ERASMUS UNIVERSITEIT ROTTERDAM

Independence of the board of directors and earnings management

A research on the effect of board independence on both accrual-based and real earnings management within US listed companies

Erasmus University Rotterdam
Accounting, auditing & Control
Master's thesis

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Date
03-09-2016

Abstract
After the passage of the SOX Act, US firms are required to have a board with a majority of independent directors. At the same time, an increase in the use of real earnings management can be observed. The objective of this study is to investigate the effect of independence of the board of directors on accrual-based and real earnings management. The sample consists of 4,455 US listed firms with fiscal years from 2007-2015. It is found that the independence of the board of directors does not have a significant effect on accrual-based earnings management. However, a negative and significant relation is found between the proportion of independent directors and real earnings management. The findings of this research could have implications for composition of the board of directors.

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1.   INTRODUCTION

1.1   Reason for this research

Accounting has two roles in the current economic environment (Beyer, Cohen, Lys, & Walter, 2010). The first one is called the valuation role. Investors can use the accounting information to evaluate their potential investment opportunities in a firm. The second role is called the stewardship role. Investors could use the accounting information to monitor their capital once they invested it in a firm. However, the reputation of accounting is impaired by the large amount of accounting scandals that occurred in the last decades. One of the most prominent scandals in the last decades was the Enron accounting scandal (Tan & Yeo, 2013). To make the profits look higher, large amounts of debt were kept off the balance sheet, revenues were manipulated upwards and the earnings were smoothed. Finally, Enron went bankrupt. This caused a loss of $74 billion for Enron's shareholders and initiated the downfall of Enron. According to Tan and Yeo (2013), shareholders were the ones who suffered most from this act of earnings management conducted by the management of Enron. One of the reasons for this is that shareholders could not effectively monitor their capital invested in Enron, which enabled Enron's management to conduct earnings management. According to Healy and Wahlen (1999), earnings management is:

> "The use of judgment in financial reporting and structuring of transactions in order to alter financial reports either to mislead some shareholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers" (p. 368).

Earnings management could be used to let the underlying economic performance look better than it is in reality.

The Enron scandal is just a single example of the problems earnings management could cause to a firm's stakeholders. Earnings management in general causes problems to a firm's stakeholders in their decision making process (Lin & Hwang, 2010). It lessens the quality of a firm's reported earnings. The consequence of earnings management is that earnings become a less reliable measure of a firm's performance. A firm's reported earnings are an important aspect in the decision making

process of a firm's stakeholder. Therefore, it is important that the reported earnings are free of material misstatements. Earnings management, however, could lead to material misstatements in reported earnings. Thus, earnings management impairs the integrity of financial reporting. Therefore, it is important to eliminate or mitigate the practice of earnings management. Corporate governance is one of the mechanisms intended to reduce the practice of earnings management. It concerns the accountability of a firm's management to the firm's stakeholders and deals with the ways in which a firm's capital providers are assured to get a sufficient return on their investment (Schleifer & Vishny, 1997).

To restore the trust of investors in the US financial markets after the accounting scandals, the Sarbanes-Oxley act (SOX act) was implemented in July 2002. One important reason of the implementation of the SOX act is that firms' boards of directors were not able to appropriately fulfill their responsibilities in monitoring and controlling the manipulation of financial reports by a firm's management (Johnson, 2002). The goal of the SOX act is to protect firms' stakeholders against these potential management distortions of the firms' financial position (Valenti, 2008).

In order to protect firms' stakeholders against the potential intentional misalignment of financial statements by management, the SOX act made the top management of a firm personally responsible for the quality of financial reports. In other words, management should be involved in examining financial statements. Valenti (2008) found that the independence of the board of directors increased in the period after the SOX act, while actually this is not directly required by the act. According to the agency theory, a board of directors should be independent in order to efficiently monitor a firm's management (Davidson, Goodwin-Stewart, & Kent, 2005). Thus, it could be said that when the independence of the board is higher, the monitoring of management is performed more effectively. Thus, independence of a board of directors should lead to less earnings management. Therefore, in this master thesis, I investigate the effect of the independence of the board of directors on earnings management.

1.2 Research question

After the passage of the SOX act, it is found that the existence of real earnings management increased, while the existence of accrual-based earnings management

decreased (Graham, Harvey, & Rajgopal, 2005; Cohen, Dey, & Lys, 2008). Moreover, it is found that managers use real earnings management as a substitute for accrual-based earnings management (Zang, 2012). Aforementioned implicates that managers changed from accrual-based to real earnings management after the passage SOX Act, possibly because after the SOX Act it became more difficult for managers to conduct accrual-based earnings management without being caught and real earnings management is more difficult to detect. At the same time, an increase in the proportion of independent directors within the board is found (Valenti, 2008), even though this is not a requirement of the SOX Act.

According to the Agency Theory, a board of directors should be independent from the firm in order to function effectively. One of the tasks of the board of directors is to prevent or detect earnings management. The relation between the independence of the board of directors and earnings management has been investigated extensively in prior literature (Klein, 2002; Davidson, Goodwin-Stewart, & Kent, 2005; Bradbury, Mak, & Tan, 2006; Marra, Mazzola, & Prencipe, 2011). The focus in prior literature is on accrual-based earnings management. Real earnings management is barely considered in the context of board independence. Therefore, this master thesis will investigate whether more independence of the board of directors is effective in reducing both accrual-based earnings management and real earnings management. This yields to the following research question:

Is the independence of a board of directors negatively related to both accrual-based earnings management and real earnings management?

It is important to have an answer on this research question, because, as said before, earnings management is causing problems to the users of financial statements. Earnings management impairs earnings numbers. This results in financial reports not giving a true and fair view of a firm's performance, which is in conflict with main objective of financial reporting (Xu, Taylor, & Dugan, 2007). In the case of earnings management, namely, financial reporting does not provide users of financial statements with the best possible information about the firm performance to base their economic decisions on. Therefore, it is important to know whether a more independent board of

directors reduces earnings management. The answer on this research questions could have consequences on how firms structure there board of directors.

1.3 Purpose of the research

The purpose of this master thesis is to provide additional insights in the relation between independence of the board of directors and earnings management within US listed firms. I consider US listed firms because of data availability.

This master thesis aims to contribute to the existing literature by providing additional insights in the relation between independence of the board of directors and earnings management. Relatively little research is done on the effect of independence of the board of directors on real earnings management. Prior research focuses on accrual-based earnings management in particular. In this research, I also focus on real earnings management. Besides, this master thesis differs from prior research by taking the percentage of women in the board of directors into account.

1.4 Structure

The structure of this master thesis is as follows. In section 2, the theoretical framework, I will discuss the board of directors, the Agency Theory, the Stewardship Theory, and types of earnings management. Section 3 firstly will explain earnings management detection methods. I will make a distinction between methods to detect accrual-based earnings management and real earnings management. Also in section 3, I will discuss prior research on the relation between the independence of the board of directors and earnings management. Section 4 will present the data and methodology of this research. In section 5, I will present the results of this master thesis. Finally, in section 6, I will summarize this research, provide an answer on the research question and describe the implications and limitations of this research.

2. THEORETICAL FRAMEWORK

2.1 Board of directors

2.2.1 Board of directors in general

Corporate governance varies between countries. For example, US companies have a one-tier structure of the board of directors, while other countries such as France and Germany know a two-tier board structure. In this section, firstly the board of

directors and the difference between a one-tier and a two-tier board is discussed. The emphasis is put on the one-tier board, because my research focuses on US companies.

The board of directors is of great importance to companies (Ooghe & De Langhe, 2002). It performs advising activities and monitors management in the name of the shareholders, which are the actual owners of the firm. For shareholders it is difficult to monitor management because of several reasons. One of these reasons is the information asymmetry between management and the shareholders. Another reason is that shareholders often own shares of more firms at once, so it becomes difficult to monitor all of these firms at once. Consequently, the board of directors plays an important role in the corporate governance of a firm, because it connects shareholders with management.

A distinction can be made between one-tier and two-tier boards. US companies in general have a one-tier board structure, while other countries, such as France and Germany, have a two-tier board structure (Block & Gerstner, 2016). In the one-tier board, the board as a whole conducts the supervising and managing activities, in contrary to the two-tier board. The two-tier board is divided in an executive board, which conducts the managing activities, and a supervisory board, which conducts the supervising activities. The one-tier board generally consists of the chief executive officer (CEO), a chairperson and directors.

According to Block and Gerstner (2016), there are several advantages of a one-tier board compared to a two-tier board. Firstly, the information flow is more efficient, because there are more official board meetings, where every director has to be present. The decision-making process is faster and more efficient, because the managing activities and supervising activities are combined in one board. Therefore, no separate approval of decisions is required. Finally, the board better understands and is more involved with the business, because of the one-tier board structure.

The one-tier board structure also has certain disadvantages compared to the two-tier board. Firstly, the same body conducts the decision-making activities and the monitoring activities. This could be at the cost of the neutrality of the monitoring activities. In addition, the independence of the board cannot be guaranteed, because an

'independent' director within the board could also be good friends with a non-independent director. Finally, it could be difficult for the 'independent' directors to monitor a firm's management independently, because they work together and socialize with that same management in the same board on a daily basis. In a two-tier board, this problem could be present too, but it is less likely because the executive board and the supervising board are not combined in the same body. Therefore managing board members and the monitoring board members are not working together and socializing every day.

Thus, the board of directors is an important body within the corporate governance of a firm. As said, there is a difference between a one-tier and a two-tier board. However, it is hard to say which kind of board of directors is the better one, because both have advantages and disadvantages. It also depends on a country's economic environment and culture to decide which of the two is better for that country.

2.2.2   Independence of the board of directors

Because of the accounting scandals at the beginning of this century, the New York Stock Exchange (NYSE) and the National Association of Securities Dealers Automated Quotations (NASDAQ) proposed a new rule to the Securities and Exchange Commission (SEC) in 2002, concerning the independence of the board of directors. Within this rule, a majority of a board of directors should be "independent". An independent director has no material relation with the firm, except for being a member of the board of directors. There is a material relation between a director and a firm when the relation affects the decision-making process of the director of that firm. This means inter alia that a director is not allowed to get any significant fee from a firm, except from the management fee. An independent director (=non-executive member of the board) is also not allowed to be affiliated with the firm he is a director of, or with a subsidiary of this firm. For example, when the director is a prior employee of the concerned company, he cannot be classified as being independent. The same applies when a director owns shares of the company. Another example is that a director, which is a partner or employee at an audit firm, cannot be classified as being independent. The SEC accepted the rules regarding the independence of the board of directors in 2003. From 2004, firms had to comply with the new rules in order to be listed on the NYSE or NASDAQ.

2.2   Theories

In this section, the Agency Theory and the Stewardship theory are discussed. These theories can be used to describe the relationship between management and shareholders, and the role of the board of directors within this relationship. Firstly, the agency theory is explained followed by the stewardship theory. Thereafter, these two theories are compared.

