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# The effect of fraud on the audit quality of Big 4 audit firms.

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# Abstract

This thesis looks into the effect of fraud by clients of Big 4 firms on the audit quality and audit credibility of those Big 4 firms. Audit quality is measured by calculating the discretionary accruals following the modified Jones model, and audit credibility by using the ex-ante cost of capital using the PEG method. To measure fraud, AAER reports published by the SEC are used and audit restatements. As results, the AAER reports have a small negative effect on audit quality and a significant negative effect on audit credibility. Audit restatements have no significant effect on audit quality and credibility.

**Key words: Audit quality, audit credibility, fraud, Big 4, ex-ante cost of capital, discretionary accruals.**

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# 1. Introduction

The auditing profession is based on providing assurance that the financial statements of a client give a faithful representation of the status of that client, and by doing so auditors contribute to the credibility of the financial statements (Menon & Williams, 1991). When auditing the financial statements of clients, the auditor increases the credibility of financial reporting and reduces in that sense information asymmetry between the clients and its investors (Clinch, Stokes, & Zhu, 2011). The higher the quality of the audit, the higher the credibility of the financial statements. This higher level of credibility of the provided information will lead to a higher participation of investors in the company of the client (Kim & Verrecchia, 1991), which in turn will lead to a decrease in cost of debts (Karjalainen, 2011) and cost of equity capital (Willenborg, 1999).

However, recently there has been a discussion about the quality of financial audits, which brings the audit profession in discredit (Jolly, 2019; Chapman, 2019; Kinder, Watchdog threatens audit firms with extra reforms, 2020; Kinder & Provan, Corporate scandals promt shake-up at UK accounting watchdog, 2020). This discussion about audit quality originates from the fact that multiple large fraud scandals were revealed in the previous decade, and the expectation gap, that lead to society expecting auditors to detect and report fraud (Porter, 1997). From the late 1990's there has been an increase in accounting misstatements (Lennox & Pittman, Big Five audits and accounting fraud, 2008), which led in 2002 to stricter regulations when the U.S. federal law introduced The Sarbanes-Oxley Act (SOX) and the Public Company Accounting Oversight Board (PCAOB). During the years 2000 until 2010, several large accounting fraud cases are known in the U.S., such as Enron in 2001, The American Insurance Group in 2005 and Bernie Madoff in 2008 (Maulidi, 2016). The Enron scandal in 2001 eventually led to one of the Big 5 firms of that time, Arthur Andersen LLP, going out of business (ABC news, 2002), leaving only four large audit firms (the Big 4). These numerous cases of fraud and the coverage of them in the news have put a dent in the reputation of auditors, and since the credibility of audit firms is based for a great deal on reputation (Khurana & Raman, 2004), these fraud cases may influence the effectiveness of audit firms. Reputation, however, is not the same as audit quality. The discussion on fraud cases and the responsibility of auditors to discover fraud, and the implementation of the SOX are there to improve the audit quality rather than the credibility. Which leads to the research question:

*Research question 1*

*What is the effect of fraud cases of clients of Big 4 auditors on the audit quality of Big 4 auditors in the United States?*

The discussion that follows from the news influences the audit reputation and in such way the audit credibility. Therefore, a second research question will look into this side of the subject. To see the

different effect on the audit credibility and the audit quality, the second research question will be as follows:

*Research question 2*

*What is the effect of fraud cases of clients of Big 4 auditors on the audit credibility of Big 4 auditors in the United States?*

This second question will look into the direct effects of a fraud case on the audit credibility of Big 4 firms.

By consulting previous literature regarding these subjects, variables to measure audit quality and audit credibility will be selected. Audit quality will be measured using the modified Jones model to calculate discretionary accruals of a company. Audit credibility will be measured using the ex-ante cost of capital, in accordance with the PEG method. For the measurement of fraud, both Accounting and Auditing Enforcement Releases (AAER) reports will be used and financial audit restatements. For the first research question, this will lead to the hypothesis that there will be no effect from fraud cases of Big 4 clients on the audit quality of Big 4 firms in the United States. For the second research question the hypothesis states that there will be a negative effect from fraud cases of Big 4 clients on the audit credibility of Big 4 firms in the United States. To validate these hypotheses, two multivariate regression models are going to be executed, using data collected via PCAOB Auditorsearch database, COMPUSTAT, AuditAnalytics, Datastream, I/B/E/S database and the SEC website for AAERs. As results, a small significant negative effect form AAERs will be seen on audit quality, when there are no control variables. This leads to a rejection of the first hypothesis concerning AAERs as a variable for fraud. The restatements variable will lead to no significant result and thus an acceptance of the first hypothesis. For the second research question, it will be able to see an increasing negative effect of AAERs on audit credibility. Therefore, the second hypothesis for AAERs as a variable for fraud will be accepted. Restatements as a measurement for fraud will lead to no significant effect on audit credibility. In this case, the second hypothesis will be rejected.

The results of this thesis can be of value for both audit firms, clients of audit firms, investors and legislators. Since it can show what effect audit scandals due to fraud have on the audit market, and whether audits are found to be less credible after a discovery of fraud or not. Up until now, research papers have looked into the effect of some scandals on non-Big 4 auditors compared to Big 4 auditors (Cassell, Giroux, Myers, & Omer, 2013; Lennox & Pittman, Big Five audits and accounting fraud, 2008) and how corporate governance of clients of Big 4 companies can restore credibility in financial reporting after fraud cases (Farber, 2005; Klai & Omri, 2011; Agrawal & Chadha, 2005). However, how fraud cases effect Big 4 companies specificly is unclear. This means that the topic of this thesis will add to the existing literature because it looks into the effects of fraud cases on Big 4 audit firms and what damage it does to their credibility, rather than that of corporate firms. Also, the effects on

audit quality of Big 4 firms will be looked into, instead of the comparizon between Big 4 and non-Big 4 audit firms.

This thesis will continue as follows; first the existing literature will be discussed. Next, hypotheses for both the research questions based on the previous literature can be found in the chapter Hypothesis development. Afterwards, the research design will be explained, where the methodology and data and sample selection will be discussed. Following the data and sample selection, the results will be looked at. Concluding remarks will be made in the conclusion part of the thesis. To finalize this thesis, there will be a list of references, where an overview is given of other literature that has been consulted during the process of this thesis, and some appendices, where additional information can be found.

# 2. Literature review

In this section, previous literature concerning the research question will be discussed. Firstly, the terms 'audit quality' and 'audit credibility' will be defined. Second, accounting fraud will be explained, and what type of fraud cases will be used for this thesis. Finally, the hypothesis will be developed.

## 2.1. Audit quality

To start, Limperg's theory of inspired confidence will show the necessity of audit quality. Following this theory, it will be explained what the term 'audit quality' means, what influences audit quality, and how audit quality can be measured.

*Limperg's theory of inspired confidence*

Limperg's theory of inspired confidence explains the necessity of auditors. According to the theory, for companies to work, a certain degree of specialization and differentiation exists within the company and between companies. It is an auditor's job to create confidence that this specialization works correctly and efficient. Therefore, for auditors, it of great importance to remain trustworthy, to be able to add to the reliability of the financial statements. If the audit quality declines, this would harm the confidence of the market in auditors and undermine their purpose (Camfferman & Zeff, 2014). To add to the economy and society, it is imperative that auditors maintain their confidence and keep up the audit quality.

*What is audit quality?*

Before audit quality can be maintained, it is necessary to know what audit quality exactly means. Watkins, Hillison and Morecroft (2004) claim that there are four different ways to define audit quality. These four different ways to define audit quality start with the probability that even though a financial report contains material errors, no unqualified report is filed. Other definitions used for audit quality are how accurate the audit report is, a measure that shows "the ability of an audit to reduce noise and bias and improve fineness in accounting data" (Watkins, Hillison, & Morecroft, 2004), and the

probability that an auditor will discover and report material errors in the financial statement, similar to the definition of DeAngelo (1981).

In another paper by DeFond and Zhang (2014), the definition of DeAngelo (1981) of audit quality is challenged. According to DeFond and Zhang (2014), an auditor should also assess whether financial reports reflect the financial status of the company correctly. Therefore, if the audit quality is high, the assurance that the quality of the financial reporting is high increases. If these different definitions of audit quality are compared, all of them combine a certain degree of auditor independence, the perception of the audit reports and auditor's knowledge. However, it is important to realize that there is a difference between audit quality and the perception of the audit quality, or audit credibility. Therefore Watkins et al. (2004) split audit quality into two main components, auditor reputation and audit monitor strength. In this thesis, this same division is made, where audit quality is defined by auditor monitor strength following previous literature, and auditor reputation is a part of audit credibility (Khurana & Raman, 2004). The definition of audit quality used in this thesis is therefore that audit quality measures how strictly an auditor monitors the financial reporting quality.

*The measurement of audit quality*

The only direct measurable outcome of an audit is represented in an audit report (Francis, 2004). Most audit reports give standard clean opinions; therefore, the audit report does not say much about audit quality. This way, for clients of audit firms, audit quality is not directly observable (DeAngelo, 1981). If clients want to know the audit quality, other measurements must be made to make audit quality visible. This leads to evaluation costs for audit quality. DeAngelo (1981) states that because of these evaluation costs, clients usually do not check the audit quality. Auditors can thus promise a higher level of audit quality than the level that will be delivered. To mitigate these evaluation costs and make audit quality observable for the consumers, DeAngelo (1981) uses auditor size as a measure for audit quality. However, because there is doubt if the difference in audit quality between Big 4 companies and non-Big 4's stems from the audit firm size rather than client characteristics (Lawrence, Minutti-Meza, & Zhang, 2011), audit size will not be used as a proxy for audit quality in this thesis. Francis (2004) proposes to look at audit quality as a 'theoretical continuum'. This theoretical continuum ranges from very high audit quality to very low audit quality. When the audit quality is low, it will lead to audit failure. Therefore, an inverse relationship between audit quality and audit failures exists. This means that audit quality could be measured in case of audit failure. However, since audit failures rarely happen, this way of measuring audit quality is not very effective.

Lawrence et al. (2011) use three different proxies in their study to define audit quality. These proxies are discretionary accruals, ex-ante cost of equity capital and analyst forecast accuracy. The ex-ante cost of equity variable shows the reaction of the market to an audit report. This variable is therefore better suited to measure audit credibility than quality. As for the analyst forecast accuracy, this way of

measuring audit quality can only be done if the researcher has access to multiple analyst reports. This would complicate the measurement of audit quality, and therefore it is decided that it is not the preferred variable for this thesis. Abnormal accruals or discretionary accruals can be used with a smaller sample and for cross-sectional analysis (Choi, Kim, Kim, & Zhang, 2009). Other papers use discretionary accruals to measure earnings management (Johnson, Nelson, & Frankel, 2002). Discretionary accruals show how much earnings management an auditor will allow and indicates the strictness of the auditor (Lawrence, Minutti-Meza, & Zhang, 2011). Therefore, if there are high discretionary accruals, the auditor allows much earnings management, and thus audit quality is low.

There are numerous other variables that are used to quantify audit quality, although it is not clear which variable can be used best (DeFond & Zhang, A review of archival auditing research, 2014). In their paper, DeFond and Zhang (2014) create an overview of these variables by sorting them in to two groups, which they then split up in multiple subcategories. Either a variable is based on the output of an audit or on the input of an audit. Audit input can be divided in audit firm characteristics and auditor-client contracting features. The output group can be split up into material misstatements, auditor communication, financial reporting quality, and perceptions. The financial reporting quality of the output group of variables is preferred, because it shows the quality that is delivered at the end of an audit rather than the quality that is expected. Also, financial reporting quality and audit quality are closely related (DeFond & Zhang, A review of archival auditing research, 2014). Discretionary accruals are a proxy for the financial reporting quality in the 'output of an audit' group and, according to DeFond & Zhang (2014), the discretionary accrual model of Jones (Jones J. J., 1991) is used most often. Besides categorizing the variables, DeFond and Zhang analyze the strengths and weaknesses of the variables. They do this by assessing how directly an auditor can influence the variable, by taking in account how sizeable the audit failure is that the variable measures, by defining if the variable is based on actual or perceived audit quality, and by looking into how measurable the variable is. By using the discretionary accruals, auditors can influence the variable by not allowing earning management, the actual audit quality can be measured in less rigorous situations than audit failure and the variable can be used easily due to its continuous nature. Due to the insight that discretionary accruals give in audit quality, they are the preferred measure for audit quality and as such are used in multiple research papers (Becker, DeFond, Jiambalvo, & Subramanyam, 1998; Carcello, Hollingsworth, & Mastrolia, The effect of PCAOB inspections on Big 4 audit quality, 2011; Johnson, Nelson, & Frankel, 2002; Chung & Kallapur, 2003; Choi, Kim, Kim, & Zhang, 2009).

To be able to define discretionary accruals, researches have used many models in the past. Most models are based on total accruals and subtract the non-discretionary accruals. Dechow, Sloan and Sweeney (1995) test five of these models and compare them with each other. They also test the Jones model (Jones J. J., 1991), and add a correction by subtracting the net receivables from the revenue, which leads to the modified Jones model. As result, the modified Jones model reflects earnings management and

thus audit quality best (Dechow, Sloan, & Sweeney, Detecting earnings management, 1995). Since their article, multiple new models have been created, however, the modified Jones model remains highly used in most researches concerning audit quality due to the fact that it most successfully represents audit quality (Dechow, Hutton, Kim, & Sloan, 2012). Therefore, the modified Jones model will be used to define discretionary accruals in this thesis.

