are repeated 1000 times.

As stated, the purpose of the non-inducement test is to examine the specification of the models. For this specification test, as no earning management is created, if the models are correctly specified the coefficients of PART, PARTP1, PARTP2 should be zero. A further test of the specification of the models is that the expectation that $\beta_1=0$, $\beta_1-\beta_2=0$ and $\beta_1-\beta_2-\beta_3=0$ would be rejected at about 5% of the time at a 5% significance level (one tailed).

5.3.2 Inducement Tests

The second test conducted by Dechow et al. (2012) is where earnings management is induced and reversed. According to Dechow et al. (2012), firstly, the test illustrates the effectiveness of models in detecting earnings management of known magnitudes, and secondly, it illustrates increase in power for each model by incorporating reversals. The test is conducted in two parts. The first part of the test is conducted thus:

1. From the data, 100 firm years are randomly selected (provided the next year's data is available) and is assumed to have earnings management.
2. The variable *PART* is set to one for the 100 firms, in addition, the 100 earnings management firm years have earnings management induced to the working capital accruals at one per cent of lagged assets, and zero otherwise.
3. And for the next year *PARTP*1 is set to one to reflect the reversal, the previous inducement is deducted at increments of ten per cent each time, starting with zero per cent.
4. For each of the increments, the regression is run and repeated 1000 times.
5. The entire process (steps 1-4) is repeated with two per cent inducement instead of the one per cent inducement.

The second part of the inducement test involves altering the sample size:
1. As before, 100 firm years are randomly selected and are assumed to have earnings management and is designated one for the PART variable, zero otherwise, provided that the consecutive year is available.
2. For the same 100 firm years 2% of lagged assets are added to the working capital accruals.

3. The induced discretionary accruals are then fully reversed in the consecutive year where the variable *PARTP*1 is set to one.

4. A pooled regression is run for the entire data set and the process is repeated 1000 times.

5. The above steps (1-4) were repeated with 150, 200, 250, 300, 350, 400, 450 and 500 firm years[11],

The inducement tests for $\beta_1>0$ and $\beta_1-\beta_2>0$ are specified at 5% significance levels (one tailed). When earnings management is present, the rejection rates at the 5% significance level from the 1000 regressions is expected to be higher than 5%; the higher the rejection rate the more power the test has. The *PARTP*2 variable is not used in the inducement tests.

5.3 Data

5.3.1 Data Collection

Non-financial firm data was sourced from Global Vantage database from the years 1993 to 2012 (both years inclusive) for China, Japan and the United Kingdom. The data for McNichols model with reversals used the following variables (Global Vantage code in brackets), current assets (*act*) current liabilities (*lct*), cash and equivalent (*che*), short term debt (*dlc*), total assets (*at*), revenues (*sale*), gross property plant and equipment (*ppegt*), and earnings before extra-ordinary items (*ib*). The earnings before extra-ordinary items were used to calculate the cash flows (earnings before extra-ordinary items − working capital accruals). The Dunmore model uses the following variables: current assets, current liabilities, revenues, gross PPE, current assets except cash, and current liabilities except short-term debt.

In the interest of consistency it is important to run both the models from the same data; however, the models approach the calculation of the dependent variables in different

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[11] The Dechow et al. (2012) study used increments of 100 firm years up to 1000, but in this study the rejection rates converge to nearly 100% after about 500 firm years for almost all the countries and models. So the decision was made to test increments of 50 firm years instead. Results using 100 firm year increments up to 1000 firm years appear in Appendix C.

ways. The McNichols model uses change in variables and the *t+1* variables for cash flow. This results in data loss for the years 1993 and 2012. On the other hand, the Dunmore model does not need change in or t+1 variable, but the needs exclude firm years with negative and zero values. After data are calculated for each model, data was matched to ensure that only those firm years that were common to both models were retained for the final data set.

As noted by Dunmore (2013) some missing data on the Global Vantage databases are recorded as @NA, while at other times missing data are recorded as zero. Thus it is important to make a judgement as to whether the values were actually zero or missing. Dunmore (2013) explains that the genuine values of exactly zero are possible, but would be expected to be very rare for the variables such as assets. Thus zeros values for asset, current assets, current liabilities, and cash were presumed to be missing. On the other hand, in the case of short term debt, zero values are not presumed to be missing and included in the data set. The zero values for short term debt is not a problem for the Dunmore model even though it uses a logged values of variables. This is because Dunmore uses an indirect calculation of current liabilities except short term debt.

There are two points about the way that variables are calculated in the Dechow et al. (2012) study that need to be highlighted. Firstly, the cash flow from operation is derived rather than directly taken from the cash flow statement. Although the cash flows from operations are directly available from the Global Vantage database for the time period studied (1993-2012), the cash flow figures were derived in the form of earnings before extraordinary items minus working capital accruals in order to match the originals study by Dechow et al. (2012). The reason that Dechow et al. (2012) may have used this method of deriving cash flows is that their study goes back to 1950. At this early point in time cash flow statements were not a mandatory requirement, in fact cash flow statements only became mandatory in 1987 after the Financial Accounting Standards Board (FASB) (1987) issued Statement No. 95 mandating that firms provide cash flow statements.

Secondly, Dechow et al. (2012) calculate accruals using the balance sheet method; equation (14) is a form of such a method. Hribar and Collins (2002) show that the balance sheet method is particularly prone to errors in the case of certain non-articulated events (such as changes in current asset and current liabilities due to non-operating events such as mergers and acquisitions and currency translations) that appear on balance sheets but do not appear on income statements. This means that under the balance sheet method of calculating accruals, elements that are actually non-operating will be included in the accruals calculations.

Dechow et al. (2012) drop depreciation from the final formula to calculate working capital accruals in equation (14). The depreciation is dropped as it is related more to longer term capital expenses rather than working capital accruals (Dechow et al., 2012). In order to reduce heteroskedasticity, the variables are divided by lagged assets and the intercept is not supressed as it was in previous models such as the Jones model.

In order to maintain consistency and to allow for comparability, the Dunmore model also scales the dependent and explanatory variables by lagged assets and includes an intercept. Finally, in order to manage outliers the data is winsorised at 1% level for all the countries for the final data set used by both models.

5.3.1 Descriptive Statistics

Table 2 reports summary statistics for data collected for China, Japan and the United Kingdom. As can be seen in Table 2 there is a large difference between the number of firm years in the original data and the actual number of firm years used in the final data, particularly in the case of China and the UK. The main reason for this is the high number of missing data for China and UK (see Appendix A for details on the numbers of missing data for each year in each country and further discussion). The missing data also affects the final number of firms and average number of years of data per firm; Japan has the highest number of firm years and also the highest number of average years per firm (13.5 years).

Table 2
Firm Statistics

	China	Japan	UK
No. of firm years in raw data	48,600	65,260	23,340
No. of firm years in final data	13,238	44,005	7,782
No. of firms in final data	1,649	3,254	954
Average no. of years per firm	8.0	13.5	8.2

Table 3 shows the summary statistics for total assets for China, Japan and the United Kingdom firms. Total asset can be used as a proxy for firm size. From the data it is clear that Japan has the firms with the largest median size at US$ 361.9 million followed by China and the United Kingdom with median firm sizes of US$ 233.5 million and US$ 149.5 million, respectively.

Table 3
Summary Statistics for Assets

	Min.	$1^{st}Q$	Median	$3^{rd}Q$	Max.
China	2.4	127.3	233.5	493.6	232,473.2
Japan	0.6	139.0	361.9	1,069.7	407,466.0
UK	0.1	35.8	149.5	842.8	292,181.0

Note. All asset figures in US$ (millions)

Table 4 (Panel A) reports the summary statistics of data for variables used for China, Japan and the UK. The data for China has severe outlier problems: the standard deviations for working capital accruals, current year cash flow and change in revenue are very high. It may also be possible that Chinese data contains errors. The Japanese data is skewed when it comes to change in revenue and PPE. In the case of UK, the current cash flow and change in revenue have standard deviations larger than the means; in addition, the mean and median values are quite different.

Table 4
Summary Statistics of Variables
Panel A: Before Winsorisation

China	Min.	1stQ	Median	Mean	3rdQ	Max.	Std. Dev.
WCA/A $_{t-1}$	-3.113	-0.051	0.005	0.204	0.060	2,535	22.038
Cash Flow/A $_{t-1}$	-1938	-0.031	0.028	-0.121	0.091	3.337	16.848
ΔRevenue/A $_{t-1}$	-3.624	-0.001	0.072	0.252	0.189	1,463	12.735
PPE/A $_{t-1}$	0.00	0.343	0.543	0.608	0.804	14.860	0.441

Japan	Min.	1stQ	Median	Mean	3rdQ	Max.	Std. Dev.
WCA/A $_{t-1}$	-6.093	-0.021	0.002	0.004	0.026	5.275	0.094
Cash Flow/A $_{t-1}$	-6.383	-0.014	0.017	0.015	0.049	8.517	0.123
ΔRevenue/A $_{t-1}$	-58.900	-0.041	0.021	0.057	0.102	32.430	0.459
PPE/A $_{t-1}$	0.000	0.329	0.601	0.655	0.922	8.560	0.434

United Kingdom	Min.	1stQ	Median	Mean	3rdQ	Max.	Std. Dev.
WCA/A $_{t-1}$	-9.679	-0.034	0.000	0.003	0.039	10.350	0.238
Cash Flow/A $_{t-1}$	-18.910	-0.030	0.042	-0.004	0.102	4.669	0.425
ΔRevenue/A $_{t-1}$	-9.663	-0.019	0.065	0.141	0.210	93.820	1.262
PPE/A $_{t-1}$	0.000	0.192	0.452	0.556	0.808	14.120	0.508

Panel B: Both Tails Winsorised at 1%

China	Min.	1stQ	Median	Mean	3rdQ	Max.	Std Dev
WCA/A $_{t-1}$	-0.419	-0.051	0.005	0.004	0.060	0.444	0.123
Cash Flow/A $_{t-1}$	-0.391	-0.031	0.028	0.031	0.091	0.459	0.126
ΔRevenue/A $_{t-1}$	-0.482	-0.001	0.072	0.122	0.189	1.426	0.262
PPE/A $_{t-1}$	0.040	0.343	0.543	0.596	0.804	1.728	0.338

Japan	Min.	1stQ	Median	Mean	3rdQ	Max.	Std Dev
WCA/A $_{t-1}$	-0.181	-0.021	0.002	0.003	0.026	0.214	0.055
Cash Flow/A $_{t-1}$	-0.275	-0.014	0.017	0.016	0.049	0.274	0.074
ΔRevenue/A $_{t-1}$	-0.513	-0.041	0.021	0.051	0.102	1.145	0.219
PPE/A $_{t-1}$	0.021	0.329	0.601	0.651	0.922	1.925	0.416

United Kingdom	Min.	1stQ	Median	Mean	3rdQ	Max.	Std Dev
WCA/A $_{t-1}$	-0.371	-0.034	0.000	0.002	0.039	0.380	0.099
Cash Flow/A $_{t-1}$	-1.081	-0.030	0.042	0.006	0.102	0.488	0.217
ΔRevenue/A $_{t-1}$	-0.873	-0.019	0.065	0.119	0.210	1.689	0.345
PPE/A $_{t-1}$	0.016	0.192	0.452	0.545	0.808	1.883	0.422

Where:
WCA = ΔCurrent Assets$_t$ - ΔCurrent Liabilities$_t$ - ΔCash$_t$ + ΔShort Term Debt$_t$
Cash Flow = earnings before extraordinary items – working capital accruals
ΔREV= Revenue$_t$ – Revenue$_{t-1}$
PPE = gross property plant and equipment
A$_{t-1}$ = the total assets for period *t-1*

Table 4 (Panel B) also shows the summary of the variables after windsorisation at 1% for both tails. The data for China shows the most marked improvement: the extreme outliers have been adjusted for, although the standard deviation of the change in revenue variableis higher than the mean. The data for Japan and the UK have also improved: the standard deviations are lower, and in most cases the means and medians are closer.

However the standard deviation for cash flow is still much higher than the mean for UK.

Data after the 1% windsorisation from Table 4 (Panel B) also highlights the differences between the countries. China has the highest median working capital accruals scaled by lagged assets (0.005), followed by Japan (0.002) and the United Kingdom (0.000) respectively. In addition, the change in revenue scaled by lagged asset can be a proxy of the median growth for firms in each country: indicating that Chinese firms have the highest median growth (0.072), followed by UK firms (0.065) and Japanese firms (0.021). Higher growth can lead to higher accruals (Ronen & Yaari, 2008), thus the high growth rate and the high accruals of Chinese firms maybe related.

6.1 Non-Inducement Test Results

Table 5 reports the results for China, Japan and the United Kingdom using the Dunmore and the McNichols models to test for earnings management when earnings management years are randomly selected.