2.2.1   Agency theory

The agency is a widely known theory used to describe the relation between a firm's shareholders and a firm's management. Therefore, in this section the agency theory is discussed.

Generally spoken there is a separation of ownership and control in contemporary US listed firms (Donaldson, 1990). Shareholders are the firm's owners while management governs the firm in name of the shareholders. In addition, the ownership of a contemporary firm is, divided by multiple shareholders (Jensen & Meckling, 1976). Shareholders, which provide capital to the firm, require the highest possible return on their investment. Management governs the firm in name of these shareholders and should act in their best interest. However, shareholders are not able to directly fully monitor management or only at unreasonably high costs. This results in information asymmetry between the owners of the firm and the firm's management. Because of the information asymmetry, shareholders cannot control whether management acts in their best interest. Consequently, the opportunity is raised that management acts in their narrow self-interest, at the cost of the wealth of shareholders and other external parties (Jensen, 1986). This situation will occur when there is a conflict of interest between a firm's management and its shareholders. This problem is explained by the agency theory, which is an organizational theory, designed by Jensen and Meckling (1976). They define an agency relationship as follows:

> "A contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent" (p. 308).

When the agency theory is applied to the relation between a firm's shareholders and management, the shareholders are the principals. They engage management as an

agent to be in control of the firm on their behalf. The board of directors monitors the management of a firm, because shareholders are not able to do so effectively. Hereby, the decision-making authority is assigned to the management. This makes the agency theory suitable to describe the relation between a firm's management and its shareholders. Management should act in the best interest of the shareholders. In practice, this is not always the case though, because shareholders cannot directly monitor management. Financial reporting should facilitate monitoring of management by shareholders. This function of financial reporting is commonly known as the stewardship function. The other function of accounting is to provide decision useful information to the users of financial statements. Financial reporting on its own is not fully capable of letting management act in the best interest of shareholders. One of the reasons is that financial numbers could be distorted, for example because of earnings management.

Corporate governance structures could be put in place to let management act in the best interest of shareholders (Donaldson & Davis, 1991). A board of directors is an example of such a structure. Within the framework of the agency theory, the board of directors should be independent from a firm's management to be effective (Davidson, Goodwin-Stewart, & Kent, 2005). According to Calkoen (2011), an independent director can be characterized by fulfilling two tasks: (1) to test and challenge the business strategy which is implemented by a firm's management, and (2) to monitor in which way a firm's business is executed. The board of directors is performing these tasks in name of the shareholders. A CEO, who is part of the board of directors, is an executive director. Another example of an executive director is a director who is employed by the firm.

2.2.2 Stewardship theory
Another, more modern theory used to explain the relation between a firm's shareholders and a firm's management is called the stewardship theory. In this section, the stewardship theory is explained.

Besides the agency theory, the stewardship theory emerged in prior literature to describe the relation between management and owners of the firm (Donaldson & Davis, 1991). Kessler (2013) provides the following definition of the stewardship theory:

"Caring and loyal devotion to an organization, institution, or social group."

As follows from the definition presented above, the stewardship theory assumes that management acts in the best interest of the firm and its shareholders rather than pursuing their individualistic behaviors as explained by the agency theory. One of the reasons for this according to the stewardship theory is that management is motivated by higher order needs, like personal growth and achievement. By acting in the best interest of the firm and its shareholders, managers can achieve these higher order objectives. In other words, management is motivated to perform as good as possible. The underlying reason for this is that management identifies itself as part of the firm, and therefore personal utility is gained when the firm achieves successes. Consequently, management has incentives to serve the firm in the best way possible. Hence, the stewardship theory suggests that managers are intrinsically motivated. Agency theory, on the other hand, emphasizes the inherent misalignment of interests between the management and shareholders in their principal-agent relationship. In sum, according to the stewardship theory, management aims to improve its own performance and the performance of the firm in order to maximize its own wealth. This is in the best interest of the shareholders of the firm.

2.2.3 Comparison

In this section, the agency theory and the stewardship are compared. Within the agency theory, management does not maximize profit for the shareholders when this is at the expense of its own wealth. A manager could try to maximize its own wealth by behaving opportunistically. Appropriate corporate governance mechanisms are necessary in order to let the management act in the best interest of the shareholders. A board of directors is an example of such a mechanism. There is evidence that the functions of CEO and chairperson of the board of directors should be separated for a board of directors to function appropriately (Donaldson & Davis, 1991). Otherwise, the interests of the CEO should be aligned with the interests of the shareholders by means of a specially designed compensation plan (Williamson, 1985). When there are no appropriate corporate governance mechanisms put in place, earnings management is likely to occur. Within the stewardship theory, aforementioned is not the case. Within the stewardship theory, management is motivated to performing as good as possible. Earnings management will not necessarily occur, even when the function of CEO and

the chairperson of the board are not separated. Therefore, when a significant relation between CEO duality and earnings management is found in this research, the agency theory is supported. When there is no significant relation between these variables, it could indicate that the stewardship theory holds.

2.3 Earnings management

2.3.1 Earnings management in general

Earnings management, which is the dependent variable of this master thesis, is causing problems to users of financial statements. It impairs the integrity of financial reporting. As a result, the reported earnings do not give a true and fair view of the underlying business performance. Therefore, it is important that earnings management is minimalized. In this section, different kinds of earnings management are explained.

The main objective of accounting is to provide the users of financial statements with the best possible information about the firm performance to base their economic decisions on (FASB, 1999). US GAAP standards allow management to apply management discretion in their financial reporting (Richardson, 2000). This management discretion can be used by management to provide the users of financial statements with private information about the firm. This is beneficial for the users of financial statements, because financial statements represent a firm's performance more fairly this way. However, this discretion can be used to manipulate reported earnings as well. When this happens, it is called earnings management.

Earnings management influences the decision-making process of the users of financial statements. For shareholders to make economic decisions, financial statements should be reliable. However, earnings management reduces this reliability. For shareholders it is difficult to examine whether the financial statements are reliable, because there is information asymmetry between management and outsiders. Earnings management compromises the integrity of financial reporting (Xu, Taylor, & Dugan, 2007). This makes earnings management of importance to regulators, shareholders, financial analysts and other users of financial statements.

2.3.2 Black, grey and white earnings management

In prior literature, three types of earnings management are distinguished: black, white and grey earnings management (Ronen & Yaari, 2008). Black earnings

management, alternatively referred to as opportunistic earnings management, is the intentional misrepresentation of financial information and fraud. Hereby management uses accounting tricks in order to mislead the users of financial statements to improve its own wealth. White earnings management, also called informative earnings management, entails management's accounting discretion, which can be used in order to enhance the transparency of financial statements. Hereby, the management signals its private information about the firm on future cash flows. White earnings management enhances the integrity of financial reporting. Grey earnings management is earnings management that is somewhere between black and white. Black earnings management has a negative effect on the integrity of financial reporting. Black earnings management is against the accounting rules, while white earnings management is not. Besides that, black earnings management is, generally spoken, at the cost of the wealth of shareholders. Therefore black earnings management is considered as fraud. In prior literature, several ways are developed to detect black earnings management. These detection methods of black earnings management are discussed in section 3.1.

As mentioned above, management could manipulate the financial statement information in its own best interest[1], which may decrease the credibility of the financial statements. This is referred to as black earnings management. In the literature, several definitions of black earnings management have emerged. The definition used in this master thesis, is the one by Healy and Wahlen (1999):

> "Earnings management occurs when managers use judgment in financial reporting and 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" (p. 368).

2.3.3 Accrual-based earnings management versus real earnings management

Another distinction that could be made in earnings management is the one between accrual-based earnings management and real earnings management (Cohen, Dey, & Lys, 2008). Within accounting, accruals can be used to mitigate the timing and

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[1] For example, earnings numbers could be manipulated upwards, because the management's bonuses are higher when the reported earnings are higher.

matching problem[2]. In addition, they can be used by management to signal private information about the firm to investors. However, accruals can also be used to conduct earnings management. For example, accruals can be used to meet or beat earnings benchmarks, like analyst forecasts. Abovementioned is called accrual-based earnings management. Accruals consist of a discretionary and a non-discretionary part. Discretionary accruals are based on management decisions, while non-discretionary accruals reflect the business condition. In other words, management has flexibility in creating discretionary accruals, while there is no flexibility in creating non-discretionary accruals.

Real earnings management, on the other hand, is conducted by manipulating real business activities (Xu, Taylor, & Dugan, 2007). With real earnings management, a firm deviates from its normal business activities in order to meet or beat short-term profit benchmarks. This could be at the cost of the future performance of a firm (Gunny, 2005). These business activities can be either operating and financing activities or investing activities. For example, management can manage the earnings of operating and financing activities by reducing discretionary expenses on research and development or by postponing a project to meet an earning target.

Zang (2012) finds evidence that managers use real earnings management as a substitute for accrual-based earnings management. When regulators implement rules against accrual-based earnings management, it is possible that managers choose to use real earnings management instead. Real earnings management causes the firm to deviate from normal business activities. For example, a certain investment can be postponed in order to defer the costs to a later period. It is important for regulators to take this into account, because real earnings management can be more costly to investors than accrual-based earnings management. This is because with real earnings management, a firm deviates from its normal course of business in order to meet or beat short-term profit benchmarks.

Cohen et al. (2008) found that before the Sarbanes-Oxley Act of 2002, accrual-based earnings management increased significantly, while real earnings management

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[2] Accruals refer to accrued revenues and accrued expenses. An accrued revenue occurs when revenues are recognized in the financial statements before the cash is received. An accrued expense occurs when expenses are recognized in the financial statements before cash is paid.

decreased. They do not solely attribute this directly to the passage of the SOX act. They also mention the increased watchfulness of auditors, investors and regulators, and the increased carefulness of management, as a consequence of the accounting scandals, for financial reporting as possible causes of the increase of real earnings management. Another possible reason for management to change to real earnings management is that real earnings management is more difficult to detect than accrual-based earnings management. In the period of 2000-2001, the period of the major corporate accounting scandals[3], accrual based earnings management increased more rapidly than in the period before. Thereafter, real earnings management increased significantly (Cohen, Dey, & Lys, Real and accrual-based earnings management in the pre- and post-Sarbanes-Oxley periods, 2008). Managers changed from conducting accrual-based earnings management to real earnings management. This is also consistent with the findings of Gunny (2005).

3.   LITERATURE REVIEW AND DEVELOPMENT OF PREDICTIONS

In this section, methods to detect earnings management are discussed firstly. Thereafter predictions, which are made in this master thesis, are developed.