Now that audit quality has been defined, and the way audit quality will be measured in this thesis has been described, the next part of this literature review will look into audit credibility, what is beholds and how it can be measured, before moving on to fraud.

## 2.2. Audit credibility

First, the meaning of audit credibility will be explained. To make audit credibility clearer, the Agency Theory and audit expectation gap will be introduced. Secondly, a description will be given of what influences audit credibility. Finally, it will be addressed how audit credibility can be measured.

*The Agency theory*

Audit credibility shows how the quality of an audit is perceived by the outside world. High audit credibility is important, because when the financial reporting of a company has a higher credibility, the information asymmetry between corporate managers and stockholders will decrease (Khurana & Raman, 2004). This is based on the Agency Theory, an economic theory that describes the relationship between a principle, in this case the stockholders, and an agent, the corporate managers (Hill & Jones, 1992). In a principle-agent relationship, the agent has the relevant information, and makes decisions on behalf of the principle. However, the agent might not act in the best interest of the principle, but rather in his or her own best interest. If the agent decides to do so, this will not be observable for the principle, who does not have the information. Within the Agency Theory, audit credibility specifically deals with this information asymmetry, since the agents have more information about what is going on in the company than the principles. Decreasing this information asymmetry leads to lower cost of capital and therefore to a more efficient capital market (Leuz & Verrecchia, 2000). Khurana and Raman (2004) notice that more credible financial reporting leads to higher investor confidence, which leads to higher stock prices and therefore makes it easier for a company to raise new equity for growth. According to Imhoff (2003), to decrease information asymmetry and increase credibility of financial reports, credible auditing and accounting are crucial.

*The Audit expectation gap*

What this enhancement in financial reporting credibility exactly entails, however, is unclear. This results in a difference between what users of the financial statements expect of auditors regarding their responsibility towards financial reporting credibility and what auditors think their responsibility is. This phenomenon is known as the expectation gap (Frank, Lowe, & Smith, 2001). According to a literature review done by Koh and Woo (1998), the public expects auditors to eliminate fraud, misstatements and

errors in financial reports, whereas auditors see themselves as providing extra credibility for financial statements, rather than total credibility. The expectation gap does not only exist between the public and auditors but can also be seen in the legal system (Frank, Lowe, & Smith, 2001). In their article, Frank et al. (2001) state that the expectation gap that exists between judicial parties and auditors has led to an increased number of lawsuits for the then Big 5 companies, including Arthur Andersen LLP. This is problematic for audit credibility, since lawsuits affect auditor reputation and auditor independence (Chaney & Philipich, 2002), which in their turn influences audit credibility (Watkins, Hillison, & Morecroft, 2004; Shroff, 2015). The expectation gap therefore influences the audit credibility. Because the bigger the gap of what is expected of an audit versus what is delivered, the more likely that users of the financial statements will be disappointed in the level of assurance provided by the auditor. Other factors that influence audit credibility are audit firm size (Lennox, Audit quality and auditor size: An evaluation of reputation and deep pockets hypotheses, 1999) and if a client voluntarily provides extra audit information (DeFond & Zhang, A review of archival auditing research, 2014).

*The measurement of audit credibility*

A measure for audit credibility, or "a perception-based measure" as Defond and Zhang (2014) say, can have multiple different forms. A possibility is to look at earnings response coefficients (ERCs), reactions of stock markets or the cost of capital (DeFond & Zhang, A review of archival auditing research, 2014). Previous papers that use the ERCs as measure state that ERC shows the quality of the earnings reported by the company, and is mostly used when earnings fluctuate (Francis & Ke, Disclosure of fees paid to auditors and the market valuation of earnings surprises, 2006; Teoh & Wong, 1993). Since in this thesis, earnings are not specifically looked at, other measures are better suited to capture audit credibility. When using stock markets as proxy for audit credibility, researchers usually look at the bid-ask spreak or trading volume. These measures are useful when looking at short term audit credibility. However, Big 4 auditors usually effect long term credibility, therefore ex-ante cost of equity capital is a better measure for audit credibility, because it captures long term information assymetry effects (Khurana & Raman, 2004). According to Hail (2002), ex-ante cost of capital decrease with increasing disclosure quality and increase with risk. This means that if ex-ante cost increase, the audit credibility will decrease. For these reasons, ex-ante cost of capital will be used to measure the changes in audit credibility similair to Hail (2002). Following previous literature (Khurana & Raman, 2004; Lawrence, Minutti-Meza, & Zhang, 2011; Cassell, Giroux, Myers, & Omer, 2013), these ex-ante costs of capital will be calculated using the redefined PEG method of Easton (2004). The PEG (price/earinings to growth) model is preffered to other approaches since it responds correctly to future realized returns and firm-specific risks, and does not unnecessary complicate the dataset (Botosan & Plumlee, Assessing Alternative Proxies for the Expected Risk Premium, 2005; Botosan, Plumlee, & Wen, The relation between expected returns, realized returns, and firm risk characteristics, 2011).

Besides audit quality and audit credibility, fraud is also an important part of the research questions. The next part of the literature review will give the definition of fraud which is used in this thesis, before moving on to the hypothesis development.

## 2.3. Fraud

The research questions looks into the effect of fraud on audit quality and credibility, which are described in the section above. In this part, first a definition of fraud will be given, the motivation of committing fraud will be touched upon, what is done to prevent fraud and finally how fraud will be measured in this thesis.

*What is fraud?*

Fraud can be interpreted in multiple ways. For the purpose of this thesis, when fraud is mentioned, financial statement fraud is meant. For a misstatement in the financial statements to be considered fraud, a few conditions should be met. First, the misstatement should be intentional. The company of the financial statement is misleading the stakeholders that use the financial statements purposefully, in order to either reach analysts goals, or to influence investors and creditors. Secondly, there is either an omission of data, manipulation of financial records, misuse or manipulation of accounting standards, or too aggressive application of accounting techniques (Rezaee, 2005).

The incentives for a person to commit fraud, and "red-flags" for auditors, consist of a concept that is known as the fraud triangle. Basically, it is believed that one or more of the following three terms are applicable in case of fraud: rationalization, opportunity and pressure (Hayes & Wallage, 2014). Where the term pressure stands for the motive of the person committing the fraud, opportunity indicates how well internal controls work and if there is a possibility to commit fraud. Rationalization of the fraud helps the person committing fraud to find a reason why the fraud is 'necessary', or to clear their conscious. If a financial statement is fraudulent, users of these statements will adjust their opinions, forecasts and analysis based on these financial statements. Which will lead to a higher pressure for fraud. This effect is similar for the other two terms of the fraud triangle. When fraud has been committed once, it creates opportunity and simplifies the rationalization for more fraudulent work (Hogan, Rezaee, Riley Jr, & Velury, 2008).

*The Audit Risk Model*

To prevent fraud, the American Institute of Certified Public Accountants (AICPA) requires auditors to use the Audit Risk Model (ARM) to assess the Acceptable Audit Risk (AAR) during the planning stage of an audit in accordance with the Statements on Audit Standards (SAS) 47 (American Institute of Certified Public Accountants (AICPA), 1997). The ARM helps auditors assess the likelihood that an unqualified audit opinion will be given, whilst the financial statement is misstated. To determine the AAR, auditors look at three types of risks. First, the inherent risk is the risk that an account or multiple accounts are materially misstated. This risk is assessed by the auditor by looking at the financial data

of the client and does not consider internal controls. The second risk is that an account is materially misstated and that this misstatement is not discovered in a timely manner by the internal controls of that company. This is called the control risk. The responsibility of both these risks lies at the company that is checked by the auditor. The third risk, the detection risk, is the responsibility of the auditor. It entails the risk that a material misstatement is not detected by the auditor (American Institute of Certified Public Accountants (AICPA), 1997). If the auditor puts more effort into the audit, the detection risk will decrease. The auditor can thus adjust its effort until the audit risk reaches an acceptable level (Hogan & Wilkins, Evidence on the audit risk model: Do auditors increase audit fees in the presence of internal control deficiencies?, 2008). However, even if auditors use the ARM and give an unqualified audit opinion, this only gives reasonable assurance that the financial statement is without misstatements. Hence, fraud can still take place (Houston, Peters, & Pratt, 1999).

*The measurement of fraud*

The way fraud will be measured in this thesis is as follows. Fraud cannot be measured unless it has been discovered, since otherwise the fraud is unknown by the public. For example, the recent fraud case of Wirecard, which has been going on for years before it was discovered (Kinder, EY chairman admits 'regret' over Wirecard failures in letter to clients, 2020). The Securities and Exchange Commission (SEC) investigates potential fraud cases and post rulings about them in the form of Accounting and Auditing Enforcement Releases (AAERs). In these AAERs, the SEC identifies civil lawsuits of the federal court that are related to financial reporting violations of the Securities Act of 1933 and the Securities Exchange Act of 1934, which are set in place to regulate financial markets. Following previous literature (Lennox & Pittman, Big Five audits and accounting fraud, 2008; Carcello & Nagy, Audit firm tenure and fraudulent financial reporting, 2004; Beasley, Carcello, & Hermanson, 1999), AAERs which describe violations of rules 10(b)-5 of the Security Exchange Act of 1934 and 17(a) of the Securities Act are used to indicate fraud. These rules are concerned with preventing fraud, since both "prohibit fraudulent conduct in connection with the purchase or sale of securities" (Securities and Exchange Commission, 2020). The fraud cases must be from companies that have a Big 4 audit firm checking their financial statements, since these Big 4 audit firms deliver similar levels of audit quality. Also, only AAERs of public U.S. firms will be used, because these must comply with the rules set by the SEC. There will be more information available concerning audit quality and credibility of public firms, because they have to file at least two reports every year with the SEC. Finally, only companies from the U.S. and audited by U.S. audit firms are used due to the difference in legislation and enforcement of these legislations between countries (Coffee Jr, 2005).

With the use of AAERs as measure for fraud there is a risk of bias, since the SEC might target specific companies or industries which are prone to fraud due to constrained resources of the SEC (Beasley, Carcello, & Hermanson, 1999). Also, there might exists a time lag of several years between the discovery of the fraud and the ruling of the SEC, which can influence the results (Lennox & Pittman,

Big Five audits and accounting fraud, 2008). This can be seen when looking at the previously mentioned Wirecard fraud, which had EY as auditor. The fraud has been discovered this year, but the lawsuits will follow and be concluded later. As can be seen in the article by Kinder (2020, September 15) however, EY has already mentioned their regret in not discovering the fraud sooner, and how they will try to improve their audit quality to prevent fraud. Therefore, another variable for fraud will be used as well on the sample. According to Hirschey et al. (2010), Liu et al. (2009) and Jones et al. (2006) fraud can be measured using financial statement restatements. Both ways of measuring fraud will be used in this thesis, to capture the effect of fraud on audit quality and credibility.

In the section above, all the variables used in the research questions are explained. The second part of this literature review will discuss the hypothesis development. Here, the hypothesis to the research questions will be formulated.

## 2.4. Hypothesis development

To conclude the literature review, hypotheses will be provided concerning the research questions. To give a hypothesis to the first research question of this thesis, previous literature will be discussed concerning the first research question. A possible hypothesis with an explanation to why this is expected will be given. Afterwards, a hypothesis for the second research question will be developed in a similar way.

*Hypothesis 1*

Imhoff (2003) investigates the role of accounting and auditing throughout the years and how it effects the recent increase in audit failures such as Enron, WorldCom and more. By looking at the past and present state of accounting, auditing and corporate governance, Imhoff hopes to increase quality of financial reporting and therefore the efficiency of the investment market. Imhoff states that even though the Securities and Exchange Commission (SEC) has introduced the SOX in 2002, this will not be enough to increase audit quality. According to him, these changes will be ineffective, and he recommends new legislation to improve auditor independence, such as a rotation of auditor every three years instead of five. In contrast of this statement by Imhoff (2003), Carcello and Nagy (2004) state that "fraudulent financial reporting is more likely in the first three years of the audit-client relationship" (Carcello & Nagy, Audit firm tenure and fraudulent financial reporting, 2004). Improvement in audit quality will have to come first from the SEC and the AICPA, who should encourage that auditors enhance their knowledge and expertise in audit (Imhoff, 2003). Since this has not happened yet, Imhoff states that audit quality will neither have improved nor worsened as a result of the recent fraud cases.

Francis and Michas (2013) investigate the "contagion effect" of audit failure. In their research, the relation between previous low-quality audits and other audits during that time and the subsequent years of that audit firm is explored. They discover that when an audit failure has taken place, the audit firm is likely to have more audit failures in the following five years (Francis & Michas, The contagion effect

of low-quality audits, 2013). This would mean that low-quality audits are "contagious", and firms that have cases of audit failures are likely to have more following in at least the coming five years, making it a systemic problem. Here they assume any type of financial reporting fraud is at least partly the responsibility of the auditor (Francis, Michas, & Yu, Office size of Big 4 auditors and client restatements, 2013). The research paper of Francis and Michas (2013) also looks into the difference between audit firms of different sizes. The results show that the contagion effect is less visible for the smallest 75 percent of audit firms (Francis & Michas, The contagion effect of low-quality audits, 2013). Li et al. (2017) find that in case of audit failure, there is a risk of the "self-contagion effect" as well. This means that audits performed by auditors who previously had low-quality audits, are more likely to be of lesser quality. This research would therefore suggest that audit quality of Big 4 companies would decrease as an effect of fraud cases.