Table 5: Panel A

China

Non-Inducement Regression Results

		$\beta 1$ PART	$\beta 2$ PARTP1	$\beta 3$ PARTP2	Predicted Accruals	ΔRev	PPE	CFt-1	CFt	CFt+1	Mean Adjusted R^2
Dunmore Model	Coefficients	-0.028	0.007	-0.006	1.049						0.645
	Std. Error	0.015	0.013	0.012	0.010						
	t value	-1.944	0.532	-0.511	104.565						
	P value	0.052	0.595	0.610	0.000						
McNichols Model	Coefficients	0.015	0.004	-0.001		0.091	0.002	0.137	-0.773	0.056	0.646
	Std. Error	0.006	0.006	0.007		0.004	0.002	0.007	0.009	0.008	
	t value	2.615	0.682	-0.102		24.341	1.088	18.433	-87.536	6.874	
	P value	0.009	0.495	0.919		0.000	0.277	0.000	0.000	0.000	

Japan

Non-Inducement Regression Results

		$\beta 1$ PART	$\beta 2$ PARTP1	$\beta 3$ PARTP2	Predicted Accruals	ΔRev	PPE	CFt-1	CFt	CFt+1	Mean Adjusted R^2
Dunmore Model	Coefficients	-0.009	-0.009	0.001	1.015						0.828
	Std. Error	0.007	0.005	0.004	0.003						
	t value	-1.341	-1.735	0.192	364.585						
	P value	0.180	0.083	0.848	0.000						
McNichols Model	Coefficients	-0.006	-0.002	-0.002		0.055	-0.002	0.172	-0.548	0.124	0.536
	Std. Error	0.004	0.004	0.003		0.002	0.000	0.005	0.005	0.005	
	t value	-1.642	-0.446	-0.682		34.340	-4.144	37.687	-109.855	25.962	
	P value	0.101	0.656	0.496		0.000	0.000	0.000	0.000	0.000	

United Kingdom

Non-Inducement Regression Results

		$\beta 1$ PART	$\beta 2$ PARTP1	$\beta 3$ PARTP2	Predicted Accruals	ΔRev	PPE	CFt-1	CFt	CFt+1	Mean Adjusted R^2
Dunmore Model	Coefficients	-0.003	-0.012	-0.001	1.119						0.756
	Std. Error	0.013	0.010	0.010	0.010						
	t value	-0.203	-1.250	-0.075	110.281						
	P value	0.840	0.212	0.940	0.000						
McNichols Model	Coefficients	-0.001	-0.010	-0.003		0.046	0.001	0.137	-0.344	0.144	0.321
	Std. Error	0.008	0.008	0.006		0.005	0.003	0.010	0.013	0.011	
	t value	-0.166	-1.235	-0.403		9.160	0.529	13.674	-26.270	12.857	
	P value	0.868	0.217	0.687		0.000	0.597	0.000	0.000	0.000	

Table 5: Panel B

	China		Japan		United Kingdom	
	Dunmore	McNichols	Dunmore	McNichols	Dunmore	McNichols
$\beta 1=0$	0.042	0.032	0.075	0.067	0.059	0.074
$\beta 1-\beta 2=0$	0.037	0.030	0.029	0.051	0.046	0.025
$\beta 1-\beta 2-\beta 3=0$	0.115	0.118	0.082	0.113	0.121	0.095

Note. The mean regression results are based on pooled regressions using the following firm year observations for each country: China – 13,238; Japan – 44,005; and the UK –7,782; for the years 1993 to 2012. *PART* is set to1 for 100 firm years selected at

random, and 0 otherwise. *PARTP*1 is set to 1 for the years subsequent to the earnings management (and 0 otherwise). PARTP2 is set to 1 for the second year after earnings management, 0 otherwise. The process is repeated 1000 times.

McNichols:$WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1} + \epsilon_{i,t}$

$\Delta REV_{i,t}$ = (Revenue$_{i,t}$ – Revenue$_{i,t-1}$)/$A_{i,t-1}$

$PPE_{i,t}$ = gross property plant and equipment$_{i,t}$/$A_{i,t-1}$

$CF_{i,t}$ = current year cash flow (calculated as earnings before extraordinary items$_{i,t}$ – working capital accruals$_{i,t}$) scaled by $A_{i,t-1}$

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

$WC\_ACC_{i,t}$ Calculated as =($\Delta CA_{i,t}$-$\Delta CL_{i,t}$-$\Delta CASH_{i,t}$+$\Delta STD_{i,t}$)/$A_{i,t-1}$. Where:

$\Delta CA_{i,t}$ = (Current Assets$_{i,t}$ – Current Assets$_{i,t-1}$) for firm i

$\Delta CL_{i,t}$ = (Current Liabilities$_{i,t}$ – Current Liabilities$_{i,t-1}$) for firm i

$\Delta CASH_{i,t}$ = (Cash$_{i,t}$ – Cash$_{i,t-1}$) for firm i

$\Delta STD_{i,t}$ = (short-term debt$_t$ - short-term debt$_{t-1}$) for firm i

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

Dunmore: $AWCA_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 PWCA_{i,t} + \varepsilon_{i,t}$

$AWCA_{i,t}$ = the actual working capital accruals for firm i, period t calculated as [(exp (actual current assets$_{i,t}$) – exp (actual cash$_{i,t}$)) – (exp (actual current liabilities$_{i,t}$) – exp (actual short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

$PWCA_{i,t}$ = the predicted working capital accruals for firm i in year t calculated as [(exp(predicted current assets$_{i,t}$) – exp(predicted cash$_{i,t}$)) – (exp (predicted current liabilities$_{i,t}$) – (predicted short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

Panel A reports the mean of coefficients, standard errors, t-statistics, and p-values for the Dunmore and McNichols models for China, Japan and the UK. Panel B reports the rejection frequencies of no earnings management for *PART* (β1=0), *PART* and *PARTP*1 (β1- β2=0), and *PART, PARTP*1and *PARTP*2 (β1- β2- β3=0). For the reversals, after each pooled regression, $\square^2$ tests are run based on heteroskedasticity-consistent standard errors. The process is run 1000 times and the percentage of 1000 regressions is calculated to show where $\square^2$is significant at 5% level (one tailed test).

Table 5 (Panel A) shows that the mean coefficients for the partitioning variables for earnings management and reversals are nearly 0 for China, Japan and the United Kingdom for the Dunmore and the McNichols models; the results for the partitioning variables are also statistically non-significant. The explanatory variables for the McNichols model are as per the findings of Dechow et al. (2012): in all three countries the change in revenue is positively significant, current year cash flows are significantly negative, while cash flows for *t-1* and *t+1* are significantly positive. The exception here is PPE which is not significant in China and the UK, but negative and significant in Japan. The coefficients of predicted accruals of the Dunmore model are close to 1 for all three countries.

There also significant differences between the models and among the countries. The Dunmore model has higher mean adjusted R^2 results than the McNichols model for Japan (0.828 for Dunmore against 0.536 for McNichols) and the UK (0.756 for the Dunmore against 0.321 for McNichols).In the case of China, the R^2 values for both models were nearly the same. The coefficients for the explanatory variables for the McNichols model are quite different for each country. The coefficients of current year cash flow is different across countries – in the UK the coefficient for current year cash flow is -0.344, while the coefficient for the same variable in China is more than double at -0.773. The coefficient for the change of revenue for China is 0.091; double that of

the UK at 0.046. In terms of the results for Japan, the coefficients for change in revenue and current year cash flow are lower than that of China and higher than that of the UK.

Table 5 (Panel B) shows the rejection rates for the Dunmore and the McNichols models for China, Japan and the UK. With no earnings management being induced, at a significance level of 5% (one sided), the rejection rates are expected to have a frequency of 5%. At the 5% level the standard error is expected to be 0.7%[12]. Therefore a simulation of 1000 runs would create an estimated rejection frequency of between 0.03 and 0.07 (at about three standard errors in each direction). Table 5 (Panel B) shows that the rejection rates for the tests of $\beta_1=0$ and $\beta_1-\beta_2=0$ for China are as expected (rejection rate frequencies are between 0.03 and 0.07) for both Dunmore and McNichols models. The rejection rates at statistically significant levels for China for the $\beta_1=0$ and $\beta_1-\beta_2=0$ tests were 0.042 and 0.037 respectively for the Dunmore model; and 0.032 and 0.030 respectively for the McNichols model. However, in the case of Japan only the McNichols model shows the rejections rates at as expected for the tests of $\beta_1=0$ and $\beta_1-\beta_2=0$. The rejection rates for Japan using the Dunmore model were contrary to expectations. On the other hand, for the UK, only the Dunmore model shows rejection frequencies that are as expected for the tests of $\beta_1=0$ and $\beta_1-\beta_2=0$, the rejection rates for McNichols model are contrary to expectation.

In the case of the rejection frequencies of $\beta_1-\beta_2-\beta_3=0$ test, Table 5 (Panel B) shows that the results for both the Dunmore and McNichols model for all three countries are higher than 0.07. This indicates that both the Dunmore and the McNichols models show that results are outside the range expected if the test is correctly specified.

6.2 Inducement with Reversals at 10% Increments

The inducement test with reversals induces earnings management at 1% and 2% of the lagged value of assets to the working capital accruals (the dependent variable). The

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[12] Calculated as square root of ((0.05x0.95)/1000).

earnings management is partially reversed at increments on 10%, starting with 0% (signifying no reversals) to 100% (signifying complete reversals).

The Figures 1 to 3 show the rejection frequencies that the tests of β_1 is positive and significant ($\beta_1>0$) and that $\beta_1- \beta_2$ is positive and significant ($\beta_1-\beta_2>0$) at a 5% level (one tailed tests). This rejection rate is for the 1000 regressions at each reversal point for China, Japan and the United Kingdom. The horizontal axes show the reversals from 0 % to 100%, while the vertical axes show the rejection rates for the Dunmore and McNichols models. In the case of the $\beta_1-\beta_2>0$ tests, after each pooled regression, χ^2 tests are run based on heteroskedasticity-consistent standard errors in order to show the frequency where χ^2 is significant at 5% level (one tailed test).

Figure 1 show the results for earnings management induced at 1% (Panel A) and 2% (Panel B) of lagged assets for China. For the 1% inducement level (Panel A) the Dunmore model rejects the null hypothesis $\beta_1=0$ between 13.6% and 16.6% of the time at 5% significance levels. For the same test the McNichols model rejects the null hypothesis between 32.1% and 35.9% at 5% significance levels. For the $\beta_1-\beta_2>0$ test the Dunmore model rejects null hypothesis between 9.2% for no reversals and 20.2% for complete reversals. The frequency with which the McNichols model rejects null hypothesis is 16.8% for 0% reversals, and 55.9% for 100% reversals at 5% significance levels. When the reversals are modelled in the next period (t+1), if in fact there was no reversal, the rejection frequency (for $\beta_1-\beta_2>0$) is lower than that of the $\beta_1>0$ for both the models. This is in line with the findings of the Dechow et al (2012) study, incorporating reversals that have not occurred reduces test power. At 100% reversals the rejection frequency improves by 48.5% (20.2%/13.6%) for the Dunmore model and 74.41% (55.9.0%/32.1%) for the McNichols model. The improvement in reported frequencies for reversals compared to $\beta_1>0$ happens at about the 50% reversal mark for the McNichols model and at the 80% reversal for the Dunmore model.

A. Induced earnings management of 1% of assets

CHINA - Frequency of Rejecting No Earnings Management (1% of Assets)

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Dunmore $\beta 1>0$	16.4%	16.6%	16.1%	16.6%	16.6%	13.6%	14.5%	16.4%	16.1%	15.5%	15.0%
Dunmore $\beta 1-\beta 2>0$	9.2%	11.9%	10.9%	10.9%	11.1%	11.9%	13.4%	14.6%	17.2%	16.9%	20.2%
McNichols $\beta 1>0$	35.9%	32.4%	32.2%	35.5%	35.2%	35.1%	33.0%	32.1%	33.6%	33.7%	32.6%
McNichols $\beta 1-\beta 2>0$	16.8%	17.8%	22.4%	26.2%	28.8%	32.2%	38.2%	43.0%	46.9%	52.1%	55.9%

Reversal %age in Year t+1

—□— Dunmore $\beta 1>0$ —△— Dunmore $\beta 1-\beta 2>0$ —■— McNichols $\beta 1>0$ —▲— McNichols $\beta 1-\beta 2>0$

B. Induced earnings management of 2% of assets

CHINA - Frequency of Rejecting No Earnings Management (2% of Assets)

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Dunmore $\beta 1>0$	41.0%	40.1%	42.1%	41.9%	41.0%	39.2%	41.3%	39.5%	39.8%	39.7%	43.0%
Dunmore $\beta 1-\beta 2>0$	18.1%	23.3%	27.3%	29.4%	32.5%	34.8%	39.2%	47.5%	49.5%	54.1%	57.6%
McNichols $\beta 1>0$	78.9%	78.2%	80.0%	78.7%	80.8%	78.7%	77.4%	79.2%	76.8%	78.3%	78.5%
McNichols $\beta 1-\beta 2>0$	57.8%	66.3%	75.5%	81.0%	87.2%	91.0%	92.3%	95.1%	97.4%	98.2%	98.9%

Reversal %age in Year t+1

—□— Dunmore $\beta 1>0$ —△— Dunmore $\beta 1-\beta 2>0$ —■— McNichols $\beta 1>0$ —▲— McNichols $\beta 1-\beta 2>0$

Figure 1: Power of tests at detecting earnings management using the Dunmore and McNichols models data from China. The results are based on pooled regressions using 13,238 firm years from China for the years 1993 to 2012. *PART* is set to 1 for 100 firm years selected at random and add 1% (2%) of lagged total assets to working capital accruals for Figure 1A (1B), and 0 otherwise. *PARTP*1 is set to 1 for the years subsequent to the earnings management and reverses at 10% increment starting form 0% to 100% (and 0 otherwise). After each pooled regression, χ^2 tests are run based on heteroskedasticity-consistent standard errors. The process is run 1000 times and the percentage of 1000 regressions is calculated to show where χ^2 is significant at 5% level (one tailed test).