3.1   Detecting earnings management

3.1.1   Basic concept of accrual-based earnings management detection methods

The basic concept of accrual-based earnings management detection methods is that accruals consist of a discretionary and a non-discretionary part (McNichols, 2000). Discretionary accruals depend on management's decisions and non-discretionary accruals not. In accrual-based detection methods, this discretionary part of accruals is a proxy for earnings management. Accrual-based models start with total accruals. A firm's total accruals can be calculated by using the financial statements. Accrual-based models are used to estimate the non-discretionary part of the accruals. Then the discretionary accruals can be determined by subtracting the estimated non-discretionary accruals from the total accruals. The following condition holds:

$$TA_t = NDA_t + DA_t \qquad\qquad (1)$$

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[3] One of the most well known accounting scandals was the one of Enron in 2001. Enron kept large amounts of debt off the balance sheet. Consequently, shareholders lost about $74 billion.

Where:

TA$_t$ = Total accruals for year t;

NDA$_t$ = Non-discretionary part of a firm's accruals in year t; and

DA$_t$ = Discretionary part of a firm's accruals in year t.

According to Jones (1991), the variables in accrual-based detection methods should be scaled against lagged total assets. This reduces heteroscedasticity issues within these models. The underlying reason for this is that, according to Jones (1991), the lagged total assets are positively related with the variance of the error term.

Dechow et al. (1995) discuss the following models in their research: the Healy Model, the DeAngelo Model, the Industry Model, the Jones Model and the Modified Jones Model. I follow their research and also discuss these models in my research.

3.1.2 Healy Model

The first research conducted to investigate whether discretionary accruals could be used to detect earnings management is Healy (1985). He states that managers manage earnings to increase their bonuses. When bonuses depend on (an increase of) the reported income, management is more likely to manage earnings upwards. This research tries to estimate in which periods earnings management is conducted by management. In some periods, the earnings are managed upwards and in some periods, the earnings are managed downwards by using the accruals. According to Healy (1985) the non-discretionary part of the accruals are constant in every period. The discretionary accruals are changing during time.

He uses total accruals as a proxy for discretionary accruals. Total accruals are the difference between reported earnings and the operational cash flow. The operational cash flow is what earnings would be when earnings management did not occur. Within his research, Healy (1985) calculates the average of the total accruals in a certain estimation period. These accruals are the non-discretionary accruals in the event period. The following equation is used to estimate the non-discretionary part of the accruals:

$$NDA_\tau = \frac{\sum_t TA_t}{T} \tag{2}$$

Where:

TA = total accruals;

T = the amount of year of the estimation period;

τ = a subscript which indicates the year in the event period; and

  t (1,2,…,T) = a subscript which indicates the years of the estimation period.

The equation above says that the non-discretionary accruals for a certain year τ are the average of the total accruals of the years within the estimation period.

This model is relatively easy to employ. However, there are certain limitations of this model. Firstly, non-discretionary accruals in the model of Healy (1985) are assumed to stay constant over time. This assumption, however, is not in line with the reality, because non-discretionary accruals are changing with a firm's business activities (Dechow, Sloan, & Sweeney, 1995). Thus, the model of Healy does not take into account the business activities of a firm. In the real world, business activities could change over time, which affects the non-discretionary accruals. Besides this, the model assumes that in the event period earnings management does not occur, which also is not in line with the reality. Finally, the total accruals are not a good proxy for discretionary accruals when the non-discretionary accruals are relatively high, compared to the discretionary accruals. The discretionary accruals are just a relatively small part of the total accruals in this case. This makes the average total accruals a bad proxy for discretionary accruals.

3.1.3 DeAngelo Model

DeAngelo's (1986) model is a variation of Healy's (1985) model. The difference between the two models is that DeAngelo uses previous year as estimation period, while Healy uses more years as estimation period. DeAngelo uses the change in total accruals in year t relative to year t-1 to estimate a firm's discretionary accruals. Healy uses the difference between the total accruals of year t and the average total accruals of the estimation period. DeAngelo assumes that the non-discretionary accruals of a firm are equal to its total accruals of year t-1:

$$NDA_t = TA_{t-1} \tag{3}$$

Where:

NDA$_t$ = non-discretionary accruals in the current period; and

TA$_{t-1}$ = total accruals in the previous period.

Taking into account that total accruals consist of discretionary and non-discretionary accruals, this model above implicates that according to DeAngelo (1986) the discretionary accruals can be estimated as follows:

$$DA_t = \Delta TA = TA_t - TA_{t-1} \tag{4}$$

The discretionary accruals in year t are equal to the change of total accruals compared to year t-1.

The DeAngelo model is relatively easy to employ. However, the DeAngelo model also has certain major limitations. This model, for example, assumes that in the prior period earnings management does not occur. It also assumes that the business activities, which are influencing the accruals, are not changing during time. This is not in line with the reality. This makes the discretionary accruals calculated with the DeAngelo Model a bad proxy for accrual based earnings management.

Both the Healy and DeAngelo model will be without any non-discretionary accruals estimation error when non-discretionary accruals do not change over time and the average discretionary accruals in the estimation period are equal to zero (Dechow, Sloan, & Sweeney, 1995). However, there will be estimation errors when non-discretionary accruals are changing over time. It depends on the circumstances which model better proxies accrual-based earnings management. For example, when the non-discretionary accruals are moving relatively stable around a certain mean over time, the Healy model would estimate the non-discretionary accruals more accurately. When the non-discretionary accruals follow a random walk, according to Dechow et al. (1995), the DeAngelo model would be a better choice.

3.1.4 Industry Model

The Industry Model is designed by Dechow and Sloan (1991). This model does not assume that non-discretionary accruals are constant over time, in contrast to the Healy model and the DeAngelo model. The Industry Model distinguishes between different industries, based on 2-digit SIC codes. The model is as follows:

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$$NDA_t = \gamma_1 + \gamma_2 . median(TA_t) \tag{5}$$

Where:

Median(TA_t) = the median of the total accruals, scaled by total assets at the end of year t-1, for firms in a specific industry.

The median of total accruals is calculated per industry year. Then the effect of the medians of the total accruals per industry on the non-discretionary accruals is determined. The discretionary accruals per firm are defined as the deviations from the industry median of the total accruals in the estimation period. Dechow, Sloan and Sweeney (1995) mention the limitations of this model in their study. Firstly, the Industry Model assumes there is no variation in the non-discretionary accruals within a certain industry. When the non-discretionary accruals of a specific firm are changing because of a change in its business activities, there is a relatively big chance that the median of the industry's total accruals is not changing. The median is less exposed to changes in specific observations compared to the mean, because it takes the middle observation within a sample, which is sorted from low values to high values. When a relatively small value changes with a relative small amount, it stays at the same side of the median. Consequently, the median stays the same. In this case, the change of the non-discretionary accruals is not taken into account when estimating the discretionary accruals. Secondly, this model does not take into account the correlation of the variation in non-discretionary accruals between firms within a certain industry. This becomes a problem when there are common incentives between firms to conduct earnings management within a certain industry.

3.1.5 Jones Model

Jones (1991) investigated earnings management during import reliefs. She designed an earnings management detection model without the assumption that non-discretionary accruals are constant, in contrast to Healy (1985) and DeAngelo (1986). Her model controls for the specific business conditions of a firm. This model is called the "Jones Model". The first step in this model is to determine the total accruals of a firm by using its financial statements or an online database. Secondly, the non-discretionary accruals are determined by using the following formula:

$$NDA = \left(\frac{\alpha_1}{A_{t-1}}\right) + \beta_1 . \Delta REV_t + \beta_2 . PPE_t \tag{6}$$

Where:

A_{t-1} = total assets at the begin of year t (end of year t-1;

NDA = non-discretionary accruals;

ΔREV_t = change in revenue in year t compared to year t-1 scaled by a firm's total assets at the beginning of year t (end of year t-1);

PPE_t = historical value of property, plant and equipment in year t scaled by total assets at the beginning of year t (end of year t-1).

With the previous equation taken into account, the total accruals scaled against a firm i's total assets at the end of year t-1 can be estimated with the following function:

$$TA_{it} = \left(\frac{a_{1i}}{A_{it-1}}\right) + b_{1i} . \left(\frac{\Delta REV_{it}}{A_{it-1}}\right) + b_{2i} . \left(\frac{PPE_{it}}{A_{it-1}}\right) + \varepsilon_{it} \tag{7}$$

a_{1i}, b_{1i} and b_{2i} are estimates, for the coefficients α_{1i}, β_{1i} and β_{2i} specific to firm i. These estimates are calculated based on data of the estimation period. The error term ε represents the estimated discretionary accruals for firm i in year t. Thus, the formula to estimate the discretionary accruals is as follows

$$DA_{it} = \varepsilon_{it} = \left(\frac{TA_{it}}{A_{it-1}}\right) - \left(\frac{a_{1i}}{A_{it-1}} + b_{1i} . \frac{\Delta REV_{it}}{A_{it-1}} + b_{2i} . \frac{PPE_{it}}{A_{it-1}}\right) \tag{8}$$

In summary, Jones (1991) regresses the total accruals on the change of revenues and the historical costs of the property, plant and equipment. The error term of this regression represents the discretionary accruals. The Jones Model is one of the most widely used models to detect earnings management. One assumption of this model is that the revenues are part of the non-discretionary accruals. However, according to Dechow, Sloan and Sweeney (1995), there is also a part of revenues that should be attributed to discretionary accruals, namely account receivables. In case earnings

management through accounts receivables exists, the Jones Model does not take into account this part of the managed revenues[4].

3.1.6 Modified Jones Model

Dechow, Sloan and Sweeney (1995) designed the Modified Jones Model, because the Jones Model assumed that revenues in total are part of the non-discretionary accruals, while in reality this is not the case. The Jones Model does not take into account that there is also a part of earnings that is directly under the management's discretion. Management can manage earnings directly through the account receivables. An example of this is given under footnote 5. Therefore, Dechow, Sloan and Sweeney (1995) modified the Jones (1991) model in the following way:

$$NDA = \left(\frac{\alpha_1}{A_{t-1}}\right) + \beta_1.(\Delta REV_t - \Delta REC_t) + \beta_2.PPE_t \qquad (9)$$

Where

ΔREC_t = change in the value of net receivables in year t compared to year t-1, scaled against the total assets at the beginning of year t (end of year t-1).

The only change compared to the Jones Model is that the amount of net accounts receivables is subtracted from the revenues in the event period. The coefficients and the non-discretionary accruals are obtained with the Jones Model. This implicates that the Modified Jones Model assumes that all the changes in net account receivables in the event period are discretionary accruals. The reasoning behind this, provided by Dechow, Sloan and Sweeney (1995), is that it is easier to manage earnings through credit sales than through cash sales, because management has more discretion over the recognition of credit sales.