After the fraud cases of the beginning of the 2000's it became clear that society was expecting a higher level of audit quality from auditors, introducing the previously mentioned expectation gap. Researchers were urging for measures to improve audit quality (Peecher, Schwartz, & Solomon, 2007), such as an increase in audit fees, audit partners signing with their names and higher specialization of auditors (Zerni, 2012). As response, an increase in regulations was implemented, such as the introduction of the PCOAB and the SOX. According to DeFond and Lennox (2011), these measurements only affected the audit quality of smaller audit firms, since only smaller audit firms left the market after the implementation of the SOX (DeFond & Lennox, The effect of SOX on small auditor exits and audit quality, 2011). The leaving of smaller audit firms decreased the bargaining power of audit clients however, which is said to increase audit quality (Asthana & Boone, 2012). According to Lennox and Pittman (2008), this did not matter for the Big 5 companies of that time. Since in the time period of 1981-2001 the Big 5 companies would deliver higher quality audit, even during the times that fraud cases increased. Their research indicated that the Big 5 companies had lower chances on fraudulent accounting, and thus higher audit quality (Lennox & Pittman, Big Five audits and accounting fraud, 2008).

To sum up, the results of previous papers on if fraud influences Big 4 audit quality differ significantly. Imhoff (2003) states that audit quality will not change until the SEC and AICPA implement new guidelines, Frachis and Michas (2013) and Li et al. (2017) prove that there is a contagion effect with audit failure, concluding that financial reporting fraud leads to lower audit quality for the coming five years of an audit firm, and Lennox & Pittman (2008) claim that the audit quality of bigger audit firms have only increased in spite of the fraud cases. The increase in audit quality measured by Lennox and Pittman (2008) could be due to the implementation of the SOX, which decreases the number of smaller auditors (DeFond & Lennox, The effect of SOX on small auditor exits and audit quality, 2011) and therefore increased the bargaining power of audit firms (Asthana & Boone, 2012). However, all previous papers seem to agree that steps should be taken to increase audit quality. Therefore, the

hypothesis to the main question is that there will be no effect from fraud cases of Big 4 clients on the audit quality of Big 4 audit firms in the United States.

*H1: there is no effect of fraud cases from Big 4 clients on audit quality of the Big 4 audit firms in the United States.*

*Hypothesis 2*

Research done by Cassel et all. compares the audit credibility second-tier audit firms with that of Big 4 audit firms. Cassel et all. look at the audit credibility of both before and after the collapse of Arthur Andersen LLP and the regulatory changes of the SOX and PCAOB. Comparing the audit credibility between those firms and events, it can be seen that the credibility of both types of audit firms have come closer together (Cassell, Giroux, Myers, & Omer, 2013). At first, audit credibility of Big 4 firms was significantly higher than that of second-tier firms. However, after the collapse of Arthur Andersen LLP and the regulatory changes, the level of audit credibility was not significantly different anymore. Teoh and Wong (1993) find similar results in their research where they compare the eight biggest auditor firms with smaller firms. In their research, the respond of the market to unexpected earnings announcements is greater for bigger audit firms than for smaller firms (Teoh & Wong, 1993). These researches indicate that fraud cases influence audit credibility and that this effect is greater for Big 4 companies than for smaller audit firms.

Chaney and Philipich (2002) investigate how the fraud at Enron effected auditor reputation. They find that the market reacted negatively to the news of Arthur Andersen LLP contributing to the fraud. The audits performed by Arthur Andersen LLP for other clients was believed to be of lesser quality as well, which decreased the credibility of these audits. This effect was most visible for clients of Arthur Andersen's Houston office, the office responsible for the audit of Enron (Chaney & Philipich, 2002). However, these results were not significantly different for other Big 4 companies, therefore it is not clear if these effects are due to loss in audit credibility or other events at that time (Nelson, Price, & Rountree, 2008). Li et all. (2017) find negative market reactions to auditors that, according to regulators, did not perform the audit well enough to prevent material misstatements in financial reports. These results only show for the same auditor, but the effect is not significant for other auditors who work at the same firm (Li, Qi, Tian, & Zhang, 2017). These research papers show that when a fraud case is known by the public, the market responds negatively and the audit credibility decreases (Jayalakshmy, Seetharaman, & Khong, 2005).

Since the SOX and PCAOB were implemented to restore audit quality and credibility after the multiple fraud cases such as the Enron scandal (Cassell, Giroux, Myers, & Omer, 2013), many researchers look if these regulations have an effect on audit credibility. These researchers find that the inspections by the PCAOB have a positive effect on audit credibility, not just for audit firms that were inspected, but all audit firms. This indicates a spill-over effect for auditor firms in audit credibility (Shroff, 2015). The

effects of the new PCAOB and SOX legislations increase the audit credibility of the U.S. firms compared to non-U.S. firms, for whom the rules do not apply (Gipper, Leuz, & Maffett, 2015). The results of these researches show the sensitivity of audit credibility for outside events, such as the new legislations. Also, due to the spill-over effect, audit firms who have nothing to do with the fraud cases or such could also experience changes in audit credibility.

Summarizing these research results and that of other papers, audit credibility has been affected previously due to noticeable fraud cases. Papers looking into the Enron scandal see a decrease in audit credibility of Big 4 auditors compared to non-Big 4 auditors (Cassell, Giroux, Myers, & Omer, 2013). The changes in audit credibility are more visible for bigger audit firms (Teoh & Wong, 1993). Also, a decrease in audit credibility of a specific auditor takes place when an auditor is held accountable for accounting misstatements by regulators (Li, Qi, Tian, & Zhang, 2017). Although it can be doubted if these effects are industry wide, or just for specific industries and audit firms (Nelson, Price, & Rountree, 2008), most papers find that audit credibility is influenced by outside factors (Shroff, 2015; Gipper, Leuz, & Maffett, 2015). Following these research papers and others (Jayalakshmy, Seetharaman, & Khong, 2005), the hypothesis to the second research question is that fraud cases of Big 4 clients have a negative effect on audit credibility of Big 4 audit firms in the United States.

*H2: fraud cases of Big 4 clients have a negative effect on audit credibility of Big 4 audit firms in the United States.*

## 2.5 Summary

In this Literature review, the terms ‘audit quality’, ‘audit credibility’ and ‘fraud’ were defined using related economic theories, such as the Agency theory. Audit quality is seen as how strictly an auditor monitors financial reporting quality, and is therefore calculated using the modified Jones model for discretionary accruals. Audit credibility will be calculated using the PEG method for the ex-ante cost of capital, and shows how credible investors think the financial reporting of clients of Big 4 auditors is. Fraud is defined as intentionally misleading users of the financial statements, and is measured using AAER reports and restatements. The hypotheses above were developed using previous literature, and give possible answers to the research questions. The first hypothesis states that fraud cases of clients of Big 4 auditors have no effect on the audit quality of these Big 4 auditors. According to the second hypothesis, fraud cases of Big 4 clients have a negative effect on audit credibility of Big 4 clients. With the development of these hypothesis, the chapter Literature review has come to an end. Moving forward, this thesis will go on by describing the methodology, data and sample used for the research design. This data and methodology will lead to results, which will be discussed after, and finally a conclusion will be given. For now, the thesis will continue with the research design.

# 3. Research design

In the previous part of this thesis the research questions have been introduced, previous literature has been discussed and hypothesis have been developed. In this part of the thesis it will be explain how the research will be conducted. First, in the methodology section, the methods, models and programs used will be discussed. Secondly, following the methodology, there will be a data section. Here, it will be explained how the sample selection is done, and the way the data were collected and prepared for the research. After the data and sample selection and the methodology, the results will be discussed in the next chapter.

## 3.1. Methodology

To answer the research questions, a series of tests are necessary. Which tests, and how they will be performed will be explained in this section of the thesis. To start, the methodology of how the first research question will be answered is discussed. The variables used for the regression of fraud and audit quality will be explained, before moving on to the explanation of the discretionary accruals and the modified Jones model. To finish this part of the thesis, the regression of fraud and audit credibility and the variables used in this regression will be explained, followed by the explanation of ex-ante cost of capital.

*Fraud and audit quality*

The first research question looks into the effect of fraud cases of Big 4 clients on the audit quality of Big 4 firms. Here, it will be discussed which method will be used to measure the effect of fraud on audit quality. To quantify audit quality, the modified Jones model is used to calculate the discretionary accruals. This modified Jones model will be addressed as well in this part of the thesis.

As discussed in the literature review, audit quality will be measured using discretionary accruals, and fraud via AAERs and restatements. A schematic view of how the first research question will be answered can be seen in the Libby box of Appendix 7- a. A multivariate regression model is used to answer the first research question, and looks as follows:

(1) $$AUDIT\ QUALITY = \alpha_0 + \beta_1 FRAUD + \beta_2 lnFIRMSIZE + \beta_3 TENURE + \beta_4 lnAUDITFEE + \beta_5 ROA + \beta_6 lnMKT + \varepsilon_i$$

Where audit quality is the dependent variable and fraud is the independent variable. Some control variables have been added. These control variables are added because they may affect audit quality. To make sure the results of the regression are not biased due endogeneity and missing variables, these are necessary to add to the regression. The control variables are based on previous literature (Lawrence, Minutti-Meza, & Zhang, 2011; Carcello & Nagy, Audit firm tenure and fraudulent financial reporting, 2004; Lennox & Pittman, Big Five audits and accounting fraud, 2008) and include a control for the size of the companies that are audited, the amount of years the same auditor has audited the firm, the fee of

the audit, return on assets of the audited company and the market value of the audited company to measure the importance of the financial data for the market. These variables control for effort needed and incentive provided to perform the audit, the independence of the auditors and the financial situation of the audited companies. To be able to compare the data of companies of different sizes, the natural logarithm of some variables will be taken. The firm size will be measured using the natural logarithm of total assets of the audited companies, the audit fee will be the natural logarithm of the audit fee and the market value will be the natural logarithm of the value of all issued shares. As stated at the hypothesis development of hypothesis 2, "fraudulent financial reporting is more likely in the first three years of the audit-client relationship" (Carcello & Nagy, Audit firm tenure and fraudulent financial reporting, 2004). Therefore, audit tenure will be a dummy variable that has value 1 if the tenure is longer than 3 year, and 0 if not. To control for multicollinearity a Pearson-product correlation test will be performed and the variance inflation factor (VIF) score will be observed, assuming a maximum VIF score of 5. Not all variables that influence audit quality are added to the regression. Therefore, the error term ε is added at the end of the regression. For a full description of all variables, see table 1 form the appendix (A.table 7.1).

*Discretionary accruals and the modified Jones model*

Audit quality is measured using discretionary accruals. To obtain the discretionary accruals (DA), the modified Jones model is used, as described by Dechow et al. (1995). The modified Jones model starts of the same way as the Jones model (Jones J. J., 1991). First, the total accruals (TA) are calculated. Second, the non-discretionary accruals (NDA) are calculated. To get the discretionary accruals, the non-discretionary accruals are subtracted from the total accruals. The regression to get firm specific parameters is described below:

$$(2)\ TA_t = \alpha_1 * \left(\frac{1}{A_{t-1}}\right) + \alpha_2 * \frac{\Delta REV_t - \Delta REC_t}{A_{t-1}} + \alpha_3 * \frac{PPE_t}{A_{t-1}} + \epsilon_t$$

Here, $TA_t$ are the total accruals at time t scaled by total assets at time t-1, $\alpha_{1,\,2,\,3}$ are firm specific parameters, ΔREV is the difference in revenue between year t and year t-1, ΔREC is the difference between the receivables of year t and year t-1, and $PPE_t$ is the total amount of property, plant and equipment at time t. These values are scaled by $A_{t-1}$ which are the lagged total assets at year t-1. To calculate the TA and NDA the following formulas are used:

$$(3)\ TA_t = (\Delta CA_t - \Delta CL_t - \Delta Cash_t + \Delta DCL_t - Dep_t)/A_{t-1}$$

$$(4)\ NDA_t = \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \alpha_2 \left(\frac{\Delta REV_t - \Delta REC_t}{A_{t-1}}\right) + \alpha_3 \left(\frac{PPE_t}{At-1}\right)$$

Where the variables $\alpha_{1,\,2,\,3}$, ΔREV, ΔREC, PPE and $A_{t-1}$ are equal to the variables used in formula (2). The variables in formula (3) are the difference in current assets ($CA_t$), current liabilities ($CL_t$), cash and cash equivalent ($Cash_t$), debt included in current liabilities ($DCL_t$) and the depreciation and amortization expenses ($Dep_t$) standardized by the lagged total assets, $A_{t-1}$. The ΔREC of formula (2)

and formula (4) is the difference between the modified Jones model and the regular Jones model. Because the difference in receivables are subtracted from the difference in revenue, it is assumed that during the estimation period changes in credit sales are a result of earnings management. (Dechow, Sloan, & Sweeney, Detecting earnings management, 1995). The final step in the modified Jones model to calculate the value of the DA used for the regression of formula (1), is as follows:

(5) $DA_t = TA_t - NDA_t = \epsilon_t$

The error term of formula (2) will be taken as value of the discretionary accruals, because it is assumed that there is no systematic earning managements during the estimation period of the $NDA_t$. The absolute value of $DA_t$ will be taken. This way the negative and positive values of $DA_t$ will not cancel each other out and the total effect on DA or audit quality will be measured. Before conclusions can be drawn about the first hypothesis based on the results of the regression described in formula (1), the possibility of reversed causality of the regression must be considered. There is a possibility that in the case of audit quality and fraud, there is a reversed causality. This means that fraud does not affect audit quality, but rather the other way around; audit quality affects fraud. The results of the regression mentioned in formula (1) should therefore be perceived with caution. To continue this thesis, the methodology to answer the second research question and test the second hypothesis will be described. Afterwards, the data necessary for the calculation of the formulas above will be obtained following the process described in the next part of this thesis, the data and sample selection.