McNichols: $WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1} + \epsilon_{i,t}$

$\Delta REV_{i,t}$ = (Revenue$_{i,t}$ – Revenue$_{i,t-1}$)/A$_{i,t-1}$
$PPE_{i,t}$ = gross property plant and equipment$_{i,t}$/A$_{i,t-1}$
$CF_{i,t}$ = current year cash flow (calculated as earnings before extraordinary items$_{i,t}$ – working capital accruals$_{i,t}$) scaled by $A_{i,t-1}$
$A_{i,t-1}$ = the total assets for firm i during period $t-1$
$WC\_ACC_{i,t}$ Calculated as =(ΔCA$_{i,t}$-ΔCL$_{i,t}$-ΔCASH$_{i,t}$+ΔSTD$_{i,t}$)/A$_{i,t-1.}$ Where:
$\Delta CA_{i,t}$ = (Current Assets$_{i,t}$ – Current Assets$_{i,t-1}$) for firm i
$\Delta CL_{i,t}$ = (Current Liabilities$_{i,t}$ – Current Liabilities$_{i,t-1}$) for firm i
$\Delta CASH_{i,t}$ = (Cash$_{i,t}$ – Cash$_{i,t-1}$) for firm i
$\Delta STD_{i,,t}$ = (short-term debt$_t$ - short-term debt$_{t-1}$) for firm i
$A_{i,t-1}$ = the total assets for firm i during period $t-1$

Dunmore: $AWCA_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 PWCA_{i,t} + \varepsilon_{i,t}$

$AWCA_{i,t}$ = the actual working capital accruals for firm i, period t calculated as [(exp (actual current assets$_{i,t}$) – exp (actual cash$_{i,t}$)) – (exp (actual current liabilities$_{i,t}$) – exp (actual short term debt$_{i,t}$)] scaled by $A_{i,t-1}$

$PWCA_{i,t}$ = the predicted working capital accruals for firm i in year t calculated as [(exp(predicted current assets$_{i,t}$) – exp(predicted cash$_{i,t}$)) – (exp (predicted current liabilities$_{i,t}$) – (predicted short term debt$_{i,t}$)] scaled by $A_{i,t-1}$

The test $\beta 1>0$ shows the percentage of $\beta 1$ for *PART* is significantly positive and test $\beta 1-\beta 2>0$ shows percentage of *PART-PARTP*1significantly positive at 5% level (one tailed test) among 1000 pooled regressions.

Figure 1 (Panel B) shows the result of the 2% inducement for China – the results are similar to that of the 1% inducement level; both models show a drop in the frequency of rejection rates for reversals compared to the $\beta_1>0$ tests when no reversal take place, but at 100% reversal the McNichols model rejects the null hypothesis 98.9% of the time while the Dunmore model rejects the null hypothesis at 57.6% of the time at 5% significance levels. Also, the higher magnitude of earnings management means that the point where the rejection frequencies of modelling reversals surpasses that of the $\beta_1>0$ test is at 30% for the McNichols model and 60% at for the Dunmore model. Finally, for the Chinese data, at both the 1% and 2% inducement levels, the McNichols model out performs the Dunmore model.

Figure 2 (Panels A and B) shows the results of the inducement tests for Japan. The same patterns as the Chinese result emerge – modelling reversals in the t+1 period when there is no reversal results in a test power in the form for a lower rejection frequency for both models. For the McNichols model at 1% inducement (Figure 2 Panel A), the rejection rate of modelling reversals surpasses the $\beta_1>0$ test at 50% reversal. For the Dunmore model it is at 70%. In the case of the 2% inducement (Figure 2 Panel B), the rejection rates are very high for both models. At 100% reversals both models reject the null hypothesis at nearly 100% of the time at 5% significance levels. In the case of McNichols model the null hypothesis rejection rates for $\beta_1>0$ and $\beta_1-\beta_2>0$ are almost identical

A. Induced earnings management of 1% of assets

JAPAN - Frequency of Rejecting No Earnings Management (1% of Assets)

Reversal %age in Year t+1	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Dunmore β1>0	53.8%	54.0%	52.2%	54.1%	56.3%	51.3%	50.4%	54.6%	52.8%	53.2%	53.3%
Dunmore β1-β2>0	25.1%	26.5%	32.4%	37.8%	42.7%	42.1%	46.2%	59.1%	59.8%	64.1%	68.4%
McNichols β1>0	84.4%	82.3%	84.6%	84.1%	83.0%	83.4%	81.8%	84.3%	83.1%	82.0%	84.6%
McNichols β1-β2>0	50.5%	58.7%	67.0%	74.2%	78.7%	87.1%	88.0%	92.2%	95.8%	97.0%	98.3%

B. Induced earnings management of 2% of assets

JAPAN - Frequency of Rejecting No Earnings Management (2% of Assets)

Reversal %age in Year t+1	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Dunmore β1>0	96.1%	95.9%	96.5%	96.5%	95.7%	94.0%	95.6%	96.3%	95.5%	93.7%	96.2%
Dunmore β1-β2>0	68.5%	76.1%	83.1%	89.5%	92.3%	95.2%	97.2%	98.2%	98.9%	99.3%	99.8%
McNichols β1>0	99.8%	99.8%	99.9%	99.9%	99.9%	99.9%	100.0%	99.8%	99.7%	99.7%	99.9%
McNichols β1-β2>0	98.1%	99.3%	99.7%	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Figure 2: Power of tests at detecting earnings management using the Dunmore and McNichols models data from Japan. The results are based on pooled regressions using 44,005 firm years from Japan for the years 1993 to 2012. *PART* is set to for 100 firm years selected at random and 1% (2%) of lagged total assets are added to working capital accruals for Figure 1A (1B), and 0 otherwise. *PARTP*1 is set to 1 for the years subsequent to the earnings management and reverses at 10% increment starting form 0% to 100% (and 0 otherwise). After each pooled regression, χ^2 tests are run based on heteroskedasticity-consistent standard errors. The process is run 1000 times and the percentage of 1000 regressions is calculated to show where χ^2 is significant at 5% level (one tailed test).

McNichols: $WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1} + \epsilon_{i,t}$

$\Delta REV_{i,t}$ = (Revenue$_{i,t}$ – Revenue$_{i,t-1}$)/$A_{i,t-1}$

$PPE_{i,t}$ = gross property plant and equipment$_{i,t}$/$A_{i,t-1}$

$CF_{i,t}$ = current year cash flow (calculated as earnings before extraordinary items$_{i,t}$ – working capital accruals$_{i,t}$) scaled by $A_{i,t-1}$

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

$WC\_ACC_{i,t}$ Calculated as =$(\Delta CA_{i,t} - \Delta CL_{i,t} - \Delta CASH_{i,t} + \Delta STD_{i,t})/A_{i,t-1}$. Where:

$\Delta CA_{i,t}$ = (Current Assets$_{i,t}$ – Current Assets$_{i,t-1}$) for firm i

$\Delta CL_{i,t}$ = (Current Liabilities$_{i,t}$ – Current Liabilities$_{i,t-1}$) for firm i

$\Delta CASH_{i,t}$ = (Cash$_{i,t}$ – Cash$_{i,t-1}$) for firm i

$\Delta STD_{i,,t}$ = (short-term debt$_t$ - short-term debt$_{t-1}$) for firm i

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

Dunmore: $AWCA_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 PWCA_{i,t} + \varepsilon_{i,t}$

$AWCA_{i,t}$ = the actual working capital accruals for firm i, period t calculated as [(exp (actual current assets$_{i,t}$) – exp (actual cash$_{i,t}$)) – (exp (actual current liabilities$_{i,t}$) – exp (actual short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

$PWCA_{i,t}$ = the predicted working capital accruals for firm i in year t calculated as [(exp(predicted current assets$_{i,t}$) – exp(predicted cash$_{i,t}$)) – (exp(predicted current liabilities$_{i,t}$) – (predicted short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

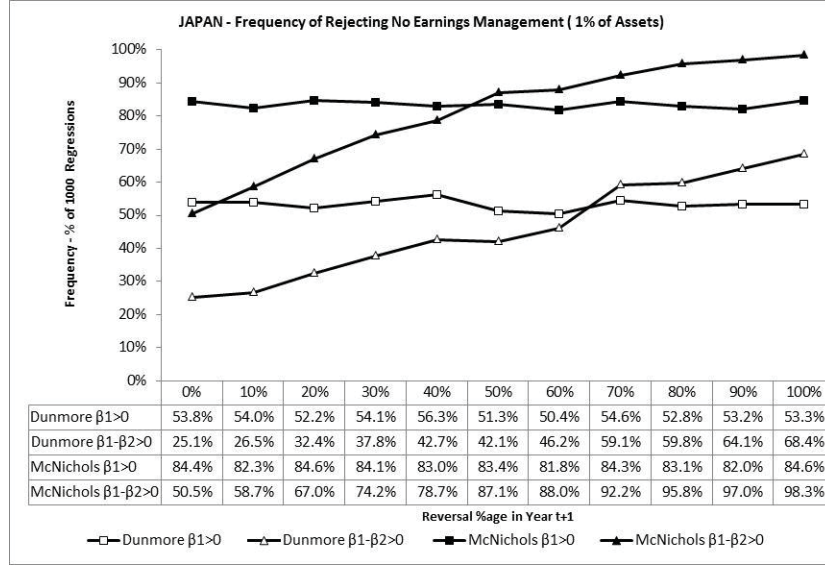The test β1>0 shows the percentage of β1 for *PART* is significantly positive and test β1-β2>0 shows percentage of *PART-PARTP*1 significantly positive at 5% level (one tailed test) among 1000 pooled regressions.

Figure 3 (Panels A and B) shows the null hypothesis rejection frequencies for the United Kingdom using the Dunmore and the McNichols models. The results show that both models have higher rejection frequencies when incorporating reversals; the McNichols model has a higher rejection rate compared to the Dunmore model. A doubling the magnitude of earnings management from 1% to 2% also doubles the rejection rates for β_1-$\beta_2>0$ test for the McNichols model. The same effect is also seen in the Dunmore model.

A. Induced earnings management of 1% of assets

UK - Frequency of Rejecting No Earnings Management (1% of Assets)

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Dunmore β1>0	23.0%	25.4%	22.1%	22.8%	25.1%	23.3%	25.5%	23.1%	24.1%	22.6%	25.4%
Dunmore β1-β2>0	10.8%	11.0%	12.7%	15.8%	16.7%	16.2%	17.6%	22.1%	22.5%	23.8%	27.8%
McNichols β1>0	36.4%	35.6%	33.4%	36.3%	39.5%	36.7%	39.3%	39.0%	36.1%	33.8%	39.0%
McNichols β1-β2 >0	13.9%	14.1%	17.4%	20.3%	24.5%	24.3%	29.5%	33.6%	33.9%	37.8%	45.4%

Reversal %age in Year t+1

—□— Dunmore β1>0   —△— Dunmore β1-β2>0   —■— McNichols β1>0   —▲— McNichols β1-β2 >0

B. Induced earnings management of 2% of assets

UK - Frequency of Rejecting No Earnings Management (2% of Assets)

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Dunmore β1>0	59.8%	60.1%	56.8%	57.5%	61.6%	62.1%	60.6%	59.5%	59.6%	57.2%	63.4%
Dunmore β1-β2>0	27.3%	32.0%	37.1%	41.9%	46.3%	52.8%	59.2%	63.5%	68.2%	71.6%	79.4%
McNichols β1>0	77.4%	77.6%	76.7%	78.4%	79.7%	77.6%	81.1%	80.2%	78.5%	80.3%	79.7%
McNichols β1-β2 >0	41.0%	49.5%	56.9%	64.7%	69.8%	79.7%	84.7%	87.1%	90.7%	93.4%	95.3%

Reversal %age in Year t+1

—□— Dunmore β1>0   —△— Dunmore β1-β2>0   —■— McNichols β1>0   —▲— McNichols β1-β2 >0

Figure 3: Power of tests at detecting earnings management using the Dunmore and McNichols models data from the UK. The results are based on pooled regressions using 7,782 firm years from the UK for the years 1993 to 2012. *PART* is set to for 100 firm years selected at random and 1% (2%) of lagged total assets are added to working capital accruals for Figure 1A (1B), and 0 otherwise. *PARTP*1 is set to 1 for the years subsequent to the earnings management and reverses at 10% increment starting form 0% to 100% (and 0 otherwise). After each pooled regression, χ^2 tests are run based on heteroskedasticity-consistent standard errors. The process is run 1000 times and the percentage of 1000 regressions is calculated to show where χ^2 is significant at 5% level (one tailed test).