Dechow, Sloan and Sweeney (1995) find that their Modified Jones Model is more powerful in detecting earnings management than the Healy Model, the DeAngelo Model, the Industry Model and the Jones Model. The Modified Jones Model is less

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[4] For example when management uses aggressive revenue recognition at the end of the year, when cash has not yet been received and it is still not sure whether the cash will be received in the future. Management could choose to recognize the earnings by increasing the account receivables and hereby manage the earnings upwards. Consequently, also the total accruals are increasing because of the increase in the trade receivables. This kind of earnings management is not recognized by the Jones Model.

likely to result in type II errors than the other models. A type II error in this case means that earnings management is not detected while in fact it did occur. With the original Jones Model, earnings management would not be detected when earnings management only through the account receivables is present.

3.1.7 Real earnings management detection methods

In this section, three real earnings management detection methods, implemented by Roychodhury (2006), are discussed. The three models follow the principle of the Jones Model and the Modified Jones Model. The only difference is that other proxies for earnings management than accruals are used. These proxies are intended to proxy earnings management through real activities (i.e. real earnings management). The following proxies for real earnings management: (1) abnormal cash flows from operations, (2) abnormal production costs, and (3) abnormal discretionary expenses. Firstly, the expected (or normal) values of these variables are estimated by using a regression model. Then the actual values are determined. These can be found in a firm's financial statements or in an online database, like Compustat. The proxies can be calculated by subtracting the normal values from the actual values. The basic idea behind this is that the normal values reflect the values when the firm is following its normal course of operations. Deviations from these normal values can be seen as manipulation of real activities by management with the goal of misleading shareholders. This manipulation can increase the profit of a firm in a certain period. For example by accelerating sales by giving abnormal high discounts.

According to Roychowdhury (2006), management can manage earnings upwards by manipulating sales. Management can do this by accelerating the sales and by generating sales that are not sustainable, for example by giving abnormal high discounts or extra beneficial credit terms for the customers. Although the earnings for the period in question will increase by doing so, this act of real earnings management results in abnormal cash flows from operations. Consequently, the incoming cash flows for a given level of sales are lower during a period with relatively high discounts or extra beneficial credit terms. When a firm does not give these discount or beneficial credit terms anymore, it is expected that earnings and cash flows return to their normal level. It follows that when current period sales are abnormal high or abnormal high compared to the previous period, caused by the high discounts or the extra beneficial credit terms,

the cash flow from operations is abnormal low. Therefore, the model, which is used to determine the estimated value of the abnormal cash flows from operations, is as follows:

$$CFO_{it} = \beta_0.\frac{1}{A_{it-1}} + \beta_1.Sales_{it} + \beta_2.\Delta Sales_{it} \qquad (10)$$

Where:

CFO$_{it}$ = value of cash flows from operations for firm i in year t, scaled against total assets at the beginning of year t (end of year t-1);

Sales$_{it}$ = value of firm i's total sales in year t, scaled against total assets at the beginning of year t (end of year t-1); and

ΔSales$_{it}$ = change of firm i's sales in year t compared to year t-1.

Another way for management to manage earnings is to accelerate the production. A firm can produce more goods than needed in order to meet demand. Doing this, a firm can spread its fixed production costs over more products. As a result, this will lower the fixed costs per product and the total costs per product as well, assuming the level of marginal costs stay the same. Thus, accelerating the production results in a decrease of total costs per unit of goods sold and an increase in the profit margin. However, other costs occur when the production is accelerated. For example storage costs, which belong to inventory costs. Because production is accelerated, not all products will be sold during the current period. Production expenses, like storage costs, will be expensed in the current period. This results in unusual high production expenses per given sales level. A firm's production expenses are calculated by summing up a firm's costs of goods sold and the change in inventory[5]. The model that is used to determine the estimated value of abnormal production costs is as follows:

$$PDEXP_{it} = \beta_0.\frac{1}{A_{it-1}} + \beta_1.Sales_{it} + \beta_2.\Delta Sales_{it} + \beta_3.\Delta Sales_{it-1} \quad (11)$$

Where

PDEXP$_{it}$ = the value of the production expenses of firm i in year t, scaled total assets at the beginning of year t (end of year t-1); and

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[5]$COGS_{it} = \beta_0.\frac{1}{A_{it-1}} + \beta_1.Sales_{it}$ and $\Delta INV_{it} = \beta_0.\frac{1}{A_{it-1}} + \beta_1.\Delta Sales_{it} + \beta_2.\Delta Sales_{it-1}$

ΔSales$_{it-1}$ = the change of firm i's sales in year t-1 compared to year t-2.

Management could also choose to reduce discretionary expenses to an unusual low level in order to manage earnings. Discretionary expenses consist of R&D expenses, advertising expenses and selling, general and administrative (SA&G) expenses. These expenses are recognized in the period in which they occur. However, in general they generate earnings, which are recognized in later periods. This is the reason why managers may choose to manage earnings through discretionary expenses. In general, current discretionary expenses are based on the sales in last period. Therefore, the model that is used to determine the estimated value of abnormal discretionary expenses is as follows:

$$DiscExp_{it} = \beta_0 . \frac{1}{A_{it-1}} + \beta_1 . Sales_{it-1} \qquad (12)$$

Where

DiscExp$_{it}$ = value of discretionary expenses for year i in year t-1;

Sales$_{it-1}$ = sales of firm i in year t-1.

In summary, Roychowdhury (2006) recognizes three ways of earnings management through real activities, namely: (1) accelerating sales by providing unusual high sales discounts or extra beneficial credit terms, (2) accelerating the production in order to lower the costs of goods sold, and (3) decreasing discretionary expenses to unusual low levels. These actions will affect the following variables: (1) cash flow from operations, (2) production expenses, and (3) discretionary accruals. Therefore, these variables are used as proxies for real earnings management. Evidence for the construct validity of the proxies used to detect real earnings management is found by Zang (2012), who performs two validity tests in her research. The first validity test is about the timing of managers to conduct real earnings management. She states that real earnings management is more likely to be conducted in the fourth quarter of a year, because in this quarter management knows whether it is necessary to manage earnings in order to meet or beat certain benchmarks regarding a firm's profits. She takes the quintile with observations with the highest values of each real earnings management proxy, and classifies these observations as suspect firms. She finds that the values of the

real earnings management proxies for these suspect firms are significantly higher in the fourth quarter than in the first three quarters. Therefore, the first test confirms the validity of the real earnings management proxies discussed before. The second validity test tests whether suspect firms are more likely to have a more negative future performance than other firms. As found by Gunny (2005), real earnings management negatively affects future firm performance. Zang (2012) finds that suspect firms indeed have a more negative future performance. The second validity test also confirms the construct validity of the real earnings management proxies. Concluding it can be said that the proxies for real earnings management, implemented by Roychowdhury (2006), actually measure what they intend to measure.

3.1.8 Discussion of the models

Dechow et al. (1995) find that, of the Healy Model, DeAngelo Model, Industry Model, Jones model and Modified Jones Model, the Modified Jones Model is the most powerful in detecting accrual-based earnings management. Although several other methods to detect accrual-based earnings management arose in prior literature, the Modified Jones Model is shown to be effective in detecting accrual based earnings management for US listed companies (Dechow, Sloan, & Sweeney, 1995). For example, models which use performance matching were developed in prior literature. These models should be used with caution. They should only be used when the omitted control variables are known.

The first reason that the Modified Jones Model is better than the other discussed accrual-based earnings management detection models that the Healy Model and the DeAngelo Model assume that the non-discretionary accruals are staying constant over time. However, non-discretionary accruals are changing with a firm's business activities. The Healy Model and DeAngelo model would lead to reliable estimates of discretionary accruals when a firm's business activities would remain the same over time. Since this is not the case in general, these models would lead to unreliable estimates of discretionary accruals.

Secondly, the industry model assumes that there is no variation in the non-discretionary accruals within a certain industry. The non-discretionary accruals are all set equal to the industry's median of total accruals. When a specific firm's non-

discretionary accruals would change because of a change in its business activities, there is a relatively small chance that the median of an industry's total accruals would change, as explained in section 3.1.4. This leads to situations in which the change in non-discretionary accruals is not taken into account. Besides this, the Industry Model has another issue. It does not take into account the correlation of the variation in non-discretionary accruals between firms within a certain industry. This would lead to estimation errors when there are, for example, common incentives between firms within an industry to manage earnings.

The Jones Model and the Modified Jones Model actually release the assumption that non-discretionary accruals stay constant over time. Thus, it takes into account the possible change in business activities of firms. Besides, the shortcomings of the Industry Model do not apply to the Jones Model and the Modified Jones Model. Taking the aforementioned into account, it could be said that the Jones Model and Modified Jones Model are, in general, more powerful in detecting accrual-based earning management than the other discussed models.

Of the Jones Model and the Modified Jones Model, the Modified Jones Model is preferred by Dechow et al. (2005), because the Jones Model sometimes leads to an underestimation of discretionary accruals. For example, when earnings are managed directly through discretionary earnings, like the account receivables. The Modified Jones Model considers this issue by subtracting the change in the account receivables from the change in revenues. This makes the Modified Jones Model the most powerful in detecting accrual-based earnings management of the discussed models. Although several other models arose in more recent prior literature, I choose to use the Modified Jones Model.

However, one issue applies to all the discussed accrual-based earnings management detection methods. Namely, Dechow et al. (1995) state that all the discussed methods to detect accrual-based earnings management lead to inaccurate predictions of discretionary accruals when a firm has an extreme high or low financial performance. The reason for this is that most of the independent variables in the accrual-based models are correlated with financial performance.

Although the volume of real earnings management is increasing after the passage of the SOX act, relatively little research is done on real earnings management compared to accrual-based earnings management. Roychowdhury (2006) provides three models that can be used to detect real earnings management. These models are shown to be construct valid by Zang (2012), as mentioned in section 3.1.7. This means that these models actually measure what they intend to measure. In addition, several prior researches use the models of Roychowdbury (2006) as dependent variable (Cohen, Dey, & Lys, 2008; Cohen & Zarowin, 2010). This implies that these real earnings management proxies are usable to detect real earnings management.

3.2 Independence of the board of directors

In this section, prior researches about the relation between board independence and earnings management are reviewed. Thereafter the predictions regarding the independence of the board of directors are developed. Firstly, the main variable of interest, the board independence, is discussed. Thereafter the control variables are discussed. These are: the proportion of female directors, the engagement with a Big-4 auditor, the board size, leverage (total liabilities divided by total assets), firm size (logarithm of total assets), the absolute value of net income scaled by lagged total assets, the absolute value of the change in net income scaled by lagged total assets, a dummy variable to indicate whether there was a loss in the previous period, and cash flow from operations scaled by lagged total assets.

3.2.1 Independence of the board of directors

According to the Agency Theory, it is important that the majority of a board of directors is independent from the firm and from the firm's management, because independent directors are more effective in monitoring activities. Independence in this context means that there may not be any material relation between a board member and a firm. Independence is important within a one-tier board, because managing and supervising activities are performed by the board as a whole. Non-independent directors may act in their own interest at the cost of shareholders' wealth when they are not monitored effectively. This means that the CEO and CFO could manipulate a firm's financial performance figures.