*Fraud and audit credibility*

The second research question looks at audit credibility and fraud. The question is about whether fraud cases of clients of Big 4 audit firms influence the audit credibility of Big 4 firms. The second hypothesis suggests that these fraud cases have a negative effect on audit credibility. In this part, it will be described how this hypothesis will be tested. Following this description, the method for obtaining the variable for audit credibility, which are the ex-ante costs of capital, will be explained.

Similar to the first research question, for the second research question the variable for fraud will be AAERs and restatements. For audit credibility, it will be the ex-ante cost of capital. To see the relation between these two variables, a multivariate regression model will be used. A schematic overview of this regression can be seen in the Libby box of Appendix 7- b. The formula of this multivariate regression model is as follows:

(6) $AUDIT\ CREDIBILITY = \gamma_0 + \delta_1 FRAUD + \delta_2\ LEV + \delta_3 ROA + \delta_4 BETA + \delta_5 lnMKT + \varepsilon_i$

Audit credibility is the dependent variable and fraud the independent variable. Following previous literature (Lawrence, Minutti-Meza, & Zhang, 2011; Cassell, Giroux, Myers, & Omer, 2013; Hail, 2002; Khurana & Raman, 2004), the control variables that are added are the leverage of the audited companies, return on assets of the audited companies and the beta of the audited companies to capture

the effect of firm-specific risk on audit credibility. Also, the natural logarithm of the market value of the firms will be added as a control variable for the effect of market size on audit credibility (Hail, 2002). These control variables control for endogeneity in the regression. Since not all variables that influence audit credibility can be included, at the end of the regression, the error term $\varepsilon_i$ is added. Just as for formula (1), a Pearson-product correlation test and the VIF score will be checked, to make sure there is no multicollinearity. To see a full overview of all variables used in formula (6), see A.table 7.1.

*Ex-ante cost of capital and the PEG method*

To capture audit credibility the redefined PEG method is used (Easton, 2004). A few assumptions are necessary to be able to apply this model to calculate the audit credibility. The first assumption is the no arbitrage assumption. This assumption states that all variables used are priced correctly and there is no difference with the market valuation. Furthermore, it is assumed that the rate of abnormal growth in earnings and dividends per share are equal to zero. When these assumptions are applied, it leads to the formula for audit credibility:

$$(7)\ r_e = \sqrt{\frac{|eps_2 - eps_1|}{P_0}}$$

Where $r_e$ is ex-ante cost of capital, $eps_2$ are the analyst's forecasts of earnings per share two years ahead, and $eps_1$ are the analyst's forecasts earnings per share one year ahead. $P_0$ is the fiscal year-end price per share. This is how the ex-ante cost of capital will be calculated. The complication of calculating a measurement of audit credibility, besides other endogen effects, is that audit credibility depends for a great deal on audit quality. Previous papers sometimes use audit credibility as a measure for audit quality. It is therefore assumable that the audit credibility will always be partially based on the audit quality (Shroff, 2015).

In the sections above, the methodology of how the hypotheses will be tested was explained. To control the data for the assumptions of ordinary least square (OLS) regressions, the natural logarithm of some variables will be taken to make sure the data has a normal distribution. All of the continuous variables mentioned above except for market value and audit fee will be Winsorized at the 1$^{st}$ and 99$^{th}$ percentiles. The regressions will be checked for multicollinearity and heteroskedasticity. Also, the data will be controlled for year fixed effects and industry fixed effects. The methodologies will provide answers for the research questions. First, the methodology of the question regarding fraud and audit quality has been shown. Secondly, the method for calculating the audit quality, the discretionary accruals and the modified Jones model, have been described. Thirdly, the methodology for the connection between fraud and audit credibility can be seen. In the final section of the methodology chapter, the description of the methodology for audit credibility, the ex-ante cost of capital and the PEG method can be read. In the next part of this thesis it will be discussed how the necessary data will be collected and the sample selection will be done.

## 3.2. Data and sample selection

In this part of the chapter Research design, the data to test the hypotheses will be collected. Before the data can be used, it must be prepared for a regression. The data concerning fraud will be collected in two separate ways. AAER reports will be used from the official website of the Securities and Exchange Commission (SEC) and financial restatements will be accumulated using the AuditAnalytics database. The fraud cases that will be looked into are from public U.S. firms. A list of these public U.S. firms will be obtained using the PCAOB Auditorsearch database. The company information regarding audit quality and the financial control variables will be obtained using the COMPUSTAT database. The control variables regarding audit tenure and audit fees come from the AuditAnalytics database as well. In the following section the data collection using each of these databases will be described, starting with the use of the PCAOB Auditorsearch database, then the gathering of AAERs, following with the COMPUSTAT database, the AuditAnalytics database and finishing with Datastream and I/B/E/S database for the variables of audit credibility and the market beta.

*PCAOB Auditorsearch database*

To collect the necessary data, first a list must be made of public U.S. companies and their auditors. To obtain this list the PCAOB Auditorsearch database was used. This is a database that provides an overview of public U.S. companies and their auditors and engagement partners. The full database will be downloaded. First, the duplicate values are removed (323). Second, all companies that use an audit firm located outside the U.S. are removed (4.828). Hereafter, the type of clients of the audit firms are selected in such way that no investment company or employee benefit scheme is in the dataset (25.203), only issuing companies. Then, all data related to non-Big 4 audit firms are removed (12.924), leaving only companies audited by Deloitte & Touche LLP, Ernst & Young LLP, KPMG LLP, or PricewaterhouseCoopers LLP. Observations with a missing Central Index Key code (CIK code) are also removed from the database, because these CIK codes are necessary to link this database to other databases (29). In this database, data of the fiscal years 2015-2020 can be found. Since financial reports of fiscal years ending in February 2020 are not completed yet, or might be influenced by the recent Corona crisis, these datapoints are deleted from the database (241). The data of the fiscal year ending in 2015 are not complete, since there are far less observations than in the years 2016-2019. Therefore, the datapoints in the year 2015 will be removed from the dataset (49). All fillings that are amendments of previous fillings or dual dated are removed from the database (979). After all these adjustment to the dataset, there are 12.497 observations of 3.777 different companies. These observations are public issuing U.S. companies during the fiscal years of 2016-2019 which were audited by a Big 4 auditor.

Now that the database containing public U.S. companies with Big 4 auditors is created, the next step is to identify the fraud cases using the AAERs.

*AAERs collection*

To identify the filings of the SEC regarding fraud, the AAERs are read. Since the PCAOB Auditorsearch database uses the years 2016-2019, these years will also be looked at for the AAER reports. Between the start of 2016 and the end of 2019, there are in total 380 reports by the SEC. Not all of them are concerned with fraud however. Therefore, all 380 reports are checked if they contain either a violation of rule 10(b)-5, rule 17(a) or a mentioning of fraud. In case of a violation of either one of these two rules or both of them, the report is considered as evidence of fraud. In case fraud is mentioned in the report, but none of the two rules were violated, the report is checked to see what kind of fraud. In case of a financial reporting fraud, the report is considered as evidence of fraud as well. An overview of the results of reading the 380 reports can be seen in the Appendix, in A.table 7.2 and in graph version at Appendix 7- c and Appendix 7- d. From the 380 reports, 155 reports contained evidence of fraud.

By reading the AAERs, the name of the company that committing fraud was obtained and whether the company had a Big 4 auditor was obtained via the annual report of that company in the year the fraud took place. Following the collection of the fraudulent AAER reports, these reports were linked to the database that was collected using the PCAOB Auditorsearch. The year when the fraud was confirmed by the SEC using the statement of an AAER report is taken as the year of the fraud, so if the AAER is filed in 2016, the effect of the AAER on the financial report following 2016 will be measured even though the actual fraud may be committed earlier. Some companies have filed for bankruptcy since the fraud and before the filing of the AAER. These AAERs of fraud could not be used due to the fact that the company does not exist anymore in the database of the PCAOB. Furthermore, some companies were bought by other companies or changed their names. In these cases, the AAER reports were linked to the new company or the new name of the company in the PCAOB Auditorsearch database. If the company changed from a Big 4 auditor to another Big 4 auditor during the time that passed since the fraud took place and the filing of the AAER by the SEC, no changes were made in the dataset. If the change was from a non-Big 4 auditor to a Big 4 auditor or vice versa, the auditor that the company had during the release of the AAER was used for the dataset. From the 155 reports containing fraud, 86 companies were found in the PCAOB Auditorsearch database. Only 19 AAER reports (16 different companies) concerning Big 4 auditors were not found. Of those 86 fraud cases in the AAERs, 44 are in the final dataset after removing the double entries and applying all adjustments mentioned in the section PCAOB Auditorsearch database.

The first variable of fraud has been collected and added to the database as stated above. To continue with the data collection for the regression, some data from the COMPUSTAT database are necessary. How this data are collected and adjusted will be explained next.

*COMPUSTAT database*

To get the necessary data for the measuring of audit quality as described in the methodology section of this paper, COMPUSTAT North America is used. This is a database that collects financial data of North American companies. The CIK codes of the companies in the PCAOB Auditorsearch dataset are used to collect the data. This way, the data of all listed U.S. firms as presented by the PCAOB dataset can be gathered. Because data of previous years are necessary to calculate the discretionary accruals for the modified Jones model, the period over which the data are collected is 2015-2020. From the companies in the list of PCAOB dataset, the CUSIP codes and ticker symbols are collected via COMPUSTAT. These are identifying variables which will be necessary to use the Datastream and I/B/E/S database. Then, variables are selected which will be used to calculate the control variable 'firm size' of formula (1), total accruals of formula (3), the non-discretionary accruals of formula (4) and the control variables 'leverage' of formula (6) and 'market value' and 'return on assets' of formula (1) and (6). This leads to a sample of 3.356 different companies over 5 years and a total of 17.875 observations.

The next step is to clean the sample, to make sure it contains only relevant information. To start, companies from the financial services industries with a Standard Industrial Classification (SIC) code between 6000-6999 will be removed (5.452, losing 5 AAER) (Lawrence, Minutti-Meza, & Zhang, 2011). This is done to prevent bias due to the fact that accounting accruals are different for companies in the financial services industry compared to the industrial industry (Francis & Ke, Disclosure of fees paid to auditors and the market valuation of earnings surprises, 2006). Companies that do not use U.S. dollars as currency are removed from the dataset (6), because these values cannot be compared to companies that do use U.S. dollars as currency. Next, companies with missing data for any of the necessary variables are removed from the dataset (438 missing Current Assets, 32 cash and cash equivalent, 1 debt in current liabilities, 66 long-term debt, 3 depr. and amortization exp., 10 PPE, 30 receivables, 1.440 market value, 2.020 total). This results in a sample of 2.417 different companies over 5 year, which totals in 10.397 observations and 39 AAER reports.

*AuditAnalytics database*

The next database that is used is AuditAnalytics database. This database collects data related to audits from disclosures of public companies. The sample remaining after the use of the COMPUSTAT database is linked to the AuditAnalytics database by CIK code. Here the data concerning the second measurement of fraud, financial restatements, will be collected. Also, auditor fees and audit tenures will be obtained using this database. For audit tenure, a variable that shows the date when the auditor changed is used. If the auditor has been the same for the more than three years, the dummy variable will be 1, if the auditor has changed in the past 3 years the value will be 0. After merging the datasets, 10.165 observations of the 10.397 were matched. Next, the duplicate values were deleted (193). Before moving on to the collection of the beta values and earnings per share, the necessary values for the calculation of the discretionary accruals will be done. After the $\Delta CA$, $\Delta CL$, $\Delta cash$, $\Delta DCL$ and $A_{t-1}$ are calculated,

the values of the years that are not necessary for the final dataset will be removed from the dataset. These are the data from the years 2015 and 2020 (2.204). Then, all observations are removed that are missing data in either one of the variables to calculate the discretionary accruals, or the variables that were collected using AuditAnalytics ($CA_{t-1}$ 447, audit fee 158, tenure 4). According to the AuditAnalytics database, some of the observations are not from Big 4 audit firms, even though a selection had already taken place before with the PCAOB Auditorsearch database. To be sure no other audit firm than Big 4 audit firms are part of the dataset, the observations that do not have a Big 4 auditor in the AuditAnalytics database are removed from the dataset (188). This results in a total dataset of 7.388 observations, of which 2.254 different companies and 39 AAERs and 501 restatements.