McNichols: $WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1} + \epsilon_{i,t}$

$\Delta REV_{i,t}$ = (Revenue$_{i,t}$ − Revenue$_{i,t-1}$)/A$_{i,t-1}$

$PPE_{i,t}$ = gross property plant and equipment$_{i,t}$/A$_{i,t-1}$

$CF_{i,t}$ = current year cash flow (calculated as earnings before extraordinary items$_{i,t}$ − working capital accruals$_{i,t}$) scaled by A$_{i,t-1}$

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

$WC\_ACC_{i,t}$ Calculated as =(ΔCA$_{i,t}$-ΔCL$_{i,t}$-ΔCASH$_{i,t}$+ΔSTD$_{i,t}$)/A$_{i,t-1}$. Where:

$\Delta CA_{i,t}$ = (Current Assets$_{i,t}$ − Current Assets$_{i,t-1}$) for firm i

$\Delta CL_{i,t}$ = (Current Liabilities$_{i,t}$ − Current Liabilities$_{i,t-1}$) for firm i

$\Delta CASH_{i,t}$ = (Cash$_{i,t}$ − Cash$_{i,t-1}$) for firm i

$\Delta STD_{i,,t}$ = (short-term debt$_t$ - short-term debt$_{t-1}$) for firm i

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

Dunmore: $AWCA_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 PWCA_{i,t} + \varepsilon_{i,t}$

$AWCA_{i,t}$ = the actual working capital accruals for firm i, period t calculated as [(exp (actual current assets$_{i,t}$) − exp (actual cash$_{i,t}$)) − (exp (actual current liabilities$_{i,t}$) − exp (actual short term debt$_{i,t}$))] scaled by $A_{i,t-1}$
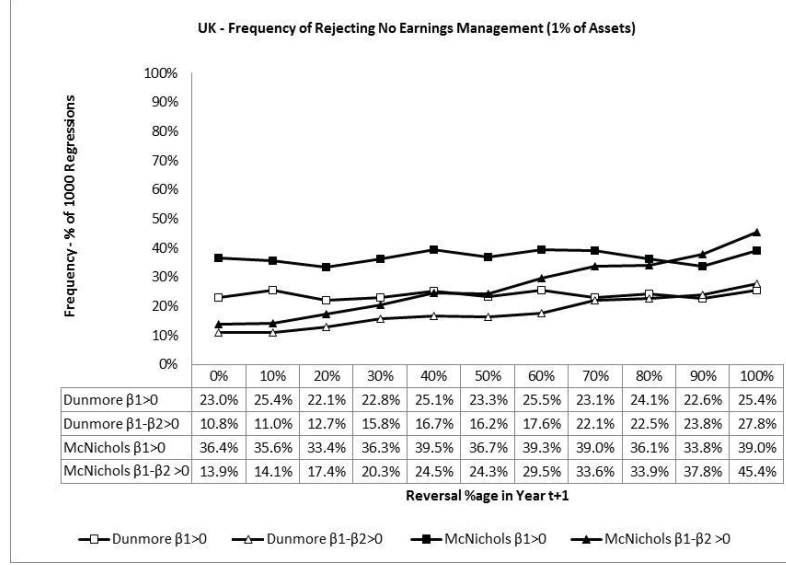
$PWCA_{i,t}$ = the predicted working capital accruals for firm i in year t calculated as [(exp(predicted current assets$_{i,t}$)) − exp(predicted cash$_{i,t}$)) − (exp (predicted current liabilities$_{i,t}$) − (exp(predicted short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

There are also country level differences. When earnings management is induced at the 1% level, the McNichols model rejects the null hypothesis at 55.9% of the time for China (Figure 1 Panel A) and 45.4% of the time for UK (Figure 3 Panel A). However, the result for Japan stands out. Even at the 1% inducement level the models reject the null hypothesis at higher frequencies: for 100% reversals the Dunmore model rejects the null hypothesis at 68.4% of the time and the McNichols model rejects the null hypothesis at 98.3% of the time (Figure 2 Panel A). Secondly, when earnings management is induced at 2% level (Figure 2 Panel B) both models reject the null hypothesis frequencies at nearly 100% of the time.

Dechow et al. (2012, p. 308) assert that "[a] common rule of thumb in hypothesis testing is that the ex ante power of a test should be at least 80% in order to have the precision to provide reliable inferences" – the highest rejection rates for the inducement tests in the Dechow et al. (2012) study was 67%. Dechow et al. (2012) thus deemed all tests using a sample size of 100 to have low power.

A notable result is that the null hypothesis rejections rates in this study are relatively high. This is especially true of the McNichols model when inducements are fully reversed. For example, using the Chinese data the McNichols model rejects the null hypothesis 98.9% of the time at the 2% inducement level (Figure 1 Panel B); using the Japanese data the null hypothesis is rejected at 98.3% of the time for the 1% inducement (Figure 2 Panel A) and 100% of the time at 2% inducement level (Figure 2 Panel B) > the McNichols model also rejects the null hypothesis at 95.3% of the time at the 2% inducement level using UK data (Figure 3 Panel B). On the other hand, the Dunmore model rejects the null hypothesis at 99.8% of the time at 2% inducement levels using Japanese data (Figure 2 Panel B) and at 79.4% of the time for the 2% inducement using UK data. (Figure 3 Panel B)

Finally, the addition of reversals does not affect the rejection frequencies of the countries in the same way. In the case of Japan, using the McNichols model at the 2% inducement level, the addition of reversals makes almost no improvement to the rejection rates when compared to non-reversal rejection rates. In both cases the rejection frequencies were near 100% (Figure 2 Panel B). On the other hand at the 2% inducement level, the point when reversals improve the rejection rates for China are when at least 30% of accruals are reversed when using the McNichols model and 60% of accruals are reversed when using the Dunmore model (Figure 1 Panel B). In the case of the UK, these figures are 50% when using McNichols model and 60% when using the McNichols model (Figure 3 Panel B).

6.3 Inducements with Increasing Sample Sizes

Figure 4 (Panels A to C) show the rejection frequencies for the test that $\beta 1$ is positive and significant ($\beta 1 > 0$) and that $\beta 1 - \beta 2$ is positive and significant ($\beta 1 - \beta 2 > 0$) at a 5% level (one tailed tests) using a 2% of lagged assets inducement rate that is fully reversed in the subsequent year. The sample sizes are increase from 100 at intervals of 50 firm years up to 500 firm years (see Appendix C for results of 100 firm year increments till 1000 firm years). This rejection rate is for the 1000 regressions at each sample size for China, Japan and the United Kingdom. The horizontal axes represents sample sizes, while the vertical axes show the rejection rates for the Dunmore and McNichols models.

Figure 4 (Panel A) shows the rejection frequencies for China. As sample sizes increase the rejection rates also increase for both models. However, the rejection rates for $\beta 1 - \beta 2 > 0$ for the McNichols model is 99.2% at sample size 100. This corresponds with the results for China in Figure 1 (Panel B) at a 100% reversal. However, for the Dunmore model the rejection frequencies for $\beta 1 - \beta 2 > 0$ reaches 88.3% after a sample size of 200 firm years. Moreover, the rejection frequencies are higher when reversals are incorporated ($\beta 1 - \beta 2 > 0$) then when they are not. This indicates that incorporating reversals reduces the need for larger sample sizes; a finding in keeping with that of Dechow et al. (2012).

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Figure 4 (Panel B) shows the rejection rates for the Japan using the Dunmore and the McNichols models. The rejection at a sample size of 100 firm years is 100% for both models for the $\beta1-\beta2>0$ test.

A. Inducements with increasing sample sizes – China

CHINA - Frequency of Rejecting No Earings Management as a Function of Sample Size

	100	150	200	250	300	350	400	450	500
Dunmore β1>0	42.0%	52.0%	62.5%	72.1%	75.2%	80.2%	87.0%	88.7%	92.0%
Dunmore β1-β2>0	59.4%	76.6%	88.3%	92.3%	96.4%	97.8%	99.3%	99.7%	99.8%
McNichols β1>0	78.8%	92.6%	96.5%	98.8%	99.3%	99.9%	99.7%	100.0%	99.9%
McNichols β1-β2>0	99.2%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Earnings Management Sample Size

□ Dunmore β1>0   △ Dunmore β1-β2>0   ■ McNichols β1>0   ▲ McNichols β1-β2>0

B. Inducements with increasing sample sizes – Japan

JAPAN - Frequency of Rejecting No Earings Management as a Function of Sample Size

	100	150	200	250	300	350	400	450	500
Dunmore β1>0	95.2%	98.6%	99.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dunmore β1-β2>0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1>0	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1-β2=0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Earnings Management Sample Size

□ Dunmore β1>0   △ Dunmore β1-β2>0   ■ McNichols β1>0   ▲ McNichols β1-β2=0

C. Inducements with increasing sample sizes – UK

UK - Frequency of Rejecting No Earnings Management as a Function of Sample Size

	100	150	200	250	300	350	400	450	500
Dunmore β1>0	60.9%	73.9%	83.7%	89.5%	92.2%	96.0%	98.0%	99.0%	99.3%
Dunmore β1-β2>0	76.4%	90.9%	97.0%	98.8%	99.7%	100.0%	100.0%	100.0%	100.0%
McNichols β1>0	75.8%	89.2%	96.0%	98.3%	99.1%	99.7%	99.7%	99.8%	100.0%
McNichols β1-β2>0	96.1%	99.7%	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%

Earnings Management Sample Size

—□— Dunmore β1>0   —△— Dunmore β1-β2>0   —■— McNichols β1>0   —▲— McNichols β1-β2>0

Figure 4: Power of tests for earnings management using the Dunmore and McNichols models and earnings management sample sizes ranging from 100 to 500 firm years. Results are based on pooled regressions using the following firm year observations for each country: China – 13,238; Japan – 44,005; and the UK –7,782; for the years 1993 to 2012. *PART* is set to1 for 100 firm years selected at random and 2% of lagged assets is added to working capital accruals, or 0 otherwise. The sample firm year size is increased by 50. The process is repeated 1000 times for each increment.

McNichols: $WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1} + \epsilon_{i,t}$

$\Delta REV_{i,t}$ = (Revenue$_{i,t}$ – Revenue$_{i,t-1}$)/A$_{i,t-1}$

$PPE_{i,t}$ = gross property plant and equipment$_{i,t}$/A$_{i,t-1}$

$CF_{i,t}$ = current year cash flow (calculated as earnings before extraordinary items$_{i,t}$ – working capital accruals$_{i,t}$) scaled by $A_{i,t-1}$

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

$WC\_ACC_{i,t}$ Calculated as =(ΔCA$_{i,t}$-ΔCL$_{i,t}$-ΔCASH$_{i,t}$+ΔSTD$_{i,t}$)/A$_{i,t-1}$. Where:

$\Delta CA_{i,t}$ = (Current Assets$_{i,t}$ – Current Assets$_{i,t-1}$) for firm i

$\Delta CL_{i,t}$ = (Current Liabilities$_{i,t}$ – Current Liabilities$_{i,t-1}$) for firm i

$\Delta CASH_{i,t}$ = (Cash$_{i,t}$ – Cash$_{i,t-1}$) for firm i

$\Delta STD_{i,t}$ = (short-term debt$_t$ - short-term debt$_{t-1}$) for firm i

$A_{i,t-1}$ = the total assets for firm i during period $t-1$

Dunmore: $AWCA_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 PWCA_{i,t} + \varepsilon_{i,t}$

$AWCA_{i,t}$ = the actual working capital accruals for firm i, period t calculated as [(exp (actual current assets$_{i,t}$) – exp (actual cash$_{i,t}$)) – (exp (actual current liabilities$_{i,t}$) – exp (actual short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

$PWCA_{i,t}$ = the predicted working capital accruals for firm i in year t calculated as [(exp(predicted current assets$_{i,t}$) – exp(predicted cash$_{i,t}$)) – (exp (predicted current liabilities$_{i,t}$) – (predicted short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

The test β1>0 shows the percentage of β1 for *PART* is significantly positive and test β1-β2>0 shows percentage of *PART-PARTP1*significantly positive at 5% level (one tailed test) among 1000 pooled regressions.

Figure 4 (Panel C) shows the rejection rates for the United Kingdom using the Dunmore and the McNichols models and the findings are as before: increasing sample size increases the rejection frequencies, and incorporating reversals increases the rejection frequencies. In terms of differences between countries, Japan had the highest rejection rates, and a sample size of 100 was enough to reach 100% rejection rate. In terms of the models, the McNichols model out performed Dunmore model for the Chinese and UK data. Japan is the exception where the Dunmore and McNichols models are evenly matched in terms of rejection rates.

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CHAPTER 7
DISCUSSION AND CONCLUSIONS

7.1 Discussion

The results of the tests provide for several points of discussion. Firstly, the test results for the reversals are as expected. The test results show that the innovations to earnings management models by Dechow et al. (2012) with the inclusion of reversals do in fact add to the power of tests. The inducement tests and sample size tests show that adding reversals to the model increase the power of both the McNichols and the Dunmore models in China, Japan and the United Kingdom. The results therefore confirm the generalizability of adding reversals to earnings management detection models to non-US markets.

In addition, the results of this study far exceed those obtained by the Dechow et al. (2012) study. The highest rejection rates at statistically significant levels were 67% in the Dechow et al. (2012) study; this led them to conclude that tests of earnings management have low power when earnings management is at 1% or 2% of assets. In contrast, the results of this study indicate that the rejection rates for all three countries at 5% significance level for the McNichols model surpassed the 80% threshold specified by Dechow et al. (2012) for the power of a test. In the case of Japan, the null hypothesis rejection rates are the highest: the McNichols model rejects the null hypothesis 98.3% of the time at 1% inducements and 100% of the time at 2% inducement using a sample size of 100 firm years (Figure 2 Panel B).

Secondly, McNichols model outperforms the Dunmore model. This result is contrary to expectations. The results of the inducement tests show that the rejection frequencies for the McNichols model for both China (Figure 1 Panels A and B) and the UK (Figure 3 Panels A and B) are higher than that of the Dunmore model. The McNichols model also requires a lower sample size to reach a 100% rejection frequency for China (Figure 4 Panel A) and the United Kingdom (Figure 4 Panel C).