The relation between the independence of a board of directors and accrual-based earnings management has been investigated extensively in prior literature (Klein, 2002; Davidson, Goodwin-Stewart, & Kent, 2005; Bradbury, Mak, & Tan, 2006; Marra, Mazzola, & Prencipe, 2011).

Research of Klein (2002)

Klein (2002) investigates the relation between board and audit committee characteristics and earnings management. She uses a sample of 692 S&P 500 firms with the fiscal years 1992 and 1993.

She uses the proportion of non-executive directors in the board as proxy for board independence. An independent director is defined as not having any relation with the firm, except for being a member of the board. An adjusted version of the Jones Model, designed by Kasznik (1999), is used to estimate abnormal accruals, which serve as proxy for earnings management. This is called the "matched-portfolio technique". I will not elaborate on this method, because it is not relevant for my research. Klein uses two proxies for board independence. The first one is the proportion of independent directors within the board. The second one is a dummy variable, which takes value one if more than a half of the directors in the board is independent. She runs a separate regression for each of these measures of board independence, because differences in the definitions could alter the way in which firms are structuring their boards. Klein uses the following regression in her research:

$$AAAC_{it} = \beta_0 + \beta_1.BDIND_{it} + \beta_2.5\%BLOCK_{it} + \beta_3.\%CEO_{it} + \beta_4.MTB_{it} + \beta_5.ABSCHNI_{it} + \beta_6.LOSS_{it} + \beta_7.DEBT_{it} + \beta_7.SIZE_{it} + \varepsilon_{it} \tag{13}$$

Where:

AAA   = absolute value of adjusted abnormal accruals, calculated with the model of Kasznik (1999);

BDIND   = board independence; either the proportion of non-executive directors or a dummy variable which takes the value 1 when the majority (>50%) of the board is independent;

BLOCK   = a dummy variable which takes the value 1 when there

is at least one outside blockholder[6] within the audit
committee;

%CEO   = percentage of shares held by the CEO;

MTB   = market-to-book ratio (market value/book value);

ABSCHNI = absolute change in net income;

LOSS   = dummy variable which takes the value 1 when there is a
negative net income for at least two consecutive years
before current year;

DEBT   = debt divided by lagged total assets; and

SIZE   = firm size measured by the logarithm of total assets.

This regression is performed twice. The only difference between the regressions
is the measure of board independence. Klein (2002) uses two definition of board
independence. In the first regression, board independence is defined as the proportion of
non-executive directors. In the second regression, board independence is defined as the
majority of the board being independent. Therefore, board independence in the second
regression is measured by a dummy variable, which takes the value 1 when more than
half of the directors within the board is a non-executive auditor.

In these regressions, the following control variables are included because they
may be correlated with earnings management or with board independence: (1) an
indicator variable for the presence of a blockholder within the audit committee, (2) the
percentage of shares held by the CEO, market-to-book ratio, (3) absolute change in a
firm's net income, (4) an indicator variable to indicate whether a firm has at least a loss
in two consecutive years before current year, (5) long-term debt divided by lagged total
assets and (6) firm size (logarithm of total assets at the beginning of the year).

There is no significant relation found between the percentage of independent
directors within the board and earnings management. However, there is a significant
relation between whether the majority of the board is independent and earnings
management.

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[6] A blockholder in this context is defined as a large shareholder, which owns at least 5% of the shares and
is not affiliated with the firm.

A significant relation is found between the dummy variable, which takes the value 1 if the majority of the board is independent, and earnings management. There is no significant relation found between the proportion of independent directors and earnings management. Furthermore, the following control variables are significant in both regression models at a 5% significance level: market-to-book ratio, the absolute change in net income and long-term debt divided by lagged total assets.

Research of Davidson, Goodwin-Stewart & Kent (2005)

Davidson et al. (2005) investigate the effect of internal corporate governance mechanisms on earnings management. Their hypothesis is: Earnings management is negatively related with the independence of the board of directors. They motivate this with the agency theory. According to the agency theory, a board of directors should be independent from a firm in order to perform monitoring activities effectively.

For their research, they use a sample of 434 listed Australian firms with their fiscal year ending at the end of the year 2000. They opt for the cross-sectional version of the Modified Jones Model to determine which firms engaged in earnings management. Their reason to use the Modified Jones Model is that it is the most widely used method in prior literature to detect earnings management[7]. Thus the discretionary accruals, as determined by the Modified Jones Model, are a proxy for earnings management in this study. To determine whether a firm's board of directors is independent, two dummy variables are used. The first one takes the value 1 when the majority of the board members is a non-executive director and 0 when not. The second dummy variable to measure a board's independence, takes value 1 when there is CEO duality[8] and 0 otherwise.

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[7] To my opinion, this is a valid scientific motivation, not to compare to a situation where some people are jumping into the water and someone does the same without thinking. The reason for this is that researchers, whose work is published in scientific journals, have specific knowledge about the research they conduct.

[8] CEO duality refers to the situation where the roles of CEO and chairperson of the board of directors are fulfilled by two different persons.

The control variables considered in this research are: (1) presence of an internal audit function, (2) engagement with a Big-5[9] audit office, (3) percentage of shares held by the largest substantial shareholder, (4) a firm's leverage (total liabilities divided by total assets), (5) absolute change in net income, (6) a firm's size (logarithm of total assets), (7) absolute current earnings, (8) market-to-book ratio, and (9) and a dummy variable indicating extreme financial performance.

This results in the following regression:

$$DAC_{it} = \beta_0 + \beta_1.BDIND_{it} + \beta_2.INDCHAIR_{it} + \beta_3.AC_{it} +$$
$$\beta_4 ACIND_{it} + \beta_5.ACMEET_{it} + \beta_6.ACSIZE_{it} + \beta_7.IAF_{it} + \beta_8.BIG5_{it} +$$
$$\beta_9.SUBSH_{it} + \beta_{10}.LEV_{it} + \beta_{11}.ABSCHNI_{it} + \beta_{12}.SIZE_{it} +$$
$$\beta_{13}.ABSNI_{it} + \beta_{14}.MTB_{it} + \beta_{15}.EXTP_{it} + \varepsilon_{it} \qquad (14)$$

Where:

DAC = discretionary accruals calculated with Modified Jones
Model;

BDIND = dummy variable which takes value 1 when the majority of
the board is independent;

INDCHAIR = dummy variable which takes value 1 when the positions of
CEO and chairman of the board are not fulfilled by the
same person;

AC = dummy variable which takes the value 1 when there is an
audit committee;

ACIND = audit committee independence, either measured by a
dummy variable which takes the value 1 when the majority
of the audit committee is independent, or by the proportion
of independent directors within the audit committee;

ACMEET = number of official meetings of the audit committee;

ACSIZE = amount of directors within the audit committee;

IAF = dummy variable for the presence of an internal audit

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[9] In the time Davidson et al. (1998) conducted their research, there were 5 big accounting firms, called the 'Big-5'. In the period before 1998, there were six big accounting firms, called the 'Big-6'. In 2002 the Big-5 became the Big-4.

function;

BIG5	= dummy variable for the engagement with a Big-5 auditor;
SUBSH	= percentage of shares held by the largest shareholder;
LEV	= leverage (total liabilities divided by total assets);
ABSCHNI	= absolute change in net income divided by lagged total assets;
SIZE	= firm size measured by the logarithm of total assets;
ABSNI	= absolute net income divided by lagged total assets;
MTB	= market-to-book ratio (market value divided by book value);
EXTP	= a dummy variable for extreme financial performance, which takes the value 1 when a firm is in the top or bottom decile of firms from the sample regarding financial performance (net income divided by lagged total assets).

A significant and negative relation is found between whether the majority of the board of directors is independent and earnings management. In both the models, a negative and significant relation of 0,017 respectively 0,024 are found. Therefore, the first hypothesis is accepted. However, no significant relation between CEO duality and earnings management is found. Furthermore, the following control variables are significant at a 5% significance level: (1) absolute change in net income, (2) leverage, (3) firm size and (4) absolute net income.

Research of Bradbury, Mak & Tan (2006)

Bradbury et al. (2006) investigate the relation between governance and earnings management. They define governance as the characteristics of the board of directors and audit committees.

CEO duality exists when the CEO and chairperson of the board of directors are the same person. The role of the chairperson of the board is, among other things, to monitor the CEO. When there is CEO duality, a board of directors is not independent from management, because the CEO cannot monitor himself effectively (Bradbury,

Mak, & Tan, 2006). Therefore, the first hypothesis in the research of Bradbury et al. (2006) is that there is a positive relation between CEO duality and earnings management. Besides, they state that a larger board of directors is less efficient in monitoring management, because of coordination issues. Therefore, the second hypothesis is that the size of the board of directors positively affects earnings management. They also state that non-executive directors have a larger role in monitoring management than inside directors. The reason for this is that inside directors have more specific and inside information about the firm, because they are more engaged with the daily business activities, while the independent directors are more concerned with monitoring. Therefore, the third hypothesis is that the percentage of non-executive directors in the board negatively affects earnings management.

The sample for this research consists of 252 listed firms from the Singapore and Kuala Lumpur Stock Exchanges. They use an ordinary least squares (OLS) regression to test the relation between the dependent and independent variables. The dependent variable in this study is abnormal working capital accruals. They use abnormal working capital accruals, because they state that it is difficult for a firm's management to manage earnings through depreciation accruals. Earnings can be managed through depreciation accruals by changing the useful life of the property, plant and equipment or by changing the depreciation method. However, firms are required to disclose these changes in their financial statement. Besides this, it is also difficult to manage earnings through the timing of the depreciation expenses. Therefore, Bradbury et al. (2006) decide not to take into account the depreciation accruals. To determine the abnormal working capital accruals, they calculate firms' actual working capital accruals for year t as follows:

$$WCA_t = \frac{\Delta CA_t - \Delta CL_t - \Delta Cash_t}{TA_{t-1}} \tag{15}$$

Where

WCA_t = accruals of working capital;

ΔCA_t = change of the current assets compared to year t-1;

ΔCL_t = change of the current liabilities compared to year t-1;

$\Delta Cash_t$ = change of the cash compared to year t-1;

TA_{t-1} = total assets at the end of year t-1.

Thereafter they estimate the expected working capital accruals for year t, which can be seen as the normal working capital accruals, with the following OLS regression model:

$$WCA_{it} = \beta_{1it}\cdot\left(\frac{1}{TA_{it-1}}\right) + \beta_{2it}\cdot\left(\frac{\Delta REV_{it}-\Delta REC_{it}}{TA_{it-1}}\right) + \sum IDUM_{jt} + \varepsilon_{it} \quad (16)$$

Where

ΔREV_{it} = change of the revenues of firm i;

ΔREC_{it} = change of the accounts receivables of firm i; and

$\sum IDUM_{jt}$ = factor variable for the industry in which a firm operates, which takes the value 1 when a firm operates in that specific industry and 0 otherwise.