*Datastream and I/B/E/S database*

Finally, Datastream and the I/B/E/S database are used. Datastream and the I/B/E/S database were accessed using the Thomson Reuters Eikon platform. By using the 9-digit CUSIP codes of the dataset, the data were linked to Datastream and the I/B/E/S database. Using this tool, the historical beta of the companies in the sample was collected and the analyst's forecast mean of earnings per share one and two years ahead. To collect the $P_0$ value for the PEG method to measure the effect of fraud on audit credibility, the official closing price of the shares is used. For observations of the fiscal year 2016, the earnings per share forecasts are used of the fiscal year ending (so the forecasts per 31-12-2016). For the values of the $P_0$, the closing price per 31-12-2016 is taken for FY 2016. After merging this data with the data sample, 7.134 observations of 2.222 different companies are left, of which 36 AAERs and 481 restatements.

## 3.3 Summary

The chapter Research design starts with explaining the methodology to answer the first research question. Using a multivariate regression model with discretionary accruals as a dependent variable for audit quality, and AAER reports and restatements as independent variable for fraud. The way the discretionary accruals are obtained is by subtracting the non-discretionary accruals from the total accruals, in accordance with the modified Jones model. The methodology for the second research question describes a multivariate regression model as well, only with the ex-ante cost of capital for audit credibility as dependent variable. To finish the methodology section, the PEG method to calculate the ex-ante cost of capital is explained. Next, the necessary data were collected via the PCAOB Auditorsearch database, AAERs collection, COMPUSTAT database, AuditAnalytics database, Datastream and I/B/E/S database. This has led to a panel-data sample of 7.134 observations for 2.222 firms with 36 AAER reports and 481 financial restatements. This sample will be used to obtain a possible answer to the research questions and to check the hypotheses. An overview of the sample can be found in Table 1. In the next chapter, the results will be discussed.

Data collection and sample selection

| Database | Collected variables | Number of observations | Unique companies | Number of AAERs | Number of Restatements |
|---|---|---|---|---|---|
| PCAOB Auditorsearch | Public U.S. companies audited by Big 4 firms | 12.497 | 3.777 | N.A. | N.A. |
| AAERs collection | Fraud cases | 12.497 | 3.777 | 44 | N.A. |
| COMPUSTAT | CUSIP codes, Tickers, current assets, total assets, cash and cash equivalents, debt in current liabilities, long-term debt, depreciation and amortization, current liabilities, PPE, revenue, receivables, net income and market value | (-2.100)<br>10.397 | (-1.360)<br>2.417 | (-5)<br>39 | N.A. |
| AuditAnalytics | Audit fee, auditor change, Big 4 firm yes/no and restatements | (-3.009)<br>7.388 | (-163)<br>2.254 | 39 | 501 |
| Datastream/ I/B/E/S | Beta, analyst's mean forecast of future earnings per share of 1 and 2 years ahead, fiscal year-end price per share | (-254)<br>7.134 | (-32)<br>2.222 | (-3)<br>36 | (-20)<br>481 |

*Table 1: An overview of the data collection and sample selection. Here it can be seen which database was used to collect the numerous variables and what the final sample size is.*

# 4. Results

In this chapter the results of the empirical part of this thesis will be discussed. The sample will be uploaded into Stata to proceed with the tests described in the methodology. First, the descriptive statistics of the sample will be discussed. Following these descriptive statistics, the results of the Pearson-product correlation test will be observed. Afterwards, the multivariate regression of formula (1) with AAER reports and restatements as measures of fraud will be shown followed with the results of the regression including the control variables. Next, the results of the multivariate regression of formula (6) can be observed. Similar to the results of formula (1), first the results related to AAER reports and restatements as measure of fraud will be shown, secondly the regression results with the control variables included will be added. Finally, an analysis of the results will be given.

## 4.1. Descriptive statistics and Pearson-product correlation test

To get an understanding of the sample, the descriptive statistics will be looked at, followed by the Pearson-product correlation test. These tables show how the sample relates to each variable and if the values are suitable for multivariate regressions. The results of these tests will be discussed first, because they can influence the results of the multivariate regressions.

*Descriptive statistics*

In Table 2 the descriptive statistics of the sample can be seen, after the data have been Winsorized at the 1$^{st}$ and 99$^{th}$ percentiles to mitigate the effect of outliers on the data. In the descriptive statistics, the minimum value, mean value, average of the 25$^{th}$ percentile, median value, average of the 75$^{th}$ percentile, maximum value and standard deviation (SD) of the variables are shown. The first section of the table shows the values for the variables of interest. Since the AAER variable and the restatement variable are dummy variables, the mean value gives the percentage of AAER reports and financial restatements in the sample. According to the AAER reports, 0,5% of the sample has a committed fraud. This is followed by the financial restatements percentage of fraud cases, which increases to 6,7%. The mean value of discretionary accruals is close to zero (-0,007). This value is compared to the absolute value of the discretionary accruals (0,078). The difference is due to the negative and positive values of the discretionary accruals leveling each other out. Therefore, it is better to use the absolute discretionary accruals value for the regressions, to see if there is an effect of fraud on audit quality.

When looking at the values that are used to calculate the discretionary accruals, it is noticeable that there are differences between the mean values and median values. In every case, the mean value is higher than the median value and the standard deviation of the variables are relatively high. This indicates that the size of companies, specifically bigger companies, have an effect on the sample. Big differences can also be seen between the minimum values and maximum values of the variables. Often, the maximum value of the variable is way higher than the mean of the highest 75$^{th}$ percentile, whilst the minimum value does not compensate. As can be seen for the PPE, total assets and long term dept.

Descriptive statistics

| | All observations | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | Minimum | Mean | 0,25 | Median | 0,75 | Maximum | *(SD)* |
| | Independent and dependent variables | | | | | | |
| AAER reports | 0 | 0,005 | 0 | 0 | 0 | 1 | 0,071 |
| Restatements | 0 | 0,067 | 0 | 0 | 0 | 1 | 0,250 |
| Discretionary accruals | -1,512 | -0,007 | -0,050 | -0,014 | 0,022 | 2,194 | 0,160 |
| Absolute discretionary accruals | 0,000 | 0,078 | 0,017 | 0,038 | 0,078 | 2,194 | 0,140 |
| Ex-ante cost of capital | 0 | 0,130 | 0,064 | 0,089 | 0,150 | 2,027 | 0,140 |
| | Values for the calculation of the discretionary accruals | | | | | | |
| Current assets | -28.438 | 2.328 | 221 | 597 | 1.796 | 21.658 | 5.537 |
| Current liabilities | -16.369 | 1.717 | 94 | 340 | 1.109 | 23.211 | 4.386 |
| Debt in current liabilities | -5.096 | 289 | 0,17 | 13 | 105 | 6.046 | 901 |
| Δ Cash and cash equivalent | -1.949 | 22 | -30 | 1,90 | 49 | 2.135 | 414 |
| Revenue | -64.465 | 5.961 | 406 | 1.513 | 4.532 | 29.530 | 14.761 |
| Receivables | -8.079 | 762 | 44 | 180 | 582 | 5.257 | 1.838 |
| Depreciation and amortization | 0,055 | 338 | 19 | 74 | 238 | 6.243 | 849 |
| Property plant and equipment | 0,137 | 2.714 | 63 | 346 | 1.562 | 45.639 | 7.087 |
| Total assets | 27,6 | 8.641 | 555 | 1.915 | 6.522 | 133.625 | 19.988 |
| Net income | -1.290 | 399 | -29 | 50 | 273 | 9.431 | 1.325 |
| Long-term dept | 0 | 2.675 | 47 | 499 | 2.189 | 36.440 | 5.932 |
| | Values for the calculation of ex-ante cost of capital | | | | | | |
| Analyst's forecasts eps1 | -14,29 | 1,70 | 0 | 1,50 | 3,30 | 14,59 | 3,70 |
| Analyst's forecasts eps2 | -10,85 | 2,10 | 0,20 | 1,70 | 3,60 | 16,02 | 3,60 |
| Fiscal year-end price per share | 1,03 | 50 | 15 | 33 | 65 | 325,76 | 56 |
| | Control variables | | | | | | |
| Natural logarithm of firm size | 3,32 | 7,60 | 6,30 | 7,60 | 8,80 | 11,80 | 1,80 |
| Audit tenure | 0 | 0,90 | 1 | 1 | 1 | 1 | 0,30 |
| Natural logarithm of audit fee | 9,62 | 15 | 14 | 15 | 15 | 17,82 | 0,99 |
| Return on assets | -2,83 | -0,04 | -0,04 | 0,03 | 0,07 | 4,29 | 0,25 |
| Natural logarithm of market value | -0,89 | 7,70 | 6,50 | 7,60 | 8,90 | 13,89 | 1,90 |
| Leverage | 0 | 0,31 | 0,13 | 0,29 | 0,43 | 3,89 | 0,26 |
| Market beta | -0,35 | 1,20 | 0,80 | 1,1 | 1,60 | 3,43 | 0,66 |
| Number of observations: | | | | | 7.134 | | |
| Number of observations per year: | | | | 2016 | 1.786 | | |
| | | | | 2017 | 1.832 | | |
| | | | | 2018 | 1.805 | | |
| | | | | 2019 | 1.722 | | |

*Table 2: Descriptive statistics of all variables in the final sample. In the table the mean value of the variable can be seen, the 25$^{th}$ percentile, median, 75$^{th}$ percentile and the standard deviations. The variables in the section 'Δ Values of explanatory variables' and 'Other explanatory variables' are in millions of U.S. dollars. All values are rounded to the second decimal point. In the 'Control variables' section, the 'Return on assets' is calculated by dividing the net income over the total assets, and the 'Leverage' is calculated by dividing the long-term debt + debt in current liabilities by the total assets. The natural logarithm of total assets was taken for firm size. Also, the natural logarithm of audit fees and the market value was taken.*

The mean values of most of the variables necessary for calculating the discretionary accruals are even in the highest 75th percentile. Only the mean of Δ cash and cash equivalents of 22 million dollars is not in the 75th percentile. However, for the variable of revenue, the minimum value of -64.465 is the outlier rather than the maximum value. It can also be noticed that there is a relatively big gap between the mean total assets of 8.641 million dollars and the mean of current assets of 2.328 million dollars. This gap is also reflected in the median of the total and current assets, and in the median and mean value of the debt in current liabilities compared to the long-term dept. The gap could be due to the industries of the companies in the sample. The mean of the net income for the sample is positive, with a value of 399 million dollars, and a median of 50 million dollars.

The variables used to calculate the ex-ante cost of capital are more normally distributed than the variables of the discretionary accrual calculation. The mean values of the analyst's forecasts of earnings per share for both years and the fiscal year-end prices of shares are below the average of the 75th percentile. However, the mean values of all three variables are still higher than the median value. Which indicates that companies with higher share prices again have an effect on the sample. The maximum value of the fiscal year-end price per share is high relatively to the mean and median value, which indicates that there are some outliers for firms of bigger sizes. The SD of the variables for the ex-ante cost of capital are relatively closer to the mean value than those of the variables for the discretionary accruals. Something else that stands out is that analysts expect on average higher earnings per share in fiscal year 2 compared to fiscal year 1.

The control variables except for tenure are all either a natural logarithm of a variable or a ratio, therefore these values control for the different sizes of the companies. The mean values and median values of the natural logarithm of firm size and audit fee are therefore similar, and the mean value and median values of most of the other variables are nearly similar as well. Only the return on asset ratio and the leverage variable show a relatively high maximum value. All control variable means are positive, except for the return on asset ratio. For the return on asset ratio, the mean is similar to the average of the lower 25th percentile. The highest 75th percentile of return on assets only has a return of 7% on assets, whilst the maximum value is a return on assets of 425%. This, and the high maximum value of leverage could be related to the high amount of total assets. The mean of audit tenure, which is a dummy variable, is 0,90. This shows that 90% of the sample has the same auditor for more than three consecutive years. The mean and median value of beta is greater than one, therefore, on average, the companies of the sample are more volatile than the market.

These observations show that when interpreting the results, the effect of bigger companies on the sample should be taken into consideration. These effects are most visible in the calculated values of the absolute discretionary accruals, and partly mitigated by dividing these values by the lagged total assets of t-1, as is explained in the methodology. The ex-ante cost of capital variables were not as affected by outlier

values of bigger companies, and the control variables are either natural logarithms, ratios or a dummy variable. Furthermore, industry and year fixed effects will be added to the regressions. It is not expected that these fixed effects will influence the results afterwards. Next, the Pearson-product correlation test will be looked at to see how the variables relate to each other.

*The Pearson-product correlation test*

The results of the Pearson-product correlation test can be seen in Table 3. In the table, first the correlation coefficient between two variables can be seen. Below the correlation coefficient the statistical significance of the correlation is shown between brackets. Whenever the correlation coefficient is positive and significant, it means that the two variables are correlated to the degree of the correlation coefficient, and move in the same direction at the same time. When the coefficient is negative it means that the two variables move in opposite directions of each other. If the correlation coefficient is not significant, there is no proof of correlation between the two variables. It is important to realize that a correlation between variables does not indicate causality.