However, in the case of Japan (Figure 2 Panel B and Figure 4 Panel B) the rejection rates of the Dunmore and the McNichols model are closely matched. There may be two causes for this. Firstly, similarity in the findings between the Dunmore and McNichols

model may be due to data: Japan has the highest number of firm years (44,004) and it also had the most complete data with the least percentage of data loss due to missing variables. Moreover, the data shows that Japan has the largest median firm size and the smallest change in revenues scaled by assets. The second and the more likely cause of the similarity may be intuitional factors (discussed below). It may be that the Dunmore model, in its current form using the current set of variables, may be susceptible to one of the differences that Japan exhibits.

Thirdly, the results are quite different for each country. As discussed in Section 3.4, the literature on international accounting predicts that the institutional differences between countries based on factors such as legal origin, protection of minority investors and creditors and the enforcement of laws will affect the motivations and the opportunities to engage in earnings management.

Institutional factors predict the United Kingdom being a common law country with higher levels of investor protection would have the least level of 'noise' in terms of earnings management detection. It also predicts that China being a developing code law country, with high ownership concentration and low anti-self-dealing and contract enforceability scores is expected to have the highest level of noise.

The results do not support this prediction. The non-inducement test results show that the explanatory variables for working capital accruals are much stronger for China than the other two countries. According to Dechow and Dichev (2002, p. 36) the "empirical measure of accrual quality is the extent to which working capital accruals map into operating cash flow realizations, where a poor match signifies low accrual quality:" According to theory, UK should have the largest coefficient for current cash flows; instead China has the largest coefficient for current cash flows. Also the theory as per institutional factors predicts that UK should have the highest rejection rates for the null hypothesis of no earnings management for tests using 1% and 2% of assets. Instead it is Japan that has the highest rejection rates for both models.

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Moreover, the reversals do not affect rejection frequencies of the countries in the same way. The implication is that the researcher has to know how much of the reversal will take place for each country when estimating discretionary accruals. Therefore, the results for the country study are not as expected: the results are quite different for each country but not in the way that the theory on institutional factors would predict.

Fourthly, the inclusion of PPE for a model that uses working capital accruals may be a misspecification. The PPE may not be necessary – because it affects depreciation, which is not part of the working capital accruals. This may explain why PPE is statistically insignificant in the regression results for non-inducement test for China and the UK.

Finally, the rejection rates for $\beta 1$- $\beta 2$- $\beta 3=0$ test for the non-inducement tests are not what is expected for the 5% significance level (one tailed). This result applies for all three countries. Dechow et al. (2012) also reported high rejection rates for this test. As the rejection frequencies are outside the range expected if the test is correctly specified for both models and all there countries, it may mean that this test is misspecified.

7.2 Conclusions

A summary of the finding of this study are:

- both models are well specified (with the exception of the PPE variable in the McNichols model)
- reversals do add to the test power of accruals models
- the McNichols model with reversals shows the highest power
- the results are quite different for each country, but not as predicted by theory on legal origins and institutional factors
- the models show high test power when applied to international data

There are two limitations to the study. Firstly, this study was conducted with data sets had a very large proportion of missing observations. It may be possible that the missing data are all similar and in aggregate may affect the findings of the results. Secondly, the power of the models is significantly reduced when reversals are modelled but do not take place. The models with reversal are therefore sensitive to the timing of the reversals. Dechow et al. (2012) used working capital accruals as the dependent variable in their study as working capital accruals are more likely to be reversed in the next year. However, in actual situations it is likely that accruals may not be reversed in the subsequent accounting period.

The main implication of this study is that the additions of reversals do increase the power of earnings management test in a non US setting and those earnings management models have enough test power. This contradicts Dechow et al.'s (2012) conclusion that test power of accruals models are too low.

Moving forward, future research could focus on earnings management within an international context to explore why the institutional factors are unable to predict the detection of earnings management.

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APPENDICES

Appendix A: Details of Missing Data

In this study, the high degree of data rejected is source of concern. This section explores the reason for the data loss. The amount of missing variables marked "@NA" in each firm year for all three countries from the Global Vantage database is the main cause of the data loss. Missing variables have to be rejected; and Figures A1, A2 and A3 plot the missing firm years for each country.
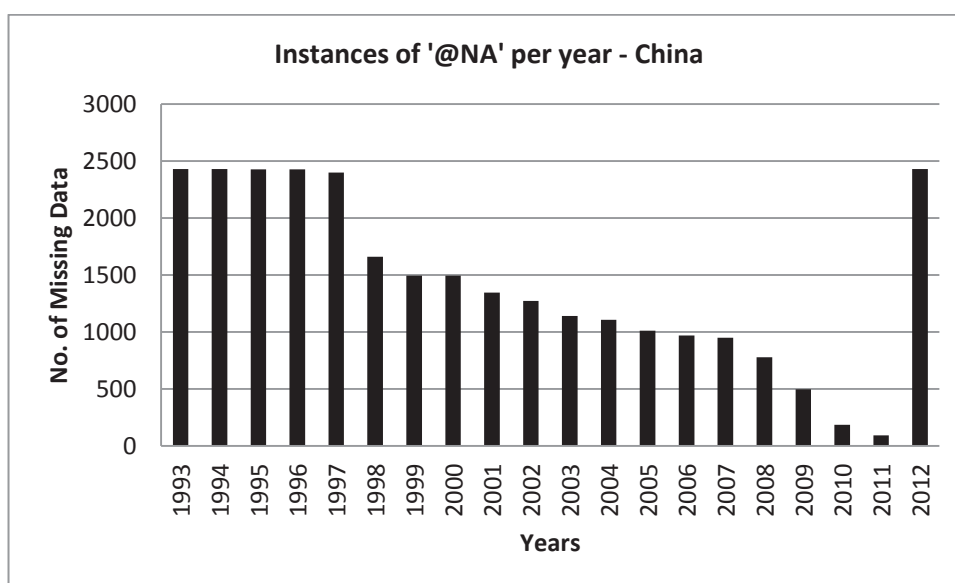
Figure A1: Missing Data in China
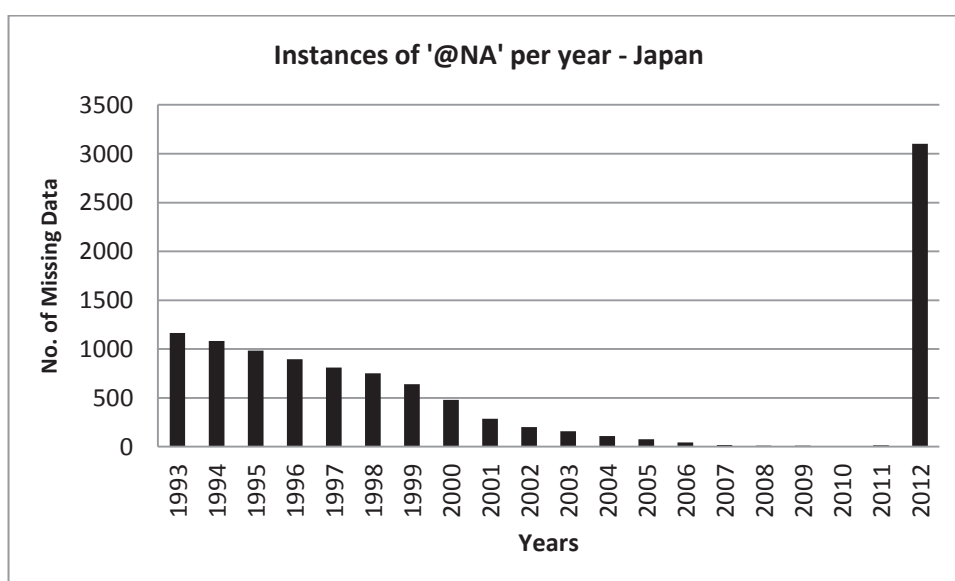
Figure A2: Missing Data in Japan
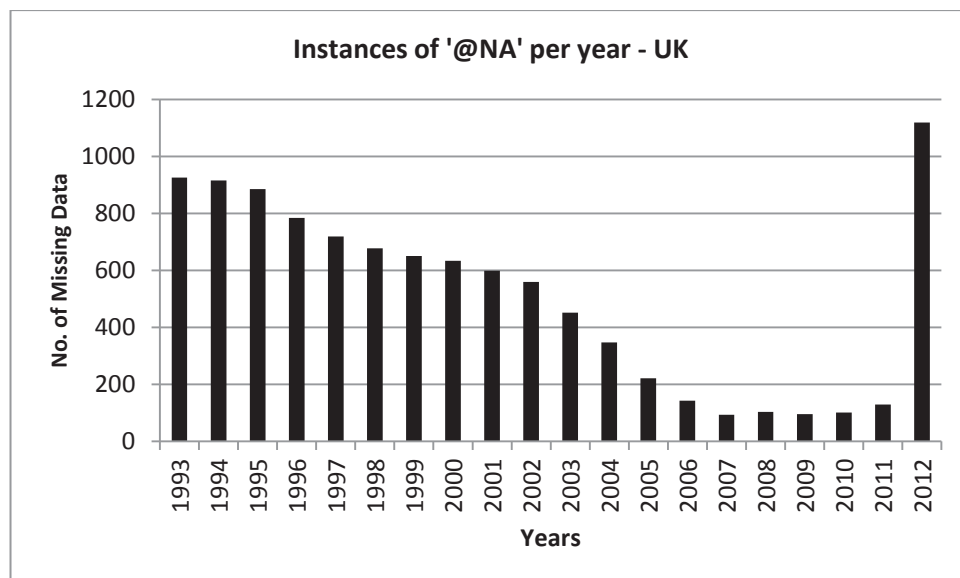
Figure A3: Missing Data in UK

1. Nearly all the firms for China, Japan, and UK have data missing in 2012. Thus in most instances 2012 is automatically dropped due to missing data, and 2011 becomes the final year.

2. Missing data is also very high in UK and Japan for 1993 (926 missing out of 1167, and 1164 missing out of 3263).

3. China has all data missing from 1993 to 1997. It improves in 1998 but more than 50% of the data are still missing. It indicates that for China data collection by Standard & Poor's Global Vantage database may have only begun from 1998. This may explain why many of the earlier cross country studies such as Ball et al. (2000), Bhattacharya et al. (2003); Leuz et al. (2003)) did not include China in their cross country studies.

4. The total numbers of missing firm years for each country (excluding 2012) are as follows: China - 26,122 missing firm years, Japan - 7738 missing firm years, and the United Kingdom – 9,042 missing firm years.

5. Although there are a large number of missing data in certain years like 1993 and 2012, it has been decided to include these years because it generates extra data for the data sets – the reasoning being that any extra data will improve the total number of observations. However, including years with larger number of missing data means that the gap between the original number of firm years and final number of firm years used in data set is also very large.

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In addition to the missing data, the McNichols requires change in current assets, current liabilities, revenues, cash and short-term debt, which means that 1993 data is lost due to the change in calculation. The McNichols model also requires the cash flow from operation from the period $t+1$, meaning that the final year also cannot be used. The missing data also means that it leaves firm years with non-sequential data, which in turn affect the availability of data calculation of the change in variables.

Finally, it is important to use the same data set for the Dunmore and McNichols models, this means that data sets had to be matched and all non-matching firm years had to be removed. For example, for the UK, the McNichols model data set had 7,858 firm years while the Dunmore model data had 10,638 firm years. After matching firms to ensure that exactly the same firm years are on both data sets, the final UK data set for both models has 7,781 firm years.