The abnormal accruals are calculated by subtracting the expected working capital accruals from the actual working capital accruals. The error term is equal to the abnormal accruals.

They include the following control variables: constitutional and managerial ownership, the presence of blockholders, a firm's market to book ratio, its leverage, its size and a dummy for losses of last year. They run five regressions to test their hypothesis. This leads to the following regression:

$$AAWCA_{it} = \beta_0 + \beta_1.CEODUAL_{it} + \beta_2.BDSIZE_{it} + \beta_3.BDIND_{it} +$$
$$\beta_4.BLKOWN_{it} + \beta_5.INOWN_{it} + \beta_6.MGROWN_{it} + \beta_7.LEV_{it} +$$
$$\beta_8.SIZE_{it} + \beta_9.MTB_{it} + \beta_{10}.LOSS_{it} + \varepsilon_{it} \quad (17)$$

Where:

AAWCA = absolute abnormal working capital accruals;

CEODUAL = dummy variable which takes value 1 when there is CEO duality and 0 otherwise;

BDSIZE = amount of directors within a board;

BDIND = proportion of independent directors within the board;

BLKOWN = dummy variable which takes value 1 when a blockholder holds more than 50% of the shares;

INOWN = institutional ownership;

MGROWN = dummy variable which takes value 1 when executive

directors together hold more than 50% of the shares;

LEV   = leverage (total debt/total assets);

SIZE   = firm size, calculated as the logarithm of total assets;

MTB   = market-to-book ratio (market value/book value);

LOSS   = dummy variable which takes the value 1 when the net

income of last year was negative.

They find no significant effect of CEO-duality and the proportion of independent directors on abnormal accruals. However, they find a significant relation of -0.045 between the proportion of independent directors in the audit committee and abnormal accruals. Furthermore, in the first model, there is a relation of -0.003 between board size and abnormal accruals, which is significant at the 10% significance level. In the second model, there is a relation of -0.004 between board size and abnormal accruals, which is significant at the 5% level. In addition, the following control variables are significant at a 5% significance level: institutional ownership and a loss reported in last year.

From this study, it can be concluded that audit committees are an effective corporate governance mechanism to reduce abnormal accruals and therefore enhance the quality of financial reporting. However, the sample size of the study is relatively small. This has a negative effect on the external validity of the research.

Research of Marra, Mazzola & Prencipe (2011)

Mara et al. (2011) investigate whether the board of directors will be more effective in reducing earnings management after the mandatory adaption of IFRS. More specifically, they investigate the effect of board independence and the presence of an audit committee on earnings management. Their sample consists of 244 Italian firms, which are listed on the Milan Stock exchange. The years 2003-2006 are considered. This results in a sample of 444 observations (after dropping 44 observations with missing values) before the mandatory adaption of IFRS in Italy from the beginning of 2005 and 444 observations after the mandatory adaption.

Two proxies are used to detect earnings management. The first proxy is abnormal working capital accruals. They do not use the Jones or Modified Jones model,

because these models could lead to errors when the amount of observations is small. This is the case for their study, which is based on 488 observations. This is the case for their sample of Italian firms. The abnormal working capital accruals are calculated as follows:

$$AWCA_t = WCA_t - \left(\frac{WCA_{t-1}}{S_{t-1}}\right) . S_t \qquad (18)$$

Where

$AAWCA_t$ = absolute abnormal working capital accruals in year t;

WCA_t = working capital accruals, excluding cash, in year t;

WC_{t-1} = working capital at the beginning of year t (end of year t-1);

S_t = sales during year t;

S_{t-1} = sales during year t-1.

The AWCA are scaled against a firm's total assets at the beginning of year t (end of year t-1). Furthermore, they are interested in the absolute value of AWCA, and not in whether it is positive or negative.

The second proxy that is used for earnings management is a dummy, which takes value 1 if there is a small positive net income, i.e. a net income between 0.00 and 0.01 euro's. They motivate the use of this proxy by stating that firm's try to achieve the zero-earnings benchmark. When the net income is close to zero, but slightly positive, this could implicate that earnings management takes place. The reason for this is that management tends to manage negative earnings towards the zero-earnings benchmark, until earnings are slightly above zero (Barth, Landsman, & Lang, 2008). Management could choose to manage earnings more upwards, but this is unnecessary in order to meet the zero-earnings benchmark.

In the research of Marra et al. (2011), independence of the board of directors is measured by the proportion of independent directors within the board. The following control variables are included in this research: (1) board size, (2) dummy indicating the presence of an audit committee, (3) presence of a financial expert within the audit committee, (4) CEO duality, (5) presence of an engagement with a Big-4 auditor, (6) firm size, (7) leverage, (8) cash flow from operations (scaled by total assets at the end of

year t-1), (9) return on investment, (10) presence of negative net income in year t-1, (11) percentage of the shares held by a firm's largest shareholder and (12) dummy to indicate whether a firm applies IFRS.

They run two regressions for each of the earnings management proxies. One regression is run for the period before the mandatory IFRS-adaption in Italy and one for the period after the adaption. They find an insignificant relation between the board independence and accrual-based earnings management before the IFRS-adaption, and a significant relation of 0.2044 in the period after the adaption. Furthermore, significant control variables for both periods at a 5% significance level are: the presence of a financial expert within the audit committee, the firm size, the leverage, the cash flow from operations and the presence of a negative net income in year t-1. For the second regression, with the dummy variable for the presence of a small positive net income, they find that the independence of the board of directors is significant at a 5% significance level in both of the periods. The relation between the independence is -0.0325 in the period before the IFRS adaption and -0.0779 in the period after the adaption. Furthermore, they find a significant relation at a 5% significance level for the following control variables in both of the periods: firm size, leverage, cash flow from operations, return on investment and the presence of a negative net income in year t-1.

3.3   Hypothesis

Prior literature investigated the effect of the board of directors on earnings management extensively (Klein, 2002; Davidson, Goodwin-Stewart, & Kent, 2005; Bradbury, Mak, & Tan, 2006; Marra, Mazzola, & Prencipe, 2011). It is shown that the independence of the board of directors is effective in reducing accrual-based earnings management. Researchers use different proxies for this accrual-based earnings management and for the independence of the board of directors. The focus in these researches is mainly on accrual-based earnings management. However, as to my knowledge, very few to no researches investigate the effect of board independence on real earnings management at the time of writing this thesis.

The extent to which real earnings management takes place is growing after the implementation of the SOX act, while the extent to which accrual-based earnings management takes place is declining, as pointed out by Graham et al. (2005) and Cohen

et al. (2008). A reason why managers are switching from accrual-based to real earnings management could be that real earnings management is more difficult to detect (Cohen & Zarowin, 2010). According to Zang (2012), real earnings management could be more costly to investors than accrual-based earnings management. It is important that the use of real earnings management gets constrained, in order to protect shareholders. As indicated before, prior research shows the effectiveness of the independence of the board of directors in reducing accrual-based earnings management. However, it is not clear yet whether the independence of the board of directors is effective in constraining real earnings management. I investigate this in my master thesis. The following predictions are made:

H1: The proportion of independent members of a board of directors is negatively associated with the extent to which accrual-based earnings management is conducted.

H2: The proportion of independent members of a board of directors is negatively associated with the extent to which real earnings management is conducted.

4. RESEARCH DESIGN

For my research, a cross-sectional research design is used. I run this regression in Stata. The final sample consists of 4,455 US listed firms. The dependent variables are estimated per industry year, with a minimum of 10 observations per industry year. Davidson et al. (2005) use 8 observations per industry year. I choose to use 10 observations per industry year, because more observations per industry year make the model more reliable. The negative side of taking more observations per industry year is that this is at the cost of the amount of total observations. In this section, firstly the sample selection process is explained. Thereafter the conceptualization of the dependent and independent variables is discussed. Finally, the control variables are covered.

4.1 Data

For this research, I use all the data available of US listed companies. Data regarding firms' fundamentals is retrieved from the Compustat database. Data regarding firms' corporate governance statistics is retrieved from the Institutional Shareholders Services (formerly Risk Metrics) database. The minimum year for which the data is

available in the International Shareholders Services database is 2007. Therefore, I use data from the years 2007-2015. Matching the datasets, results in 11,928 observations. Following Bédard (2004), I drop data from regulated firms[10], financial firms[11] and governmental firms[12], because these firms have special accounting practices. This makes the estimation of the abnormal cash flow from operation, abnormal cost of goods sold, abnormal discretionary expenses and discretionary accruals difficult. Consequently, 2,825 observations are dropped. Thereafter, the following illogical observations are dropped: firms with total assets, costs of goods sold, inventories or sales, which are negative or equal to zero, and firms with negative values of gross property, plant and equipment, trade receivables, advertising expenses, R&D-expenses or selling and administrative expenses. This results in 1,118 observations to be dropped. Ten duplicates are removed. Thereafter, 2,697 observations with missing values, necessary to calculate the earnings management proxies, are dropped. The variables, which are used as proxy for real earnings management respectively accrual-based earnings management, are estimated per industry year with at least 10 observations, 823 observations are removed. This results in a final sample of 4,454 US listed firms with fiscal years of 2007 up to and including 2015. Table 1 summarizes the sample selection process.

Table 1
Sample selection

	Amount of observations
Initial sample after merging databases	11,928
Less:	
Firms with special accounting practices	(2,825)
Illogical observations	(1,118)
Duplicates	(10)
Missing values	(2,697)
Less than 10 observations per industry year	(823)
Final Sample	4,455

Note: The data is retrieved from Compustat and the Institutional Shareholder Services (ISS) database (formerly Risk Metrics).

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[10] SIC codes 4000 to 4900
[11] SIC codes 6000 to 6900
[12] SIC codes 9900.

4.2 Method
4.2.1 Conceptualization of earnings management

For the first hypothesis, I run a regression with the absolute discretionary accruals (DAC) as dependent variable. The discretionary accruals are estimated by using the Modified Jones Model, because this is the most frequently used method in prior literature (Davidson, Goodwin-Stewart, & Kent, 2005). Dechow et al. (1995) showed that this method is more powerful than the Healy Model, DeAngelo Model, Industry Model, Jones Model and Modified Jones Model, as explained in section 3.1.8. According to Bradbury et al. (2006) and Marra et al. (2011), the Modified Jones Model can be exposed to estimation errors when it is applied to small samples. In my thesis, the sample is relatively large (4,455 observations). Furthermore, according to Dechow et al. (1995) the Modified Jones Model can be unreliable when applied to firms with extreme financial performance. In order to increase the reliability of the Modified Jones Model, I use the winsorize option in Stata. I use this option to set the 1% of smallest respectively largest observations of revenues (REV) equal to the 1st percentile respectively the 99th percentile.