The first and most important result of the Pearson-product correlation test is that the independent variables of fraud, the AAER and the restatements, do not correlate with the dependent variables of absolute discretionary accruals and ex-ante cost of capital. However, the independent variables are both correlated with the control variables ln firm size and ln audit fee. The correlations are statistical significant within 95%. Between the natural logarithm of firm size, audit fee and AAERs the correlation coefficients are 0,03 and 0,06 and between the natural logarithm of firm size, audit fee and restatements the correlation coefficients are -0,04 and -0,03. The restatement variable also correlates on a significance level of 99% for 0,03 with the natural logarithm of the market value. Because these correlations are quite weak, the results of the regressions will still be interpretable. Therefore it is still possible to use both measures as independent variable.

When looking at the other variables and their correlation coefficients, a few of them stand out. For example, there is a significant correlation of 0,15 between the absolute discretionary accruals and the ex-ante cost of capital. As described in the Literature review, some research papers use auditor reputation and credibility as a measure of audit quality. This correlation is thus not unexpected. Because both variables will not be in the same regression in this thesis, this correlation will give no problems for the results. The same goes for other significant correlations between dependent and control variables or between control variables which are not in the same regression model.

The significant correlations between dependent variable absolute discretionary accruals and the control variables ln firm size and return on assets of 0,29 and 0,28 are probably due to the fact that all three variables are at least partially based on total assets. A significant correlation coefficient of roughly the same amount (0,33) can be seen between the two control variables.

Between the dependent variable of ex-ante cost of capital and the control variables beta and the natural logarithm of market value, a significant correlation exists. These correlations follow from the fact that ex-ante cost of capital is based on earnings per share and share prices, which in their turn are proxies for market value and are based on the market beta. Similarly, the return on assets and the leverage influence the analyst's forecasts of earnings per share, which could explain the significant correlation between these variables and the ex-ante cost of capital.

Other noticeable correlation coefficients are the correlation between the natural logarithm of audit fee and firm size and the natural logarithm of market value and firm size. These are strong statistically significant correlation coefficients of 0,82 and 0,85. Indicating that audit fee and firm size increase simultaneously, as well as the market value and firm size. Based on previous literature and knowledge of the financial markets, these correlation coefficients seem logical. A smaller yet still strong significant correlation of 0,72 can be seen between the natural logarithm of the audit fee and the market value. Finally, a smaller yet interesting significant correlation of 0,15 can be seen between audit tenure and the natural logarithm of the firm size. Indicating that if the size of the company increases, so does the audit tenure.

Because there is no significant correlation between the dependent and independent variables, and almost no correlation between de independent variables and the control variables, the regression models can be used to obtain results. However, to be able to see the effect of the correlations between the dependent variables and the control variables, each control variable is added one by one to the regression model. Since this thesis is only concerned with the regression coefficients of the independent variables, it is not a problem if the control variables are correlated, as long as there is no multicollinearity with the independent variables. The VIF- scores of the regressions will be checked as well to make sure there is no multicollinearity. These results and the results of the multivariate regressions will be discussed next.

Pearson-product correlation test

| Variables | AAERs | Restate -ments | Discr. accruals | Abs. DA | Ex-ante cost of capital | Ln firm size | Tenure | Ln audit fee | Leverage | Beta | Return on assets | Ln market value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AAERs | 1.000 | | | | | | | | | | | |
| Restatements | -0.003 | 1.000 | | | | | | | | | | |
| | (0.776) | | | | | | | | | | | |
| Discretionary accruals | -0.007 | 0.016 | 1.000 | | | | | | | | | |
| | (0.579) | (0.189) | | | | | | | | | | |
| Absolute discr. accruals | -0.019 | -0.003 | 0.377* | 1.000 | | | | | | | | |
| | (0.109) | (0.796) | (0.000) | | | | | | | | | |
| Ex-ante cost of capital | 0.012 | -0.003 | -0.062* | 0.155* | 1.000 | | | | | | | |
| | (0.296) | (0.827) | (0.000) | (0.000) | | | | | | | | |
| Ln firm size | 0.030* | -0.038* | 0.002 | -0.288* | -0.286* | 1.000 | | | | | | |
| | (0.012) | (0.001) | (0.889) | (0.000) | (0.000) | | | | | | | |
| Tenure | -0.016 | -0.007 | -0.016 | -0.067* | -0.068* | 0.148* | 1.000 | | | | | |
| | (0.186) | (0.566) | (0.165) | (0.000) | (0.000) | (0.000) | | | | | | |
| Ln audit fee | 0.056* | -0.034* | -0.036* | -0.230* | -0.217* | 0.820* | 0.151* | 1.000 | | | | |
| | (0.000) | (0.005) | (0.002) | (0.000) | (0.000) | (0.000) | (0.000) | | | | | |
| Leverage | -0.001 | -0.004 | -0.037* | -0.104* | 0.105* | 0.215* | 0.034* | 0.181* | 1.000 | | | |
| | (0.928) | (0.709) | (0.002) | (0.000) | (0.000) | (0.000) | (0.004) | (0.000) | | | | |
| Beta | -0.011 | 0.016 | 0.017 | 0.105* | 0.202* | -0.143* | -0.011 | -0.084* | -0.013 | 1.000 | | |
| | (0.339) | (0.181) | (0.151) | (0.000) | (0.000) | (0.000) | (0.348) | (0.000) | (0.266) | | | |
| Return on assets | 0.013 | -0.016 | 0.087* | -0.280* | -0.374* | 0.457* | 0.090* | 0.330* | 0.012 | -0.176* | 1.000 | |
| | (0.259) | (0.184) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.309) | (0.000) | | |
| Ln market value | 0.016 | -0.033* | 0.045* | -0.177* | -0.458* | 0.850* | 0.141* | 0.718* | 0.070* | -0.187* | 0.437* | 1.000 |
| | (0.175) | (0.005) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | |

*Table 3: The results of the Pearson-product correlation test. Where the first value is the correlation value between variables, and the second value is the significance of the correlation. Every value marked by a * is significant to at least p<0.1. This table was created using asdoc, a Stata program written by Shah (2018).*

## 4.2 Multivariate regression results

To answer the research questions and check whether the hypotheses are correct, the multivariate regressions from formula (1) and (6) will be performed. After analyzing the descriptive statistics and the Pearson-product correlation test, the structure of the sample is better understood. This will help with understanding the results of the regressions. For both regressions, a control for industry and year fixed effects have been added, to mitigate the endogenous effects of different years or company types. To see the effect the control variables have on the regression, they will be added one by one to the regression. For every separate regression, the VIF score will be checked for multicollinearity. First the results of formula (1) for the first research question about the effect of fraud on audit quality will be analyzed. Secondly the results of formula (6) for the second research question about the relationship between audit credibility and fraud will be discussed.

*Audit quality regression results*

In Table 4 the results of the regression of formula (1) can be seen. In this table, the dependent variable are the discretionary accruals, and the independent variables are the AAER reports and the restatements. The control variables are added one by one, starting by the natural logarithm of firm size, tenure, natural logarithm of audit fee, return on assets and finishing with the natural logarithm of the market value. Within every regression a control was placed for industry fixed effects and yearly fixed effects. In the table, first the regression coefficient can be seen for every variable. Below the regression variable, the standard error is shown in parentheses. Some values have either one, two or three asterisks. These indicate the statistical significance of the value.

To understand how much the independent variables and control variables explain the dependent variable, the adjusted $R^2$ value is observed rather than the $R^2$ value. This is because the $R^2$ value assumes that every independent and control variable influences the dependent variable, whereas the adjusted $R^2$ value adjusts itself in accordance to the number of independent and control variables in the regression that actually influence dependent variable. The results of the first regression with only the independent variables has an adjusted $R^2$ value of 0,175. This means that the variables in the regression explain the dependent variable of discretionary accruals for 17,5%. It can be seen that the AAER reports have a significant effect of 90% on the dependent variable of discretionary accruals. This effect is negative with a value of 0,037. If the AAER reports value of the regression increases with 1, the value of the discretionary accruals will decrease significantly with 0,037. When the control variables are added, the AAER reports do not longer have a significant effect on the discretionary accruals. The control variable of firm size does have a highly significant effect of 99% on the discretionary accruals. Although the regression coefficient of firm size is small, only -0,010, the adjusted $R^2$ value increases to 18,5% when this control variable is added. The variable is negative, so if firm size increases, the number of discretionary accruals decreases.

Regression results of 2.1. Audit quality and 2.3. Fraud

| Variables | (1) | (2) | (3) | (4) | (5) | Full regression |
|---|---|---|---|---|---|---|
| Constant | 0,041 | 0,115*** | 0,122*** | 0,107* | 0,109* | 0,095* |
| | (0,040) | (0,041) | (0,.041) | (0,056) | (0,056) | (0,056) |
| AAERs | -0,037* | -0,030 | -0,031 | -0,031 | -0,031 | -0,027 |
| | (0,022) | (0,022) | (0,022) | (0,022) | (0,022) | (0,022) |
| Restatements | 0,000 | -0,001 | -0,001 | -0,001 | -0,001 | -0,002 |
| | (0,006) | (0,006) | (0,006) | (0,006) | (0,006) | (0,006) |
| Natural logarithm of firm size | - | -0,010*** | -0,010*** | -0,010*** | -0,010*** | -0,021*** |
| | | (0,001) | (0,001) | (0,002) | (0,002) | (0,003) |
| Tenure | - | - | -0,009* | -0,009* | -0,009* | -0,010* |
| | | | (0,005) | (0,005) | (0,005) | (0,005) |
| Natural logarithm of audit fee | - | - | - | 0,001 | 0,001 | 0,002 |
| | | | | (0,003) | (0,003) | (0,003) |
| Return on assets | - | - | - | - | -0,006 | -0,014* |
| | | | | | (0,008) | (0,008) |
| Natural logarithm of market value | - | - | - | - | - | 0,011*** |
| | | | | | | (0,002) |
| $R^2$ value | 0,213 | 0,223 | 0,223 | 0,223 | 0,223 | 0,227 |
| Adjusted $R^2$ value | 0,175 | 0,185 | 0,185 | 0,185 | 0,185 | 0,189 |
| Number of control variables | 0 | 1 | 2 | 3 | 4 | 5 |
| Observations | 7.134 | 7.134 | 7.134 | 7.134 | 7.134 | 7.134 |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |

*Table 4: The regression results of formula (1), where the control variables have been added one by one. All regressions have been controlled for year fixed effects and industry fixed effects and have a 7.134 observations, following the Data and sample selection chapter. The regression coefficient is given first, the value in parentheses below is the standard error. The significance of the variables is also given, where ***p<0,01 , **p<0,05 and *p<0,1. The dependent variable in this regression model are the discretionary accruals and the independent variables are the AAERs and the restatements. The value of $R^2$ tells how well the variables explain the dependent variable.*

Tenure, the control variable that is added next, has a negative 90% significant effect of 0,009. However, adding this variable does not increase the strength of the regression model, since the adjusted $R^2$ value remains the same. The adjusted $R^2$ value of the full regression is the highest. When all control variables are added, the regression model explains the dependent variable of discretionary accruals for 18,9%. Both return on assets and market value have a statistical significant effect on discretionary accruals in the full regression model. Market value is 99% significant and return on assets 90%. Both regression coefficients are rather low. Because the adjusted $R^2$ only increased when the market value variable was added, the effect of return on assets on discretionary accruals was probably caught in another control variable before it was added. Looking at all results of the regressions, it is observable that the value of restatements never had a statistical significant effect on the discretionary accruals. The AAER reports only have a statistically significant effect on the dependent variable when no control variables are added to the regression. However, the control variables except for audit fee and return on asset have a constant statistical significant effect on discretionary accruals.

In the Appendix, the results of the VIF scores can be seen in A.table 7.3. The mean VIF scores are all below 5, which indicates that there is no multicollinearity. The VIF scores of the independent variables AAERs and restatements are constantly 1,07 and 1,10. Therefore there is no risk of multicollinearity for these variables. With the control variable firm size there is a risk of multicollinearity. When only firm size and tenure are added to the regression model, the VIF score of firm size is below 5. But in the regression models with 3 and 4 control variables, the VIF score of firm size are 5,30 and 5,79. When the natural logarithm of market value is added to the regression model the VIF score of firm size even increases to 11,23 and the VIF score of market value is 5,92. These scores are above the maximum of 5. Therefore the regression coefficient of firm size and market value in the regression with 3 and 4 control variables and the full regression cannot be interpreted directly. In the regression results of Table 4 it can be seen that the regression coefficient of firm size doubles in value as soon as market value is added to the regression. The same can be said for the VIF score. It is probable that these increases are due to multicollinearity. Since these variables are not the independent variables of this research, and the VIF scores of the independent variables stay stable, the results can still be interpreted.

Table 4 and A.table 7.3 show the results of formula (1) for the first research question. Moving forward, the results of the second research question will be discussed.