Appendix B: Dunmore Model Calculations

Table B1
Results of 4 variable regression for UK (unconstrained)

	Intercept	PPE_{t-1}	Rev_{t-1}	Exp_{t-1}	CFO^{out}_{t-1}	Sum of rows
PPE_t	0.0685	0.9645	-0.0241	0.0154	0.0239	0.9797
Rev_t	0.0804	0.0287	0.7427	0.0798	0.1376	0.9888
Exp_t	0.1359	0.0334	-0.0037	0.5686	0.3728	0.9711
CFO^{out}_t	0.0866	0.0021	0.0259	0.3562	0.5889	0.9732

Note. Coefficients from four variables using UK data (variables in year *t* are dependent variables, *t-1* are independent variables).
Where:
PPE = gross property, plant and equipment
Rev= Revenues
Exp= Expenditure calculated as revenues – net income
CFOout = cash flow out calculated as revenue – cash flow from operation

Table B2
Results of 6 variable regression for UK (unconstrained)

	Intercept	PPE_{t-1}	Rev_{t-1}	CA_{t-1}	CL_{t-1}	CFO^{out}_{t-1}	Exp_{t-1}	Sum of rows
PPE_t	0.1832	0.9531	-0.0166	0.0881	0.0106	-0.0253	-0.0225	0.9874
Rev_t	0.2975	0.0091	0.7342	0.0436	0.1235	0.1120	-0.0259	0.9963
CA_t	0.1956	0.0005	-0.0040	0.8521	0.0758	-0.0049	0.0522	0.9718
CL_t	0.0511	0.0092	-0.0071	0.0859	0.8145	0.0419	0.0379	0.9822
CFO^{out}_t	0.3032	-0.0187	0.0218	0.0721	0.1069	0.5476	0.2529	0.9826
Exp_t	0.4376	0.0095	-0.0102	0.0734	0.1312	0.3304	0.4470	0.9813

Note. Coefficients from six variables using UK data (variables in year *t* are dependent variables, *t-1* are independent variables). Where:
PPE = gross property, plant and equipment
Rev= Revenues
CA = Current assets
CL = Current liabilities
Exp= Expenditure calculated as revenues – net income
CFOout = cash flow out calculated as revenue – cash flow from operation

Table B3
Results of 7 variable regression for UK (unconstrained)

	Intercept	PPE_{t-1}	Rev_{t-1}	Dep_{t-1}	Inv_{t-1}	AR_{t-1}	AP_{t-1}	CFO^{out}_{t-1}	Exp_{t-1}	Sum of rows
PPE_t	0.2616	0.9596	-0.0185	0.0288	-0.0048	-0.0045	0.0216	0.0062	-0.0055	0.9830
Rev_t	0.4290	0.0275	0.7347	0.0057	0.0015	0.0276	0.0718	0.1477	-0.0266	0.9899
Dep_t	-0.0853	0.1027	-0.0532	0.8502	-0.0145	0.0442	0.0504	0.0521	-0.0455	0.9864
Inv_t	0.0582	0.0330	-0.0925	-0.0212	0.9493	0.0070	0.0301	0.0864	-0.0069	0.9852
AR_t	0.1603	-0.0175	-0.0148	0.0414	0.0013	0.8756	0.0258	0.0043	0.0602	0.9762
AP_t	-0.1754	0.0065	-0.0388	-0.0058	0.0101	0.0124	0.8361	0.1345	0.0283	0.9832
CFO^{out}_t	0.3819	0.0057	0.0167	-0.0038	0.0012	0.0093	0.0919	0.6162	0.2446	0.9819
Exp_t	0.6193	0.0137	0.0112	0.0408	-0.0040	0.0188	0.0958	0.3723	0.4331	0.9818

Note. Coefficients of eight variables using UK data (variables in year *t* are dependent variables, *t-1* are independent variables). Where:
PPE = gross property, plant and equipment

Rev= Revenues
Dep = Depreciation
Inv = Inventory
AR = Accounts receivable
AP = Accounts payables
Exp= Expenditure calculated as revenues – net income
CFOout = cash flow out calculated as revenue – cash flow from operation

Table B4-B6 shows the final variables chosen and the regression results (coefficients constrained to 1) for China, Japan and the United Kingdom.

Table B4
Intercepts & Matrix of Coefficents - China

	Intercept	CA_{t-1}	CL_{t-1}	REV_{t-1}	PPE_{t-1}	$CA\text{-}Cash_{t-1}$	$CL\text{-}STD_{t-1}$	Sum of Rows
CA_t	0.1293	0.8898	-0.0508	0.1040	0.0004	0.0113	0.0454	1.0000
CL_t	0.1186	0.0583	0.8192	0.0575	0.0309	0.0221	0.0121	1.0000
REV_t	0.1657	0.0839	-0.0483	0.9192	0.0257	-0.0448	0.0642	1.0000
PPE_t	0.0218	0.1242	-0.0129	0.0670	0.9430	-0.0697	-0.0517	1.0000
$CA\text{-}Cash_t$	-0.0210	0.1621	0.0082	0.0897	-0.0228	0.7716	-0.0088	1.0000
$CL\text{-}STD_t$	-0.0264	0.0780	0.0750	0.0702	-0.0006	-0.0064	0.7838	1.0000

Note. Coefficients and Intercepts of six variables using Japanese data used for final version of Dunmore model (variables in year t are dependent variables, t-1 are independent variables).
Where:
PPE = gross property, plant and equipment
Rev= Revenues
CA = Current assets
CL = Current liabilities
CA- Cash = Current assets
CL – STD = Current liabilities – short term debt

Table B5
Intercepts & Matrix of Coefficents - Japan

	Intercept	Intercepts &	CL_{t-1}	REV_{t-1}	PPE_{t-1}	$CA\text{-}Cash_{t-1}$	$CL\text{-}STD_{t-1}$	Sum of Rows
CA_t	-0.0224	0.9698	-0.0379	0.0657	-0.0129	-0.0082	0.0234	1.0000
CL_t	-0.0945	0.0310	0.8821	0.0858	0.0014	-0.0090	0.0087	1.0000
REV_t	0.0608	0.0467	0.0174	0.9696	-0.0135	-0.0552	0.0350	1.0000
PPE_t	0.0086	0.0609	-0.0001	0.0298	0.9625	-0.0699	0.0169	1.0000
$CA\text{-}Cash_t$	-0.0424	0.0834	-0.0068	0.0359	-0.0116	0.8786	0.0206	1.0000
$CL\text{-}STD_t$	-0.1621	0.0618	0.0104	0.0887	-0.0086	-0.0249	0.8727	1.0000

Note. Coefficients and Intercepts of six variables using Japanese data used for final version of Dunmore model (variables in year t are dependent variables, t-1 are independent variables).
Where:
PPE = gross property, plant and equipment
Rev= Revenues
CA = Current assets
CL = Current liabilities
CA- Cash = Current assets
CL – STD = Current liabilities – short term debt

Table B6
Intercepts & Matrix of Coefficents - UK

	Intercept	CA_{t-1}	CL_{t-1}	REV_{t-1}	PPE_{t-1}	$CA\text{-}Cash_{t-1}$	$CL\text{-}STD_{t-1}$	Sum of Rows
CA_t	0.1453	0.8734	0.0286	-0.0048	0.0031	0.0240	0.0756	1.0000
CL_t	0.0524	0.1064	0.6594	0.0308	0.0126	-0.0444	0.2352	1.0000
REV_t	0.3035	0.0171	0.0148	0.8170	0.0070	0.0308	0.1133	1.0000
PPE_t	0.0147	0.1200	0.0262	0.0136	0.9562	-0.0957	-0.0202	1.0000
$CA\text{-}Cash_t$	-0.0162	0.1310	0.0204	0.0384	-0.0075	0.7730	0.0446	1.0000
$CL\text{-}STD_t$	-0.0318	0.1186	0.0317	0.0389	-0.0026	-0.0622	0.8755	1.0000

Note. Coefficients and Intercepts of six variables using Japanese data used for final version of Dunmore model (variables in year t are dependent variables, t-1 are independent variables).
Where:
PPE = gross property, plant and equipment
Rev= Revenues
CA = Current assets
CL = Current liabilities
CA- Cash = Current assets
CL – STD = Current liabilities – short term debt

Appendix C: Results of Increasing Sample Size at Intervals of 100

The following figures show the rejection frequencies as a function of sample size using and inducement of 2% of total lagged assets and a 100% reversal. The samples sizes are increased at increments of 100 firm years at a time to reach 1000 firm years.

China - Frequency of Rejecting No Earings Management as a Function of Sample Size

	100	200	300	400	500	600	700	800	900	1000
Dunmore β1>0	42.0%	62.5%	75.2%	87.0%	92.0%	94.4%	96.0%	98.0%	98.1%	99.7%
Dunmore β1-β2>0	59.4%	88.3%	96.4%	99.3%	99.8%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1>0	78.8%	96.5%	99.3%	99.7%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1-β2>0	99.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Earnings Management Sample Size

Legend: —□— Dunmore β1>0 —△— Dunmore β1-β2>0 —■— McNichols β1>0 —▲— McNichols β1-β2>0

Figure C1: Rejection frequencies for China with increasing sample size.

Japan - Frequency of Rejecting No Earings Management as a Function of Sample Size

	100	200	300	400	500	600	700	800	900	1000
Dunmore β1>0	95.2%	99.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Dunmore β1-β2>0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1>0	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1-β2=0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Earnings Management Sample Size

Legend: —□— Dunmore β1>0 —△— Dunmore β1-β2>0 —■— McNichols β1>0 —▲— McNichols β1-β2=0

Figure C2: Rejection frequencies for Japan with increasing sample size.

UK - Frequency of Rejecting No Earings Management as a Function of Sample Size

	100	200	300	400	500	600	700	800	900	1000
Dunmore β1>0	60.9%	83.7%	92.2%	98.0%	99.3%	99.9%	99.9%	100.0%	100.0%	100.0%
Dunmore β1-β2>0	76.4%	97.0%	99.7%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1>0	75.8%	96.0%	99.1%	99.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
McNichols β1-β2>0	96.1%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Earnings Management Sample Size

—□— Dunmore β1>0   —△— Dunmore β1-β2>0   —■— McNichols β1>0   —▲— McNichols β1-β2>0
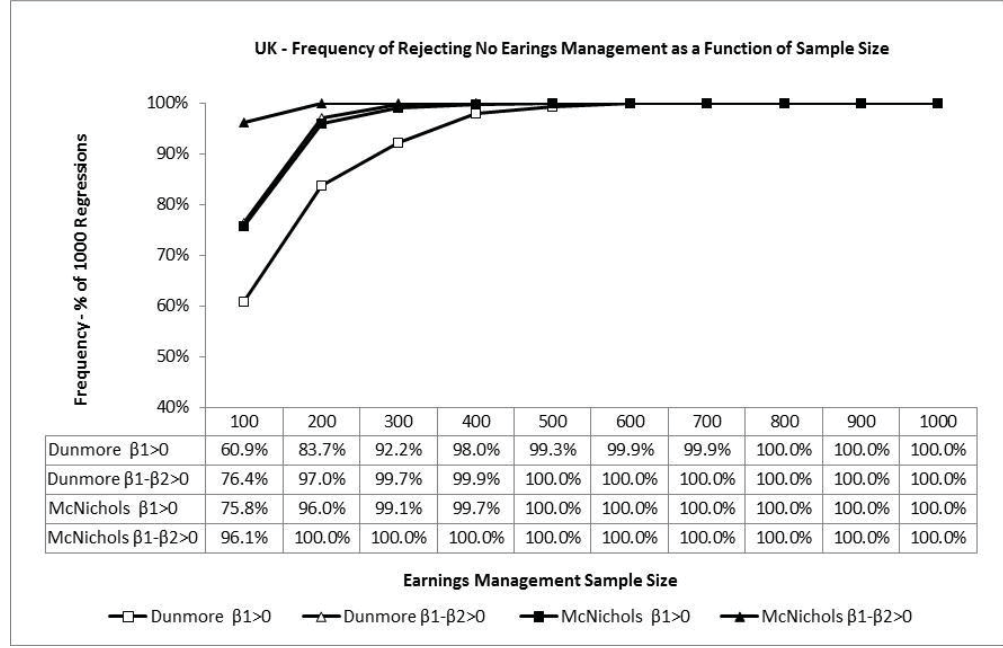
Figure C3: Rejection frequencies for the UK with increasing sample size.

Notes for Figure C1 to C3. Power of tests for earnings management using the Dunmore and McNichols models and earnings management sample sizes ranging from 100 to 1000 firm years. Results are based on pooled regressions using China – 13,238; Japan – 44,005; and the UK –7,782;firm year observations for the years 1993 to 2012. *PART* is set to1 for 100 firm years selected at random and 2% of lagged assets are added to working capital accruals or 0 otherwise. The sample firm year size is increased by 100 up to 1000. The process is repeated 1000 times for each increment.

McNichols: $WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1} + \epsilon_{i,t}$

$\Delta REV_{i,t} = (\text{Revenue}_{i,t} - \text{Revenue}_{i,t-1})/A_{i,t-1}$

$PPE_{i,t} = \text{gross property plant and equipment}_{i,t}/A_{i,t-1}$

$CF_{i,t} = $ current year cash flow (calculated as earnings before extraordinary items$_{i,t}$ – working capital accruals$_{i,t}$) scaled by $A_{i,t-1}$

$A_{i,t-1} = $ the total assets for firm i during period $t-1$

$WC\_ACC_{i,t}$ Calculated as $=(\Delta CA_{i,t} - \Delta CL_{i,t} - \Delta CASH_{i,t} + \Delta STD_{i,t})/A_{i,t-1}$. Where:

$\Delta CA_{i,t} = (\text{Current Assets}_{i,t} - \text{Current Assets}_{i,t-1})$ for firm i

$\Delta CL_{i,t} = (\text{Current Liabilities}_{i,t} - \text{Current Liabilities}_{i,t-1})$ for firm i

$\Delta CASH_{i,t} = (\text{Cash}_{i,t} - \text{Cash}_{i,t-1})$ for firm i

$\Delta STD_{i,t} = (\text{short-term debt}_t - \text{short-term debt}_{t-1})$ for firm i

$A_{i,t-1} = $ the total assets for firm i during period $t-1$

Dunmore: $AWCA_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 PWCA_{i,t} + \varepsilon_{i,t}$

$AWCA_{i,t} = $ the actual working capital accruals for firm i, period t calculated as [(exp (actual current assets$_{i,t}$) – exp (actual cash$_{i,t}$)) – (exp (actual current liabilities$_{i,t}$) – exp (actual short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

$PWCA_{i,t} = $ the predicted working capital accruals for firm i in year t calculated as [(exp(predicted current assets$_{i,t}$) – exp(predicted cash$_{i,t}$)) – (exp (predicted current liabilities$_{i,t}$) – (predicted short term debt$_{i,t}$))] scaled by $A_{i,t-1}$

The test β1>0 shows the percentage of β1 for *PART* is significantly positive and test β1-β2>0 shows percentage of *PART-PARTP1*significantly positive at 5% level (one tailed test) among 1000 pooled regressions.

Appendix D: Instructions for R Programming Codes

The following are the instructions that were written for the programming code. The instructions were specific to the McNichols model; modifications to accommodate the Dunmore model were made to the final codes.