For the second hypothesis, I use the method of Roychowdhury (2006) to calculate real earnings management proxies. I chose to use this method, because several prior studies use these variables as a proxies for real earnings management, and therefore it can be assumed that these variables are actually measuring real earnings management (Cohen, Dey, & Lys, 2008; Cohen & Zarowin, 2010; Zang, 2012). This assumption is strenghthened by the two validity tests of Zang (2012), discussed in section 3.1.7, which showed that these measures of real earnings management are construct valid[13]. As follows from the models of Roychowdhury (2006), the following proxies of real earnings management are used as proxies for real earnings management:

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[13] Construct validity refers to how accurately a variable measures what it intends to measure. In this case, it refers to how accurately the measures of the models of Roychowdhury (2006) measure real earnings management. Construct validity is different from internal validity, which refers to the question whether an independent variable actually *causes* the change of the dependent variable. However, this is an association study and not a causality study.

(1) abnormal cash flows from operations (ABNCFO), (2) abnormal production expenses (ABNPDEXP), and (3) abnormal discretionary expeneses[14].

All the earnings management proxies are estimated per industry-year, in order to control for year effects and industry effects. Furthermore, I use the absolute values of these earnings management proxies, because I am interested in the extend to which earnings management took place, and not in whether the earnings are managed upwards or downwards.

4.2.2 Conceptualization of board independence

In prior literature, the independence of the board of directors is conceptualized in several ways. One of these ways, is by taking the proportion of the non-executive directors (Klein, 2002; Xie, Davidson, & DaDalt, 2003; Davidson, Goodwin-Stewart, & Kent, 2005; Bradbury, Mak, & Tan, 2006). This is done either by taking the proportion of non-executive directors, or by creating a dummy variable, which takes the value 1 when the proportion of non-executive directors exceeds a certain value, and the value 0 otherwise. Usually, this proportion is set to 50%, in order to indicate whether the majority of the board is a non-executive or not. However, as pointed out in section 2.2.2., the rules regarding board independence became more stringent. A director cannot be classified as being independent, when s/he has any material relation with a firm. Consequently, a non-executive director is not independent anymore per se. Davidson et al. (2005) state in the limitations of their research that "a more refined classification" of board independence would be a more informative proxy for the monitoring abilities of the board of directors.

The requirements of the NYSE and NASDAQ regarding the independence[15] of a board of directors provide this more refined classification. Therefore, I follow Marra et al. (2011), and measure the independence of the board of directors (BOARDIND) as proportion of independent directors within the board, whereby independence is determined based on the new definition. Thereby, I use the requirements regarding the independence of the board of the NYSE and the NASDAQ as benchmark.

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[14] Discretionary expenses are defined as: R&D expenses, advertising and selling, general and administrative (SA&G) expenses.
[15] The definition of "independent" is discussed in section 2.2.2.

4.2.3 Control variables

I include control variables, which probably affect real earnings management Firstly, I include a dummy variable, which takes the value of 1 when the audit firm is a Big-4 firm, and the value 0 otherwise (BIG4). I do this, because Becker et al. (1998) find a significant negative relation between the quality of an audit firm and earnings management. This is because it is expected that a bigger audit firm delivers more audit quality and thereby reduces the probability of earnings management within the audited firm. They use a Big-6 audit firm as proxy for a high quality audit firm.

Secondly, I include a variable that indicates the proportion of female directors (PROPFEM), because Arun et al. (2015) find evidence that the proportion of female directors within a board of directors is negatively associated with earnings management. This is because women in general are possibly less tolerant against earnings management, because women have a more ethical nature than men (Gul, Fung, & Jaggi, 2009).

Thirdly, I include a variable indicating the amount of directors within the board (BDSIZE), because Bradbury et al. (2005) find a negative relation between the size of the board of directors and earnings management.

Following Klein (2002), I include leverage (LEV), measured by the total debt divided by the total assets, as control variable, because Klein (2002) finds a positive relation between the leverage of a firm and earnings management and between the absolute change in net income and earnings management.

Besides, I also include the absolute change in net income (ABSCHNI), compared to last year and scaled by a firm's total assets. Namely, Davidson et al. (2005) find a negative association between firm size and earnings management.

Furthermore, I include firm size, as measured by the logarithm of total assets, as control variable. I do this, because Davidson et al. (2005) also find a positive association between a firm's absolute net income and earnings management.

I include a dummy variable (LOSS), which takes the value 1 when the firm has a negative net income excluding extraordinary items, and the value 0 otherwise, because

Bradbury et al. (2006) find a positive relation between whether the firm had a loss last year and the level of earnings management.

Finally, I include a firm's cash flow from operations scaled by its lagged total assets (CFO) as control variable, because Marra et al. (2011) find a negative relation between cash flow from operation and earnings management.

4.3   Regression models

In order to deal with extreme values, the winsorizing-option of Stata is used. By using two-sided winsorizing, most the left-sided 1% most extreme values are set equal to the 1st percentile, while the most right-sided 1% outliers are set equal to the 99th percentile. By using one-sided winsorizing, only the left sided outliers are set equal to the 1st percentile or the right-sided outliers are set equal to the 99th percentile. In this way there is dealt with outliers that are possibly spurious. The variable CFO is winsorized two-sided. The following variables are winsorized right-sided: ABNSNI, LEV and ABSCHNI.

The association between the dependent and independent variables, taking the control variables into account, is tested by an ordinary least squares (OLS) regression. I use a linear regression, because the dependent variable is a continuous variable. Moreover, I follow prior literature by using a linear regression, since prior literature also uses OLS for similar regression models (Bradbury, Mak, & Tan, 2006; Marra, Mazzola, & Prencipe, 2011).

$$EM_{it} = \beta_0 + \beta_1.BDIND_{it} + \beta_2 CEODUAL_{it} + \beta_3 PROPFEM_{it} +$$
$$\beta_4.BDSIZE_{it} + \beta_5.LEV_{it} + \beta_6.ABSCHNI_{it} + \beta_7.FSIZE_{it} +$$
$$\beta_8.ABSNI_{it} + \beta_9.LOSS_{it} + \beta_{10}.CFO_{it} + \varepsilon_{it} \qquad (19)$$

Where:

EM = absolute value of earnings management proxies, which are DAC (model 1), ABNCFO (model 2), ABNPDEXP (model 3) and ABNDCEXP (model 4);

BOARDIND = independence of a firm's board of directors, measured as the proportion of independent directors;

CEODUAL = dummy variable, which takes the value 1 when there

	is CEO duality, and the value 0 otherwise;
PROPFEM	= proportion of female directors within a board;
BDSIZE	= size of the board of directors;
LEV	= firm's leverage, calculated by total debt liabilities by total assets;
ABSCHNI	= absolute change in net income, scaled by lagged total assets;
FSIZE	= firm size, measured by the logarithm of the total assets;
ABSNI	= absolute value of net income, scaled by lagged total assets;
LOSS	= indicator variable, which takes the value 1 when there is a negative reported net income in the previous period, and the value 0 otherwise;
CFO	= firm's cash flow from operations scaled by its lagged total assets;
ε	= error term for firm i in year t;
i	= subscript, indicating the firm; and
t	= subscript, indicating the period.

Earnings management (EM) takes either the absolute value of discretionary accruals (DAC) in model 1, as calculated by the Modified Jones Model, or the absolute value of the abnormal cash flows from operations (ABNCFO) in model 2, abnormal production costs (ABNPDEXP) in model 3, and abnormal discretionary expenses (ABN DISCEXP) in model 4, as calculated by the models of Roychowdhury (2006). I use absolute values of the earnings management proxies, because I am interested in the magnitude of the earnings management conducted, and not in whether earnings are managed upwards or downwards. By doing this, I follow Davidson et al. (2005).

5 RESULTS

5.1 Descriptive statistics

The descriptive statistics of the regression models are shown in table 2. The continuous variables are described in Panel A and the dummy variables are described in

Panel B. The total observations are 4,455 for each variable. Panel A shows the mean values of the accrual-based earnings management proxy (DAC) and of the real earnings management proxies (ABNCFO, ABNPDEXP and ABNDCEXP). The means are 0.12, -0.023, 0.023 and -0.007 respectively. Furthermore, it shows that on average, 80.4% of the firms' board of directors is independent. The proportion of female directors within a board of directors is 0.136 on average. The average board of directors consists of approximately nine members. The average leverage, calculated by dividing total liabilities by total assets, of the firms within the sample is 0.506. The absolute change in net income, scaled by lagged total assets, is 0.041 million dollars on average. The average firm size, measured by the log of the total assets, is 7.981 million dollars. The absolute net income scaled by lagged total assets, is 752 on average. Finally, the average cash flow from operations, scaled by a firm's lagged total assets, is 0.118 million dollars on average.

Table 2
Descriptive statistics

Panel A: Descriptive statistics continuous variables

Variable	Observations	Mean	Standard Deviation	Minimum	Median	Maximum
Discretionary accruals (DAC)	4,455	-0.007	0.050	-0.283	0.004	0.222
Abnormal cash flows from operations (ABNCFO)	4,455	0.012	0.068	-0.338	0.011	0.263
Abnormal production expenses (ABNPDEXP)	4,455	-0.023	0.153	-0.803	-0.021	0.992
Abnormal discretionary expenses (ABNDISCEXP)	4,455	0.023	0.159	-0.766	0.0003	0.928
Proportion of independent directors (BDIND)	4,455	0.804	0.105	0.538	0.833	1
Proportion female directors (PROPFEM)	4,455	0.136	0.110	0	0.125	0.75
Board size (BDSIZE)	4,455	9.250	2.074	4	9	15
Leverage (LEV)	4,455	0.506	0.216	0.033	0.514	3.251

Absolute change in net income (ABSCHNI)	4,455	0.041	0.082	0	0.018	1.820
Logarithm of total assets (FSIZE)	4,455	7.981	1.580	4.077	7.898	12.710
Absolute net income (ABSNI)	4,455	751.658	1675.493	0.097	149.422	11,809
Cash flow from operations (CFO)	4,455	0.118	0.075	-0.087	0.106	0.368

Panel B: Descriptive statistics dummy variables

	Observations	Percentage of observations with value 1
Firms with a Big-4 auditor (BIG4)	4,455	92.7%
Negative net income after extraordinary items in previous year (LOSS)	4,455	12.8%

Notes: see section 4.3 for a description of the variables.

5.2 Possible problems with regression models

In this section some problems, which affect the reliability of a regression analysis in a negative manner, are discussed. Firstly, multicollinearity is considered. Thereafter, heteroscedasticity is discussed.