*Audit credibility regression results*

In Table 5 the results of the regression of formula (6) can be seen. The dependent variable of formula (6) is the ex-ante cost of capital, which is the descriptive variable for audit credibility. The independent variables are again the AAER reports and the restatements. Formula (6) has different control variables than formula (1). These control variables added one by one to the regression, to be able to see the effect of each control variable separately on the regression. The first variable that is added is leverage, followed by return on assets and the market beta. The last control variable that is added is the natural logarithm of market value. Table 5 has the same structure as Table 4, where first per variable the regression coefficient is shown, the level below the regression coefficient shows the standard error in parentheses. The statistical significance of the variables is shown by the number of asterisks, and all the regressions are controlled for industry and year fixed effects.

Similar to the results of Table 4, for the results of Table 5 the adjusted $R^2$ will be observed rather than the $R^2$ value, as it takes the number of variables that have an effect on the dependent variable into account. In the first column of the regression table, it can be seen that the two independent variables have no statistically significant effect on the ex-ante cost of capital. The first regression has no control variables, which results in an adjusted $R^2$ value of 0,151 or 15,1%. This means that the regression with only the independent variables explains the value of ex-ante cost of capital for 15%.

Regression results of audit credibility and fraud.

| Variables | (1) | (2) | (3) | (4) | Full regression |
|---|---|---|---|---|---|
| Constant | 0,11** | 0,086** | 0,095** | 0,078** | 0,301*** |
| | (0,04) | (0,041) | (0,040) | (0,039) | (0,037) |
| AAERs | 0,037 | 0,035 | 0,041* | 0,043** | 0,049** |
| | (0,023) | (0,022) | (0,022) | (0,021) | (0,020) |
| Restatements | -0,00 | -0,000 | -0,003 | -0,004 | -0,005 |
| | (0,01) | (0,006) | (0,006) | (0,006) | (0,006) |
| Leverage | - | 0,078*** | 0,062*** | 0,061*** | 0,075*** |
| | | (0,007) | (0,007) | (0,007) | (0,006) |
| Return on assets | - | - | -0,162*** | -0,158*** | -0,073*** |
| | | | (0,007) | (0,007) | (0,007) |
| Beta | - | - | - | 0,021*** | 0,014*** |
| | | | | (0,003) | (0,002) |
| Natural logarithm of market value | - | - | - | - | -0,030*** |
| | | | | | (0,001) |
| $R^2$ value | 0,190 | 0,205 | 0,260 | 0,267 | 0,362 |
| Adjusted $R^2$ value | 0,151 | 0,167 | 0,224 | 0,231 | 0,331 |
| Number of control variables | 0 | 1 | 2 | 3 | 4 |
| Observations | 7.134 | 7.134 | 7.134 | 7.134 | 7.134 |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes |

*Table 5: The regression results of formula (6), where the control variables have been added one by one. All regressions have been controlled for year fixed effects and industry fixed effects and have a 7.134 observations, following the Data and sample selection chapter. The regression coefficient is given first, the value in parentheses below is the standard error. The significance of the variables is also given, where ***p<0,01 , **p<0,05 and *p<0,1. The dependent variable in this regression model are the ex-ante cost of capital and the independent variables are the AAERs and the restatements. The value of $R^2$ tells how well the variables explain the dependent variable.*

Moving on to the second regression results with the control variable 'leverage', the adjusted $R^2$ value increases to 16,7%. Leverage has a regression coefficient that is 99% statistically significant and has a value of 0,078. This means that when the value of leverage increases with 1, the value of the ex-ante cost of capital increase with 0,078. As more control variables are added to the regression, the adjusted $R^2$ value also increases. When the return on asset variable is added, the regression model explains ex-ante cost of capital for 22,4%, with the addition of the market beta the adjusted $R^2$ value goes up to 23,1% and the full regression model has an adjusted $R^2$ value of 33,1%. This last increase of the value of the adjusted $R^2$ is due to the addition of the control variable of market value. In these regression models, all control variables are statistically significant for 99%. All control variable have positive regression coefficients except for return on assets and market value. Return on asset and market value have a negative regression coefficient, which means that if the value of return on assets or market value increase, the value of the ex-ante cost of capital decrease. For example, according to the regression model with two control variables, if the return on assets increase by one, the ex-ante cost of capital

decrease with a value of 0,162. Similar, when market value increases by one, the ex-ante cost of capital decrease by 0,030.

The independent variable of restatements is in none of the regression models statistically significant, but the independent variable of AAERs becomes statistically significant for 90% after the control variable of return on assets is added. When the control variables beta and market value are added, the AAERs independent variable even becomes 95% statistically significant. The regression coefficient of the AAER report variable is positive, and for the regression with two control variables 0,041, for the regression with three control variables 0,043 and for the full regression 0,049. When the variable of AAERs increases by one, the value of ex-ante cost of capital thus increases by 0,049 if the full regression model is used.

The VIF scores of the separate regressions can be seen in the Appendix, in A.table 7.4. The values of the VIF scores cannot be higher than five for every variable in the different regressions, because this would indicate that there might be multicollinearity between the different variables. As can be seen in A.table 7.4, the mean VIF score for the different regressions is 3,12 for the regression with only the independent variables and 3,11 for all other regressions. All the VIF scores of the independent variables and the control variables are less than two, so there is no case of multicollinearity in the regressions concerning ex-ante cost of capital and the AAERs and restatements.

## 4.3 Analysis of the results

In this section, the results of the multivariate regressions will be analyzed further. The results will be compared with previous literature and diverging results will be explained. To start, the results of audit quality and fraud will be discussed. Finally, audit credibility and fraud will be interpreted.

*Audit quality and fraud*

The results of the first regression show only a small significant effect of AAERs on discretionary accruals. When more control variables are added, this significant effect disappears. This is probably due to the fact that the variable of AAERs captured the effect of some control variables on discretionary accruals. As soon as these control variables are added, it is possible that the effects of these variables are reflected by themselves, and therefore are no longer translated into the regression via the AAERs. It could also be that the control variables generate noise in the regression model, and this noise leads to the effect of AAERs being overruled. Therefore, the significant effect of AAERs in the first multivariate regression of formula (1) have to be taken into consideration. The results of the AAERs variable differs from the results of Lennox and Pittman (2008), who find that the audit quality of Big 5 audit firms in the period of 1981-2001 has remained unaffected and influenced by fraud cases. This difference could be because Lennox and Pittman compare their results for Big 5 audit firms with non-Big 5 audit firms. It could also be due to the different times, since then, Arthur Andersen LLP has gone out of business, leaving only the Big 4 firms.

The variable of restatement shares the results of Lennox and Pittman. According to this variable, there are no significant changes in audit quality due to fraud. These results also agree with the results of Hirschey et al. (2010) and Jones et al. (2006). Both these researches conclude that there is no significant effect of restatements on discretionary accruals.

For the control variables of the first regression it can be noticed that there is a significant effect of 99% of the natural logarithm of firm size on the discretionary accruals. However, when looking at A.table 7.3 of the VIF scores, the natural logarithm of firm size shows VIF scores higher than five. Due to the risk of multicollinearity that follows, the coefficient of firm size cannot be interpreted. This is similar for the natural logarithm of market value. The variable for tenure is 90% significant for every regression, with a coefficient value of -0,01. This would suggest that if the tenure of an audit is more than 3 years, the discretionary accruals decrease with 0,01, thus improving audit quality. This result is similar to that of Carcello and Nagy (2004), who find that fraud and low audit quality is more common in the early years of an audit engagement.

To continue, the results of the second multivariate regression of formula (6) will be looked at more closely.

*Audit credibility and fraud*

In the second regression, the results show an increase in significance of the AAERs variable of fraud. This indicates that even when control variables are added, the effect of AAERs on audit credibility increases. Therefore, it is assumed that AAER reports influence audit credibility. This results contradicts the results of Nelson et al. (2008), who could not find a correlation between the fraud case of Enron and a decrease in reputation for Arthur Andersen LLP. When comparing the results to the research done by Cassell et al. (2013), the same results are obtained. Cassel et al. find that fraud cases increase the ex-ante cost of capital, similar to the results visible in table 5. These different results could be due to the research of Nelson et al. (2008) being focused on the Enron scandal, whilst Cassel et al (2013) look into the implementation of the SOX, and this thesis focusses on more recent years. The results of restatements as measure for fraud show no significant effect on audit credibility. The results of a study done by Liu et al. (2009) has a different outcome. According to Liu et al., restatements have a negative effect on the reputation of auditor firms, and thus the credibility. This effect cannot be seen in this thesis. A probable reason for this is because the variable of audit credibility in this thesis is the ex-ante cost of capital, whilst Liu et al. use the whether or not stockholders want a different audit firm after restatements as a measure for audit credibility.

None of the control variables in the second multivariate regression model have a VIF score higher than five, according to A.table 7.3. This means that there is no risk of multicollinearity for these variables. The variable of leverage has a significance of 99%, as do return on assets, the market beta and the natural logarithm of market value. Since there is no risk of multicollinearity, these coefficients can be

interpreted. According to the full regression model, leverage and the market beta have a small positive effect on ex-ante cost of capital. This means that the audit credibility of Big 4 audit firms decreases for clients on a volatile market and clients with more liabilities per asset. The variable for return on asset and the natural logarithm of market value have a negative effect on ex-ante cost of capital, indicating that a higher market value and higher returns per assets increase the audit credibility of Big 4 audit firms.

### 4.4 Summary

The results of several tests on the dataset and of the multivariate regression formulas (1) and (6), as described in the chapter Research design, are discussed in this chapter. First, the descriptive statistics and Pearson-product correlation test are observed. The descriptive statistics show that after the data are Winsorized, company size, and especially bigger companies, influences the sample. These effects are mitigated by scaling the variables by the lagged total assets or using natural logarithms. The Pearson-product correlation test shows no correlation between the dependent and independent variables. Although the independent variables correlate slightly with some control variables, this correlations are too small to influence the regression. Therefore the regression coefficients of these variables can be interpreted without the risk of multicollinearity. The results of formula (1) are discussed next. The AAER independent variable has a 90% significant effect of -0,037 on discretionary accruals when none of the control variables are added to the regression. This result contradicts a research done by Lennox and Pittman (2008). The full regression model has the highest adjusted $R^2$ value of 18,9%, due to the variable of market value, but none of the independent variables are significant. When looking at the VIF scores, the variable of firm size and market value have a VIF score of five or higher from the regression with three control variables onwards. These regression coefficients can therefore not be interpreted, due to the risk of multicollinearity. The multivariate regression results of formula (6) show the highest adjusted $R^2$ value of 33,1% for the full regression. The independent variable of AAER reports has a significance level of 95% and a value of 0,049 in the full regression, this result is similar to that of Cassell et al. (2013). When looking at the VIF scores for the regression of formula (6), there is no risk for multicollinearity. The restatement variable is never significant.

To continue, these results will be interpreted, an answer to the research questions will be formulated and the hypotheses concerning these research questions will be accepted or rejected in the conclusion of this thesis. In the following chapter of the conclusion, the limitations and possible improvements to this thesis will be discussed.

## 5. Concluding remarks

After the introduction of the research questions, the development of the hypotheses, the explanation of the methodology for testing these hypotheses, the collection of the data and sample and the discussion of the results, this part of the thesis will conclude the research. To conclude, first a short summary will

repeat what has been done in this thesis before moving on to the interpretation of the results and answering the research questions. To continue, the hypotheses for the research questions will be either accepted or rejected. The contributions of this thesis to the existing literature will be discussed next. Finally, improvement points and suggestions for follow up research will be made.

## 5.1. Conclusion

In this section the research will be concluded. This will be done by summarizing what has been done so far, and discussing what the results of this thesis are. The results will be discussed by answering the research questions and accepting or rejecting the hypothesis.

*Summary*

In this thesis the main objective has been to discover the effect of fraud cases from clients of Big 4 firms on the audit quality and credibility of those Big 4 firms. Since the discovery of multiple high profile fraud cases in the recent years, a public debate has been going on about how to improve the audit quality and credibility. These fraud cases concern audit quality and credibility, because the auditing profession is based on providing assurance that the financial statements of a company reflect the current status of that company correctly, thus decreasing the information asymmetry in accordance with the Agency theory. Due to the expectation gap, the public expects auditors to eliminate fraud, misstatements and errors in financial reports, whilst auditors can only provide reasonable assurance that the financial statements are without fraud, errors and misstatements. To be able to improve audit quality and credibility, it is necessary to know how fraud influences audit quality and credibility. This has led to the main research questions of this thesis:

1. *What is the effect of fraud cases of clients of Big 4 auditors on the audit quality of Big 4 auditors in the United States?*

And;

2. *What is the effect of fraud cases of clients of Big 4 auditors on the audit credibility of Big 4 auditors in the United States?*

Whilst consulting previously written literature on this subject, different results can be found regarding the two main questions. To develop hypotheses for the two main questions, these results from previous literature have been combined, leading to the following hypotheses:

*H1: there is no effect of fraud cases from Big 4 clients on audit quality of the Big 4 audit firms in the United States.*

*H2: fraud cases of Big 4 clients have a negative effect on audit credibility of Big 4 audit firms in the United States.*

To test these hypotheses, multivariate regression models have been used. The first model uses audit quality as depending variable and fraud as independent variable. As a measurement for audit quality, the modified Jones model is used to calculate the discretionary accruals. Here, the discretionary accruals reflect the financial reporting quality of the output of an audit. This is the preferred variable for audit quality, because audit quality in this thesis is defined as how strictly an auditor monitors financial reporting quality. So when discretionary accruals increase, audit quality will decrease.