Non Inducement Operation – CODE # 1

The equation:

$$WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_3 PARTP2_{i,t} + \beta_4 \Delta REV_{i,t}$$
$$+ \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1}$$

1. Winsorised data at 1% at both tails.
2. Initiate variables Part, PartP1, and PartP2.
3. Set Part, PartP1, and PartP2 to 0.
4. Randomly choose 100 cases with following conditions
   a. ONLY when SubsYrs* = 1
   b. AND neither of the next two years can be chosen**
   c. Set PART = 1, for the 100 randomly chosen variables
5. For PART = 1,
   a. Set PARTP1 =1 in random case+1 (next case),
   b. Set PARTP2 = 1 in random case+2 (second case)
6. Run regression
   a. Collect constants, coefficients, t-stats, p values, standard errors, adjusted R^2, based on heteroskedasticity-consistent standard errors.
   b. For the P=values:
      i. P values are to be 1 sided for Part, Part P1, & PartP2 (against alternatives Part>0, PartP1<0, PartP2<0)
      ii. Also compute 2-sided p value for the $\Box^2$ tests testing whether the coefficient of Part - coefficient of PartP1= 0, & coefficient of Part – coefficient of PartP1 – coefficient of PartP2 =0.
7. Repeat Steps 2 to 6, 1000 times
8. Print the means of constants, coefficients, t-statistics, standard errors, and the adjusted R^2.
9. Print the fraction of p values less than 0.05 (both for coefficients and $\Box^2$ test).

*when SubsYrs is 0, it means that the next two cases are not from the same firm or years are out of sequence due to missing data, thus do not have subsequent years.

**for example when Part is 1 for the year 2003 for company XYZ, PartP1 has to be set as 1 for 2004, Part and PartP2 for 2004 will be zero. In the second year PartP2 will be 1, while Part & PartP1 will be 0 (as shown below)

Company	Year	Part	PartP1	PartP2
XYZ	2003	1	0	0
XYZ	2004	0	1	0
XYZ	2005	0	0	1

PART must not be 1 for either 2004 or 2005 for this firm.

Inducement Operation - Code # 2

SECTION A

The equation:

$$WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1}$$
$$+ \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1}$$

1. Winsorise data at 1% at both tails
2. Define Vector
   X=[0,0.001,0.002,0.003,0.004,0.005,0.006,0.007,0.008,0.009,0.01].
3. Perform steps 4 to 11 for each value of X.
4. Set Part = 0 AND PartP1 = 0.
5. Define variable WCANew=WCA.
6. **Inducement section:**
   a. Randomly choose 100 cases
   b. Only when SubsYrs=1.
   c. AND the next year cannot be chosen
   d. set Part = 1, for the 100 randomly chosen cases,
   e. AND add 0.01 to WCANew, where Part=1.
7. **Reversals section:**
   a. Where Part=1,
   b. set PartP1 =1, in case+1 (in the case after the randomly chosen case)
   c. **AND subtract the current value of vector X from WCANew, where PartP1=1.**
8. Run a regression of the equation with all cases:

a. WCANew = Part +PartP1 + ChangeinRev + PPE + Cashflowt.1 + Cashflowt + Cashflowt.1.1

b. Collect the constants, coefficients, t-statistics, p values, standard errors, and the adjusted R^2 based on heteroskedasticity-consistent standard errors.

c. For the P=values:

    i. P values are to be 1 sided for Part & Part P1 (against alternatives Part>0, PartP1<0)

    ii. Also compute 2-sided p value for the $\square^2$ tests testing whether the coefficient of Part - coefficient of PartP1= 0.

9. Run steps 4 to 8; 1000 times.

10. Print the mean of constants, coefficients, t-statistics, standard errors, and the adjusted R^2.

11. Print the fraction of p values less than 0.05 (both for coefficients and $\square^2$ test)

SECTION B

$$WC\_ACC_{i,t} = \beta_0 + \beta_1 PART_{i,t} + \beta_2 PARTP1_{i,t} + \beta_4 \Delta REV_{i,t} + \beta_5 PPE_{i,t} + \beta_6 CF_{i,t-1} + \beta_7 CF_{i,t} + \beta_8 CF_{i,t+1}$$

1. Use winsorised data as before

2. Initialise Part & PartP1

3. Set Part = 0 **AND** PartP1 = 0.

4. Define variable WCANew=WCA.

5. **Inducement section:** Randomly choose 100 cases with the following conditions:

    a. Only when SubsYrs=1

    b. AND the next year cannot be chosen

    c. set Part = 1,

    d. **AND** add 0.02 to the dependent variable WCANew, where Part=1.

6. **Reversals Section**

    a. For Part=1, set PartP1 =1 in case+1 (the next year)

    b. For PartP1=1; subtract 0.02 from WCANew.

7. Run steps 8 to 11 from Section A.

Appendix E: R Programming Codes

The Non-Inducement and Inducement codes were written by Dr Daniel CI Walsh, Lecturer, at the Institute of Information and Mathematical Sciences at Massey University, Albany Campus. The Code for Square Matrix of Coefficients with Constraint was written by Prof Paul V. Dunmore, Research Professor in Accountancy, at the School of Accountancy, Massey University. The codes have been modified in terms of variables and sample cases to run the variations required for different models and tests.

<u>Non-Inducement Code – Written by Dr Walsh</u>

```
## --- Random
## --- Load library
library ("lmtest")
library ("sandwich")

## --- Read data
Dat0 <- read.csv (file.choose(), header=TRUE)

## --- Winsor function
winsor <- function (x, fraction) {
 lim <- quantile(x, probs=c(fraction, 1-fraction))
 x[ x < lim[1] ] <- lim[1]
 x[ x > lim[2] ] <- lim[2]
 x
}

## --- Create new data set
Dat <- data.frame (Company=Dat0$Company, Year=Dat0$Year,
          SubsYrs=Dat0$SubsYrs)

## --- Windsorise data
WinFrac      <- 0.01
Dat$WCA       <- winsor (Dat0$WCALaggedAssets, fraction=WinFrac)
Dat$CFT       <- winsor (Dat0$CashFlowT, fraction=WinFrac)
Dat$CFT.1     <- winsor (Dat0$CashFlowT.1, fraction=WinFrac)
Dat$CFT.1.1   <- winsor (Dat0$CashFlowT.1.1, fraction=WinFrac)
Dat$ChangeInRev <- winsor (Dat0$ChangeinRevLaggedAsset, fraction=WinFrac)
Dat$PPE       <- winsor (Dat0$PPELaggedAsset, fraction=WinFrac)

## --- Simulation parameters
NSim  <- 1000    ## Number of simulations
NVars <- 9       ## Number of coffecients in model
NCases <- 100    ## Number of cases to sample

## --- Create ouput object
Out <- NULL
Out$coef     <- matrix (NA, nrow=NSim, ncol=NVars)
Out$stderr   <- matrix (NA, nrow=NSim, ncol=NVars)
Out$tvalues  <- matrix (NA, nrow=NSim, ncol=NVars)
Out$pvalues  <- matrix (NA, nrow=NSim, ncol=NVars)
```

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```
Out$adjrsq    <- vector (mode="numeric", length=NVars)
Out$Wald.P01  <- vector (mode="numeric", length=NVars)
Out$Wald.P012 <- vector (mode="numeric", length=NVars)

## --- Set random nummber seed
set.seed (123)

## --- Perform simulation
for (i in 1:NSim) {

  ## --- Choose random cases
  repeat {
    RandomCases <- sort (sample (x=which(Dat$SubsYrs==1),
                        size=NCases, replace=FALSE))
    if ( min(diff(RandomCases)) > 2 ) { break }
  }

  ## --- Set PART variables
  PART <- rep (0, nrow(Dat))
  PART[RandomCases] <- 1
  PARTP1 <- c(0, PART[-length(PART)])
  PARTP2 <- c(0, PARTP1[-length(PARTP1)])

  ## --- Regression
  M1 <- lm (Dat$WCA ~ PART + PARTP1 + PARTP2
        + Dat$ChangeInRev + Dat$PPE
        + Dat$CFT + Dat$CFT.1 + Dat$CFT.1.1)

  ## --- Summary
  Results <- summary(M1)

  ## --- Find robust standard errors
  M1$newse <- vcovHC(M1)
  Robust   <- coeftest(M1, M1$newse)

  ## --- Store results
  Out$coef[i,]     <- Results$coefficients[,1]
  Out$stderr[i,]   <- Robust[,2]
  Out$tvalues[i,]  <- Robust[,3]
  Out$pvalues[i,]  <- Robust[,4]
  Out$adjrsq[i]    <- Results$adj.r.squared

  ## --- Fix one-sided hypotheses for PART variables
  ## --- Ha: > 0
  Out$pvalues[i,2]  <- pt (Out$tvalues[i,2], Results$df[2],
                lower.tail=FALSE)

  ## --- Ha: < 0
  Out$pvalues[i,3]  <- pt (Out$tvalues[i,3], Results$df[2],
                lower.tail=TRUE)
  ## --- Ha: < 0
  Out$pvalues[i,4]  <- pt (Out$tvalues[i,4], Results$df[2],
                lower.tail=TRUE)

  ## --- Wald test to compare coefficients of PART and PART1
  ## --- Covariance matrix
  V      <- vcov(M1)[c("PART", "PARTP1"), c("PART", "PARTP1")]

  ## --- Variance of effect
```

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```
V.eff  <- sum(diag(V)) - 2*V[1,2]

## --- Coefficients
Coef   <- coef(M1)[c("PART", "PARTP1")]

## --- Squared estimate of effect
Sq.eff <- (Coef[1]  - Coef[2])^2

## --- P-value
Out$Wald.P01[i] <- 1 - pchisq ( Sq.eff/V.eff, 1)

## --- Wald test to compare coefficients of PART - PART1 - PART2
## --- Covariance matrix
V <- vcov(M1)[c("PART", "PARTP1", "PARTP2"),
        c("PART", "PARTP1", "PARTP2")]

## --- Variance of effect
V.eff  <- sum(diag(V)) - 2*(V[1,2] + V[1,3] - V[2,3])

## --- Coefficients
Coef   <- coef(M1)[c("PART", "PARTP1", "PARTP2")]

## --- Squared estimate of effect
Sq.eff <- (Coef[1]  - Coef[2] - Coef[2])^2

## --- P-value
Out$Wald.P012[i] <- 1 - pchisq (Sq.eff/V.eff, 1)
}

## --- Rejection rates for regresssion model
Out$RR.Reg       <- colMeans (Out$pvalues < 0.05)
names(Out$RR.Reg) <- c("Interept", "PART", "PARTP1", "PARTP2",
             "ChangeInRev", "PPE",
             "CFT", "Dat$CFT.1", "Dat$CFT.1.1")

## --- Rejection rates for Wald test
Out$RR.P01       <- mean (Out$Wald.P01  < 0.05)
Out$RR.P012      <- mean (Out$Wald.P012 < 0.05)

## --- Save results
save (Out, file="Random_Out.RData")
```