5.2.1 Multicollinearity

In a multiple regression, it is assumed that the independent variables are independent of each other. When this is not the case, it is called multicollinearity. In other words, there is multicollinearity when two or more independent variables are correlated with each other. Multicollinearity decreases the reliability of a regression model. Therefore, the multicollinearity should not be too high. According to Studenmund (2011), the multicollinearity within a regression model can be tested by using the variance inflation factors (VIF). The VIF-value shows to which extend the variation of a variable within a regression model is increased because of multicollinearity. For example, a VIF of 4 means that the variation of an independent variable is inflated to four times its own size, because of the existence of multicollinearity. A rule of the thumb is that a VIF of four indicates that the variation is inflated too much because of multicollinearity. This means that the standard deviation

of a variable should not be inflated to higher than two times its own size, since the standard deviation is the square root of the variance. Table 3 shows the VIF-factors of the dependent variables used in my research.

Table 3
Multicollinearity test

Variable	VIF[a]
BOARDIND	1.23
BIG4	1.41
PROPFEM	1.22
BDSIZE	1.81
LEV	1.66
ABSCHNI	1.29
FSIZE	2.24
ABSNI	1.71
LOSS	1.40
CFO	1.90

[a]VIF = variance inflation factor.

Table 3 shows that none of the VIF-values is higher than four. This implicates that there is no reason to assume that multicollinearity is present within the regression model.

5.2.2 Heteroscedasticity

Another possible problem that makes regression models less reliable is heteroscedasticity. Heteroscedasticity means that the standard deviations of the error terms, given the independent variables, are not constant. In other words, the error terms are dependent of the value of the independent variable in the case of heteroscedasticity. To test for heteroscedasticity, I use the Breusch-Pagan test. This test gives a chi² value of 440.31 and a *p*-value of 0.000. This means that the null-hypothesis of homoscedasticity if rejected. According to Studenmund (2011), a White-Huber standard error can be used to deal with heteroscedasticity. This is a heteroscedasticity robust

standard error. Therefore, I use the option of Stata to include a robust standard error in the regression models.

5.3   Regression analysis

Table 4 shows the results of the four regression models. No significant relation is found between the proportion of independent directors and discretionary accruals (model 1). This is consistent with the research of Klein (2002) and Bradbury et al. (2006), who find an insignificant relation between the proportion of independent directors and earnings management. Klein (2002), however, does find a significant relation between whether the majority of the board of directors is independent and accrual-based earnings management.

A negative association is found between the three measures of real earnings management and the proportion of independent directors (model 2, 3 and 4). The association found between the proportion of independent directors and abnormal operating cash flow is -0.027. The association between the proportion of independent directors and abnormal production expenses is -0.076. The association between the proportion of independent directors and abnormal discretionary expenses is -0.126. All of these associations are significant at the 1% level. This supports H2 that the proportion of independent directors within a board is negatively associated with the extent to which real earnings management is conducted.   It   follows   from   the regression results of table 4 that the proportion of the board of directors, given that the majority of the board is already independent, is negatively associated with the real earnings management proxies.

Table 4
Regression results

Variables	Prediction	Model 1[a]	Model 2[b]	Model 3[c]	Model 4[d]
Constant		0.050*** (0.000)	0.032*** (0.002)	0.058*** (0.009)	0.096*** (0.000)
BDIND (H1)	-	-0.005 (0.414)	-0.027*** (0.000)	-0.076*** (0.000)	-0.126*** (0.000)
BIG4	-	0.003 (0.163)	0.009*** (0.001)	0,016** (0.024)	0.008 (0.211)

		Model 1	Model 2	Model 3	Model 4
PROPFEM	-	0.003 (0.629)	-0.006 (0.410)	0.064** (0.001)	0.071*** (0.000)
BDSIZE	-	0.001* (0.087)	-0.0004 (0.317)	-0.001 (0.618)	-0.001 (0.188)
LEV	+	0.004 (0.193)	0.003 (0.448)	0.054*** (0.000)	0.033*** (0.002)
ABSCHNI	+	0.136*** (0.000)	-0.005 (0.726)	0.049 (0.190)	0.092** (0.017)
FSIZE	-	-0.001** (0.034)	-0.001** (0.025)	-0.002 (0.232)	-0.005*** (0.001)
ABSNI	+	0.078*** (0.000)	0.171*** (0.000)	0.198*** (0.000)	0,144*** (0.003)
LOSS	+	0.021*** (0.000)	0.010*** (0.000)	-0.015*** (0.002)	0.006 (0.257)
CFO	-	0.022 (0.161)	0.113*** (0.000)	0.178*** (0.000)	0.105*** (0.004)
Year fixed effects		Included	Included	Included	Included
Industry fixed effects		Included	Included	Included	Included
Adjusted R²		0.206	0.196	0.232	0.285
F statistic		16.47 (0.000)	22.39 (0.000)	48.25 (0.000)	96.63 (0.000)

Note: [a] The dependent variable in model 1 is the absolute value of discretionary accruals as calculated by the Modified Jones Model. [b] The dependent variable in model 2 is the absolute value of abnormal cash flow from operations as calculated by the model of Roychowdhury (2006). [c] The dependent variable in model 3 is the absolute value of abnormal production expenses, as calculated by the model of Roychowdhury (2006). [d] The dependent variable in model 4 is the absolute value of abnormal discretionary expenses, as calculated by the model of Roychowdhury (2006). See section 4.3 for a description of the independent variables. *** means that the relation between the dependent and independent variable is significant at the 1% level, ** means that the relation is significant at the 5% level, and * means that the relation is significant at the 10% level (*p*-values in parentheses). A White-Huber (robust) standard error is used, because this standard error is heteroscedasticity-robust. Year fixed effects and industry fixed effects are included, in order to control for the effects of years and industry.

It turns out that there is a significant positive relation between the engagement with a Big-4 audit firm and both absolute abnormal cash flow from operations and

absolute abnormal production expenses, although Becker et al. (1998) finds a negative relation between the engagement with a Big-4 audit firm and earnings management. This could be explained by the fact that recent research found that a bigger audit firm does not necessarily deliver a higher audit quality per se (Eshleman & Guo, 2014). It is also found that the proportion of female directors within the board of directors is significantly positively related to absolute abnormal production expenses and absolute discretionary expenses (model 3 and 4). Future research is needed to investigate this positive relation, because previous research found a negative relation between the proportion of women within the board and earnings management (Arun, Almahrog, & Aribi, 2015). The size of the board of directors is not significantly related to real earnings management, although the sign is negative as predicted. Leverage has a positive and significant association with both absolute abnormal production expenses and absolute abnormal discretionary expenses. A significant relation is found between the absolute change in net income, and both discretionary accruals (model 1) and absolute abnormal discretionary expenses (model 4). This is in accordance with the predictions made. Furthermore, highly levered firms are expected to conduct relatively more earnings management, as measured by absolute abnormal production expenses (model 3) and absolute abnormal discretionary expenses. Furthermore a significant negative association is found between firm size, and both accrual-based earnings management (model 1) and real earnings management (model 2 and 4). The negative sign of the relation is consistent with the prediction made. Absolute net income is significantly and positively related to all of the measures of real earnings management, as predicted. Firms that reported a negative net income in the previous year are likely to have higher values of absolute discretionary accruals, absolute cash flow from operations and absolute production expenses. The sign is consistent with the prediction made. Finally, cash flow from operations is negatively and significantly related to all the proxies of real earnings management, which is also consistent with the prediction made.

Thus, ceteris paribus, it can be said that firms with a higher proportion of independent directors within the board, are more likely to have higher absolute values of abnormal cash flow from operations, abnormal production expenses and abnormal

discretionary expenses. This implicates that the relation between the percentage of independent directors within the board and real earnings management is negative.

6   CONCLUSION

6.1   Summary

The accounting scandals at the beginning of this century led to the implementation of the SOX act in 2002 in the US. Because of the regulations of the SOX act, it became more difficult for firms to conduct accrual-based earnings management. Managers possibly switched to real earnings management, because this is more difficult to be detected (Graham, Harvey, & Rajgopal, 2005; Cohen, Dey, & Lys, 2008). Earnings management could be causing even more damage to investors than accrual-based earnings management (Zang, 2012). This makes it important to investigate which factors could reduce real earnings management. This research investigated whether a higher proportion of independent members of the board of directors could reduce real earnings management. To investigate this, the following research question is formed:

Is the independence of a board of directors negatively related to both accrual-based earnings management and real earnings management?

To give an answer on this research question, a cross-sectional research was conducted with a sample of 4,455 US firms with fiscal years between 2007 and 2015. Accrual-based earnings management was measured with the Modified Jones Model. Real earnings management was measured with the three measures, calculated with the models of Roychowdhury (2006). The proportion of the independent directors within a board was used as main independent variable. A negative but *insignificant* relation is found between the proportion of independent directors and discretionary accruals. This implicates that there is no reason to assume that a higher proportion of independent directors within a board will reduce accrual-based earnings management. However, a negative relation is found between the proportion of independent directors and the proxies for real earnings management (i.e. abnormal cash flow from operations, abnormal production expenses and abnormal discretionary accruals), which is significant at the 1% level. Therefore, there is reason to assume that a higher proportion

of independent directors reduce the extent to which real earnings management is conducted.

6.2   Implications

One requirement for US-firms to be listed on a stock exchange is that the majority of their board of directors is independent. My research shows a negative association between the proportion of directors and real earnings management. This implicates, that even if the majority of a board of directors is already independent, a higher proportion of independent directors still reduces the extent to which real earnings management is conducted. This finding could be worth considering by firms, auditors and regulators, because real earnings management is causing damage to investors (Gunny, 2005). It is important to reduce the extent to which real earnings management is conducted and a higher proportion of independent directors within a firm's board of directors could be helpful for this purpose.

Furthermore, the research on real earnings management is in an early stage (Zang, 2012). The measures of Roychowdhury (2006) are one of the relatively few real earnings management measures, which emerged in prior literature. Therefore, it is difficult to say to which extent these measures are construct valid, because these measures could not be compared to other real earnings management measures. Future research has to show to which extend the real earnings management detection methods of Roychowdhury (2006) are construct valid. Possibly, future research will develop better measures for real earnings management. Then the relation between the proportion of independent directors and real earnings management can be investigated again.

6.3   Limitations

This research has some limitations and it is important to take these into account when interpreting the results. Firstly, it is important to realize that this is an association study rather than a causation study. The reason for this is the cross-sectional research design. A laboratory experiment or field experiment are research designs where causal inferences can be made. However, such a research design is not feasible in a field research like my research, because the researcher is not able to fully control the independent variables. Therefore, causal inferences cannot be made with certainty in a cross-sectional study.

Furthermore, it is important to realize that the sample consists of US firms, which have a one-tier board. The results will not per se be the same when the same research is done with a sample of two-tier board firms, because there is a substantial difference between one-tier and two-tier boards, as explained in section 2.2.1. Therefore, the results could not be generalized to environments where a two-tier board is present.

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