Inducement Code with Incremental Reversals Written by Dr Walsh

```r
## --- Inducement-A
## --- Load library
library ("lmtest")
library ("sandwich")

## --- Read data
Dat0 <- read.csv (file.choose(), header=TRUE)

## --- Winsor function
winsor <- function (x, fraction) {
  lim <- quantile(x, probs=c(fraction, 1-fraction))
  x[ x < lim[1] ] <- lim[1]
  x[ x > lim[2] ] <- lim[2]
  x
}

## --- Create new data set
Dat <- data.frame (Company=Dat0$Company, Year=Dat0$Year,
           SubsYrs=Dat0$SubsYrs)

## --- Windsorise data
WinFrac       <- 0.01
Dat$WCA        <- winsor (Dat0$WCA, fraction=WinFrac)
Dat$CFT        <- winsor (Dat0$CashFlow.T, fraction=WinFrac)
Dat$CFT.1      <- winsor (Dat0$CashFlow.T.1, fraction=WinFrac)
Dat$CFT.1.1    <- winsor (Dat0$CashFlow.T.1.1, fraction=WinFrac)
Dat$ChangeInRev <- winsor (Dat0$ChangeinRev, fraction=WinFrac)
Dat$PPE        <- winsor (Dat0$PPE, fraction=WinFrac)

## --- Simulation parameters
NSim   <- 1000    ## Number of simulations
NVars  <- 8       ## Number of coffecients in model
NCases <- 100

## --- Define X
X <- seq (from=0, to=0.01, length=11)

## --- Create ouput object
Out <- vector (mode="list", length=length(X))
for ( i in 1:length(X) ) {
  Out[[i]]$X       <- X[i]
  Out[[i]]$coef    <- matrix (NA, nrow=NSim, ncol=NVars)
  Out[[i]]$stderr  <- matrix (NA, nrow=NSim, ncol=NVars)
  Out[[i]]$tvalues <- matrix (NA, nrow=NSim, ncol=NVars)
  Out[[i]]$pvalues <- matrix (NA, nrow=NSim, ncol=NVars)
  Out[[i]]$adjrsq  <- vector (mode="numeric", length=NVars)
  Out[[i]]$Wald.P01 <- vector (mode="numeric", length=NVars)
}

## --- Set random number seed
set.seed (456)

## --- Loop through X values
for ( k in 1:length(X) ) {
  ## --- Perform simulation
  for ( i in 1:NSim ) {
```

```r
## --- Choose random cases
repeat {
  RandomCases <- sample (x=which(Dat$SubsYrs==1),
                size=NCases, replace=FALSE)
  if ( min(diff(sort(RandomCases))) > 1 ) { break }
}

## --- Define new WCA
WCANew <- Dat$WCA

## --- Set PART variables
PART <- rep (0, nrow(Dat))
PART[RandomCases] <- 1
PARTP1 <- c(0, PART[-length(PART)])

## --- Adjust WCA new : Inducement
WCANew <- WCANew + PART * 0.01

## --- Adjust WCA new : Reversals
WCANew <- WCANew - PARTP1 * X[k]

## --- Regression
M1 <- lm (WCANew ~ PART + PARTP1 + Dat$ChangeInRev
        + Dat$PPE + Dat$CFT + Dat$CFT.1 + Dat$CFT.1.1)

## --- Summary
Results <- summary(M1)

## --- Find robust standard errors
M1$newse <- vcovHC(M1)
Robust   <- coeftest(M1, M1$newse)

## --- Store results
Out[[k]]$coef[i,]    <- Results$coefficients[,1]
Out[[k]]$stderr[i,]  <- Robust[,2]
Out[[k]]$tvalues[i,] <- Robust[,3]
Out[[k]]$pvalues[i,] <- Robust[,4]
Out[[k]]$adjrsq[i]   <- Results$adj.r.squared

## --- Fix one-sided hypotheses for PART variables
## --- Ha: > 0
Out[[k]]$pvalues[i,2]  <- pt (Out[[k]]$tvalues[i,2], Results$df[2],
                lower.tail=FALSE)

## --- Ha: < 0
Out[[k]]$pvalues[i,3]  <- pt (Out[[k]]$tvalues[i,3], Results$df[2],
                lower.tail=TRUE)

## --- Wald test to compare coefficients of PART and PART1
## --- Covariance matrix
V     <- vcov(M1)[c("PART", "PARTP1"), c("PART", "PARTP1")]

## --- Variance of effect
V.eff  <- sum(diag(V)) - 2*V[1,2]

## --- Coefficients
Coef   <- coef(M1)[c("PART", "PARTP1")]

## --- Squared estimate of effect
```

```
  Sq.eff <- (Coef[1]  - Coef[2])^2

  ## --- P-value
  Out[[k]]$Wald.P01[i] <- 1 - pchisq (Sq.eff/V.eff, 1)
 }


 ## --- Rejection rates for regresssion model
 Out[[k]]$RR.Reg      <- colMeans (Out[[k]]$pvalues < 0.05)
 names(Out[[k]]$RR.Reg) <- c("Interept", "PART", "PARTP1",
               "ChangeInRev", "PPE",
               "CFT", "Dat$CFT.1", "Dat$CFT.1.1")


 ## --- Rejection rates for Wald test
 Out[[k]]$RR.P01      <- mean (Out[[k]]$Wald.P01 < 0.05)
}

## --- Save results
save (Out, file="Inducement-A_Out.RData")
```

Inducement Code with 100% Reversals – Written by Dr Walsh

```
## --- Inducement-B
## --- Load library
library ("lmtest")
library ("sandwich")

## --- Read data
Dat0 <- read.csv (file.choose(), header=TRUE)

## --- Winsor function
winsor <- function (x, fraction) {
  lim <- quantile(x, probs=c(fraction, 1-fraction))
  x[ x < lim[1] ] <- lim[1]
  x[ x > lim[2] ] <- lim[2]
  x
}

## --- Create new data set
Dat <- data.frame (Company=Dat0$Company, Year=Dat0$Year,
          SubsYrs=Dat0$SubsYrs)

## --- Windsorise data
WinFrac       <- 0.01
Dat$WCA       <- winsor (Dat0$WCA, fraction=WinFrac)
Dat$CFT       <- winsor (Dat0$CashFlow.T, fraction=WinFrac)
Dat$CFT.1     <- winsor (Dat0$CashFlow.T.1, fraction=WinFrac)
Dat$CFT.1.1   <- winsor (Dat0$CashFlow.T.1.1, fraction=WinFrac)
Dat$ChangeInRev <- winsor (Dat0$ChangeinRev, fraction=WinFrac)
Dat$PPE       <- winsor (Dat0$PPE, fraction=WinFrac)

## --- Simulation parameters
NSim  <- 1000    ## Number of simulations
NVars <- 8       ## Number of coffecients in model
NCases <- 100

sample1 <- function(test, NSize)
  # Return a vector of NSize elements from items where the vector test has value 1
  # such that no two are adjacent.
{
  test[1] <- test[length(test)] <- 0 # These should never be selected, but make sure to avoid subscript
errors.
  i.select <- rep(NA, NSize)
  for (i in 1:NSize) {
     i.select[i] <- sample(x=which(test==1), size=1) # Select one element.
     test[i.select[i] + (-1:1)] <- 0 # Mark this element and its neighbours for non-selection in future.
  }
  i.select
}

## --- Create ouput object
Out <- NULL
Out$coef     <- matrix (NA, nrow=NSim, ncol=NVars)
Out$stderr   <- matrix (NA, nrow=NSim, ncol=NVars)
Out$tvalues  <- matrix (NA, nrow=NSim, ncol=NVars)
Out$pvalues  <- matrix (NA, nrow=NSim, ncol=NVars)
Out$adjrsq   <- vector (mode="numeric", length=NVars)
Out$Wald.P01 <- vector (mode="numeric", length=NVars)

## --- Set random nummber seed
```

```
set.seed (789)

## --- Perform simulation
for ( i in 1:NSim ) {

## --- Choose random cases
 RandomCases <- sample1(Dat$SubsYrs, NCases)

## --- Define new WCA
  WCANew <- Dat$WCA

## --- Set PART variables
  PART <- rep (0, nrow(Dat))
  PART[RandomCases] <- 1
  PARTP1 <- c(0, PART[-length(PART)])

## --- Adjust WCA new : Inducement
  WCANew <- WCANew + PART * 0.02

## --- Adjust WCA new : Reversals
  WCANew <- WCANew - PARTP1 * 0.02

## --- Regression
  M1 <- lm (WCANew ~ PART + PARTP1
        + Dat$ChangeInRev + Dat$PPE
        + Dat$CFT + Dat$CFT.1 + Dat$CFT.1.1)

## --- Summary
  Results <- summary(M1)

## --- Find robust standard errors
  M1$newse <- vcovHC(M1)
  Robust   <- coeftest(M1, M1$newse)

## --- Store results
  Out$coef[i,]    <- Results$coefficients[,1]
  Out$stderr[i,]  <- Robust[,2]
  Out$tvalues[i,] <- Robust[,3]
  Out$pvalues[i,] <- Robust[,4]
  Out$adjrsq[i]   <- Results$adj.r.squared

## --- Fix one-sided hypotheses for PART variables
## --- Ha: > 0
  Out$pvalues[i,2]  <- pt (Out$tvalues[i,2], Results$df[2],
                 lower.tail=FALSE)

## --- Ha: < 0
  Out$pvalues[i,3]  <- pt (Out$tvalues[i,3], Results$df[2],
                 lower.tail=TRUE)

## --- Wald test to compare coefficients of PART and PART1

## --- Covariance matrix
  V     <- vcov(M1)[c("PART", "PARTP1"), c("PART", "PARTP1")]

## --- Variance of effect
  V.eff  <- sum(diag(V)) - 2*V[1,2]

## --- Coefficients
```

```
  Coef   <- coef(M1)[c("PART", "PARTP1")]

## --- Squared estimate of effect
  Sq.eff <- (Coef[1]  - Coef[2])^2

## --- P-value
  Out$Wald.P01[i] <- 1 - pchisq (Sq.eff/V.eff, 1)
}

## --- Rejection rates for regresssion model
Out$RR.Reg        <- colMeans (Out$pvalues < 0.05)
names(Out$RR.Reg) <- c("Interept", "PART", "PARTP1", "ChangeInRev",
                   "PPE", "CFT", "Dat$CFT.1", "Dat$CFT.1.1")

## --- Rejection rates for Wald test
Out$RR.P01        <- mean (Out$Wald.P01 < 0.05)

## --- Save results
```

Code for Square Matrix of Coefficients with Constraint – Written by Prof Dunmore

```
lm1 <- function(dep, indep, constrain=FALSE, rowsum=1, ...) {
  # dep      Vector or matrix of dependent variables. If a matrix, there is a regression for each column.
  # indep    Matrix of independent variables, same number of rows as dep. An intercept is assumed but
not specified.
  # constrain If TRUE, the rows of the coefficients (excluding the intercept) will be constrained to sum to
rowsum.
  #          If FALSE, a test will be applied to see if every set of coefficients does in fact sum to rowsum.
  # rowsum   Typically rowsum will be 0 or 1.
  # ...      Additional parameters to be passed to lm(). Not likely to be used.
  #
  # In what follows, nreg  is the number of columns of dep,
  #               nvar   is the number of columns of indep.
  #
  # Function value contains the following elements:
  #   $coef      Matrix of regression coefficients, constrained if constrain=TRUE. nreg rows, nvar+1
columns.
  #          First column contains the intercepts for the regressions.
  #   $se     Matrix of standard errors of $coef, the same size as $coef.
  #   $t.sig  Matrix of 2-sided p values for the significance of the t value for each coefficient; same size as
$coef.
  #   $adj.R2 Vector of adjusted R2 values for each regression. nreg rows.
  #   $F      A scalar giving the F test for the hypothesis that all rows of coefficients sum to rowsum.
  #   $F.sig  A scalar giving the p value of $F.
  #          If constrain=TRUE, the F test is meaningless, and both $F and $F.sig are returned as NA.

  # Test for various inconsistencies in the arguments.
  if (NROW(dep) != NROW(indep)) {cat(" lm1: dep and indep do not have the same number of rows.\n");
stop()}
  if (length(rowsum) > 1) {cat(" lm1: rowsum must be a number, not a vector.\n"); stop()}
  nreg  <- NCOL(dep)
  if (nreg == 1) dep <- matrix(dep, ncol=1)
  nvar  <- NCOL(indep)
  if (nvar < 2) {cat(" lm1: at least two independent variables must be supplied.\n"); stop()}

  # Remove any cases with missing values (consistently across the whole set of variables).
  i <- complete.cases(dep, indep)
  dep  <- matrix(dep[i,], ncol=nreg) # Prevent a single-column matrix being converted back to a vector.
  indep <- indep[i,]
  ncases <- NROW(dep)

  # Run each regression separately for now.
  coef <- matrix(NA, nrow=nreg, ncol=nvar+1)
  if (length(colnames(indep)) == 0) colnames(indep) <- paste("x",1:nvar,sep="")
  if (length(colnames(dep)) == 0) colnames(dep) <- paste("y",1:nreg,sep="")
  colnames(coef) <- c("Intercept",colnames(indep)); rownames(coef) <- colnames(dep)
  se <- coef; t.sig <- coef
  adj.R2 <- NA; F <- NA; F.sig <- NA; sigma <- NA
  for (ireg in 1:nreg) {
   if (constrain) {
     # Constrained regression. Eliminate the last independent variable.
     x <- matrix(indep[,-nvar], nrow=ncases) # Ensure x is a matrix, even if only 1 column.
     for (j in 1:(nvar-1)) x[,j] <- x[,j] - indep[,nvar]
     y <- dep[,ireg] - rowsum * indep[,nvar]
     smry <- summary(lm(y~x, ...))
     coef[ireg,] <- c(smry$coefficients[,1], rowsum-sum(smry$coefficients[-1,1]))
     se[ireg,]   <- c(smry$coefficients[,2], sqrt(sum(smry$cov.unscaled)))
```

```
        t.sig[ireg,] <- 2 * pt(abs(coef[ireg,])/se[ireg,], ncases-nvar+1, lower.tail=FALSE) # Significance of
the two-tailed test.
      adj.R2[ireg] <- smry$adj.r.squared
      sigma[ireg] <- smry$sigma
    } else {
      # Unconstrained regression.
      y <- dep[,ireg]
      smry <- summary(lm(y~indep, ...))
      coef[ireg,]  <- smry$coefficients[,1]
      se[ireg,]    <- smry$coefficients[,2]
      t.sig[ireg,] <- smry$coefficients[,4]
      adj.R2[ireg] <- smry$adj.r.squared
      sigma[ireg]  <- smry$sigma
  } }
  # Now the F test, which requires all the regressions to be completed first.
  if (!constrain) {
    F <- (sum((rowSums(coef[,-1])-rowsum)^2) / sum(chol2inv(chol(crossprod(cbind(1,indep))))[-1,-1])) /
sum(sigma^2)
    # This is Judge et al's (2.1.43) specialised to this specific setting.
    F.sig <- pf(F, df1=nreg, df2=ncases-nvar+1, lower.tail=FALSE)
  }
  list(coef=coef, se=se, t.sig=t.sig, adj.R2=adj.R2, F=F, F.sig=F.sig)
}

# Test case.
G <- matrix(rnorm(16), nrow=4)
for (i in 1:nrow(G)) G[i,] <- G[i,] / sum(G[i,]) # Row sums are exactly 1.
x <- matrix(rnorm(1000*nrow(G)), nrow=1000)
y <- x %*% t(G) + matrix(rnorm(1000*nrow(G),sd=0.5), nrow=1000) # Include normally distributed
errors.
# print(cbind(G, rowSums(G)))
# lm1(y, x, constrain=FALSE, rowsum=1)
# lm1(y, x, constrain=FALSE, rowsum=0)
# lm1(y, x, constrain=TRUE, rowsum=1)
```