The second model uses the ex-ante cost of capital, calculated using the PEG method, as a dependent variable reflecting audit credibility and fraud as an independent variable. The ex-ante cost of capital is a variable that captures the perception of the output of an audit, which therefore reflects how credible the audit is perceived to be. When the ex-ante cost of capital increases, audit credibility decreases. In both regressions the variable for fraud is measured in two ways. The first variable of fraud is a dummy variable for AAER reports, which are official rulings by the SEC that fraud has been committed. Thus marking the time when a fraud case officially has been ruled as such. Due to possible time lags and possible bias in investigations by the SEC, a dummy variable for official restatements has also been used as a measure for fraud.

To collect the data to perform the multivariate regression models, multiple databases have been used. The data that has been collected is of non-financial public U.S. companies of the years 2016-2019 that were audited by Big 4 companies. The databases that have been used are PCAOB Auditorsearch, COMPUSTAT, AuditAnalytics, Datastream and I/B/E/S. The sample has a size of 7.134 observations of 2.222 different companies, with 36 AAER reports and 481 restatements. When looking at the descriptive statistics of the sample, it can be seen that there is an effect from relatively bigger firms on the sample. Therefore, either the natural logarithm of the variables is used or the variables are divided by the lagged total assets, to compensate for firms from different sizes. According to the Pearson-product correlation test, there is no significant correlation between the dependent and independent variables. To make sure there is no risk for multicollinearity, the VIF-scores of both multivariate regressions are observed. For both regressions, the dependent and independent variables are not at risk of multicollinearity.

This summarizes what has been done so far in this thesis. The results of the multivariate regressions will be discussed next, in combination with either accepting or discarding the hypotheses and giving answers to the research questions.

*The effect of fraud by Big 4 clients on audit quality of Big 4 firms*

By looking at the descriptive statistics of the sample, the Pearson-product correlation test and the VIF scores, the assumptions for a regression have been checked. Now, the results of the regression can be interpreted. In case of this first regression however, it should be noticed that there is a possibility of reversed causality. In case of reversed causality, the audit quality of Big 4 firms affects the possibility

of fraud by clients of Big 4 auditors, instead of fraud affecting audit quality. To interpret the results of the regression, Table 4 is observed. When looking at Table 4 it can be seen that in the first regression, with only the independent variables and the dependent variable, that the AAERs have a 90% significant effect of -0,037 on discretionary accruals. This would mean that if there is one extra AAER report, the discretionary accruals would decrease with 0,037, thus the audit quality would improve with 0,037. The regression with the highest adjusted $R^2$ value, and therefore the regression that best describes the dependent variable, is the full regression. The adjusted $R^2$ value is 0,189 which means that the model explains the dependent variable for 18,9%. With the full regression, and all other regressions except for the first one, none of the independent variables are significant. Therefore, there is no significant effect of the independent variables of fraud on discretionary accruals.

Following these results concerning the independent variables and the control variables, it can be seen that the independent variables of fraud, AAERs and restatements, do not significantly influence discretionary accruals in most regressions. The AAERs have a small significant negative effect on discretionary accruals and thus positive effect on audit quality when there are no control variables in the regression. This regression explains the dependent variable for 17,5%, and the AAER coefficient is significant for 90%. Even though these results are not very strong, they show that AAERs have some effect, however small, on the dependent variable of audit quality. This means that the first hypothesis stating that there is no effect from fraud cases of Big 4 clients on audit quality of Big 4 audit firms in the United States has to be rejected when AAER reports are used to measure fraud. When looking at the restatement variable as a measure of fraud, there is no significant effect on audit quality in any of the regressions. Therefore, if restatements are considered as measure of fraud, the first hypothesis will be accepted.

*The effect of fraud by Big 4 clients on audit credibility of Big 4 firms*

For the results of the second multivariate regression the descriptive statistics, Pearson-product correlation test and VIF scores are observed as well. The descriptive statistics show that the variables for the second regression also hold the assumptions of the regression model. The results of the regression can thus be interpreted. These results can be found in Table 5. Table 5 shows that as more control variables are added to the regression model, the AAER variable gets more significant. In the full regression model with an adjusted $R^2$ value of 0,331, the AAER variable is significant for 95%. The adjusted $R^2$ value indicates that the full regression explains the dependent variable of audit credibility for 33,1%. The coefficient of the AAERs is 0,049. So if there is one more AAER report, ex-ante cost of capital will increase with 0,049 and when the ex-ante cost of capital increase, audit credibility decreases. The coefficient for AAERs is highest and most significant in the full regression.

The second hypothesis states that fraud cases of Big 4 clients have a negative effect on audit credibility of Big 4 auditors in the United States. The results of Table 5 show that the AAER variable of fraud has

a 95% significant positive effect of 0,049 on ex-ante cost of capital. This means that the AAER variable has a negative effect on audit credibility. The results of the restatement variable are not significant. If the restatement variable is used to answer the research question and accept or reject the hypothesis, the hypothesis will be rejected, because there is no visible effect from fraud cases of Big 4 clients on audit credibility of Big 4 audit firms in the United States. When looking at the AAER reports as a measure of fraud, the variable does have a negative effect on audit credibility of Big 4 audit firms in the United States. Therefore the second hypothesis will be accepted for the AAERs as a measure of fraud.

## 5.2 Contribution and limitations

In this final part of the thesis, the contribution to existing literature and possible improvements or suggestions for follow-up research will be discussed. The contribution of the results to existing literature will be discussed first, following with the limitations and suggestions.

*Contribution to existing literature*

The results of this thesis add to existing literature, because previous literature is mostly concerned with the difference between Big 4 and non-Big 4 firms. Also, previous literature looks at how characteristics or behavior of clients of Big 4 firms effect the audit quality and audit credibility of Big 4 firms. Audit firms have no control over these characteristics, similar to the inherent and control risk of the Audit Risk Model. Audit firms can control the detection risk however. An understanding of the effect of fraud on audit credibility and quality, characteristics of audit firms, can therefore contribute to the improvement of audit quality and credibility.

This thesis shows that restatements have no significant effect on both audit quality and audit credibility. The results also discusses the usage of AAER reports as a measure of fraud. This information adds to existing literature. Since AAER reports do have significant results, other researchers can use this thesis as an example of the difference between these two measures. The reaction of the control variables that significantly effect audit quality or audit credibility also add to existing literature. The information on these control variables can be used in other research papers, or to improve audit quality and credibility.

*Limitations and suggestions*

There are some points on which this research can be improved. First of all, the measure of discretionary accruals for audit quality has a high measurement error, according to DeFond & Zhang (2014). Also, it is unclear how discretionary accruals can be measured best. In this thesis, the absolute value of discretionary accruals is used, and the modified Jones model. However, there are multiple other ways that discretionary accruals can be measured. Also, there are a number of external effects that might influence audit quality, which were not part of the multivariate regression model in this thesis. Therefore, it might not be possible to interpret the results of the regression as causal (Shroff, 2015). Lastly, discretionary accruals are sometimes used for signaling stakeholders of a company, rather than

earnings management in favor of management (Lawrence, Minutti-Meza, & Zhang, 2011). This difference has not been made in this thesis.

Another limitation to this research is the ex-ante cost of capital as a measure for audit credibility. Because audit quality and audit credibility are closely related, changes in the audit credibility most of the time coincide with changes in audit quality (Shroff, 2015). This makes it hard to find a variable that isolates the effect of fraud on audit credibility. Furthermore, a problem with using the ex-ante cost of capital as a measure for audit credibility, especially in case of the PEG method, is that this model is based on the assumption that there will be a growth of 0% for the abnormal earnings of the company. The PEG method therefore does not take market effects into consideration, and ignores the possibility of dividends for the following year (Botosan & Plumlee, Assessing Alternative Proxies for the Expected Risk Premium, 2005).

For the variable of AAERs reports used to indicate fraud, the possibility of time lag might bias the results, which is a limitation to this thesis. In this thesis, the year of the SEC report is assumed to be the year the fraud has been committed, even though the SEC report might be published some years later than the year of the fraud. Also, the fact that the SEC does not investigate all companies, leads to a possible selection bias (Dechow, Sloan, & Sweeney, Detecting earnings management, 1995; Dechow, Larson, & Sloan, Prediciting material accounting misstatements, 2011). To control for these biases, restatements are also used as a measure of fraud, since they are not subject to a selection bias, and are always connected directly to a year with a misstatement, thus no time lag. However, the limitation of restatements as a measure of fraud, is that not all restatements are due to fraud. Some misstatements are due to other problems, such as a miscalculation. Therefore the restatement variable is contaminated by random noise, which can influence the results (Hirschey, Smith, & Wilson, 2010).

A final limitation is the high VIF scores for some of the control variables in the first multivariate regression model. This makes it harder for the results to be interpret. For future research on this subject, a suggestion could be to use other control variables, that do not have a correlation with each other, such as the control variables in the second regression. Also, the effect of the control variables as independent variables on audit quality and audit credibility could be tested. Another suggestion for a research continuing on this subject, is to see if similar results would be obtained when using different variables for audit quality and credibility. Finally, to mitigate problems arising from the fraud variable, an event study with actual known fraud cases would be interesting, to further analyze the effects of fraud on audit quality and audit credibility.

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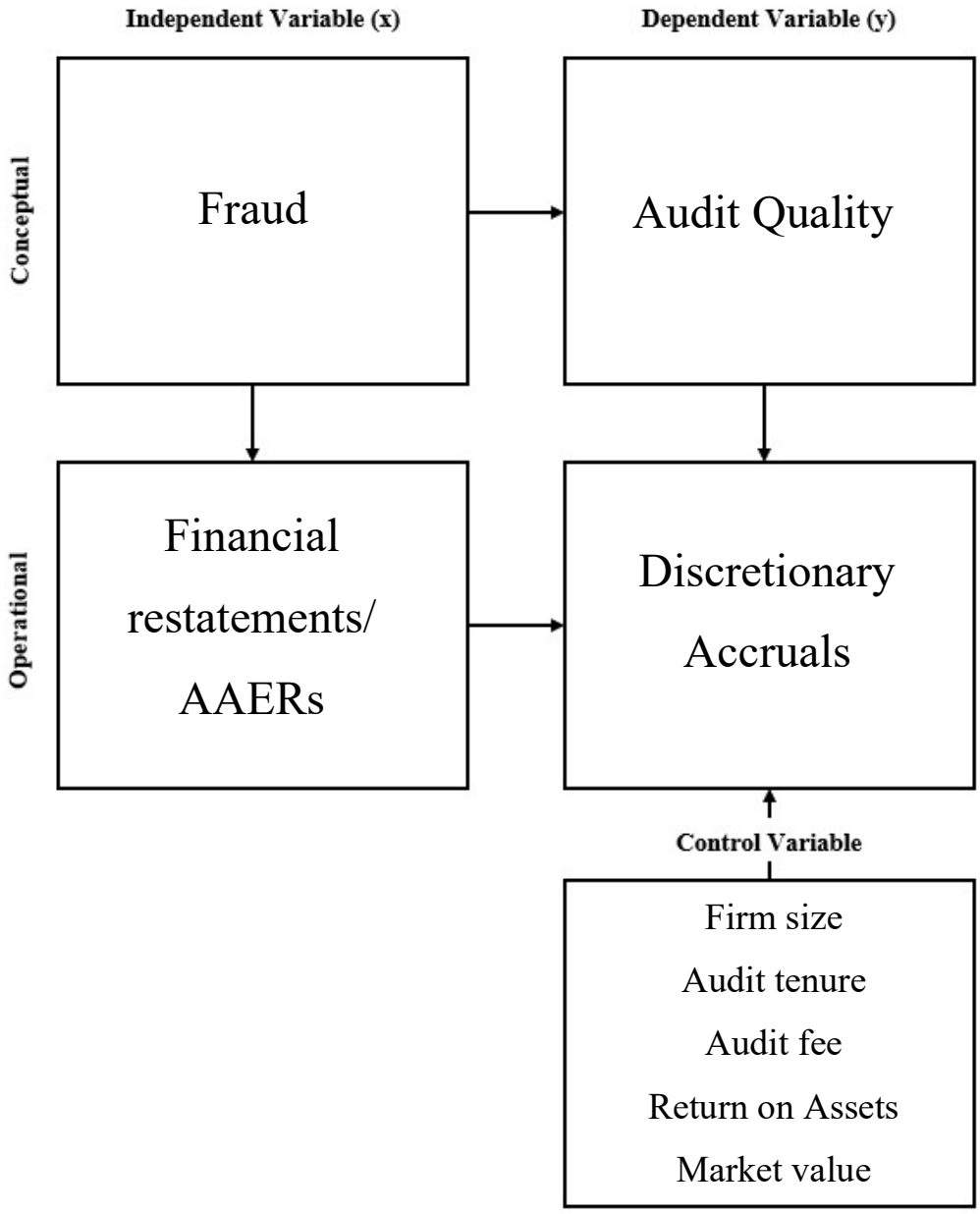
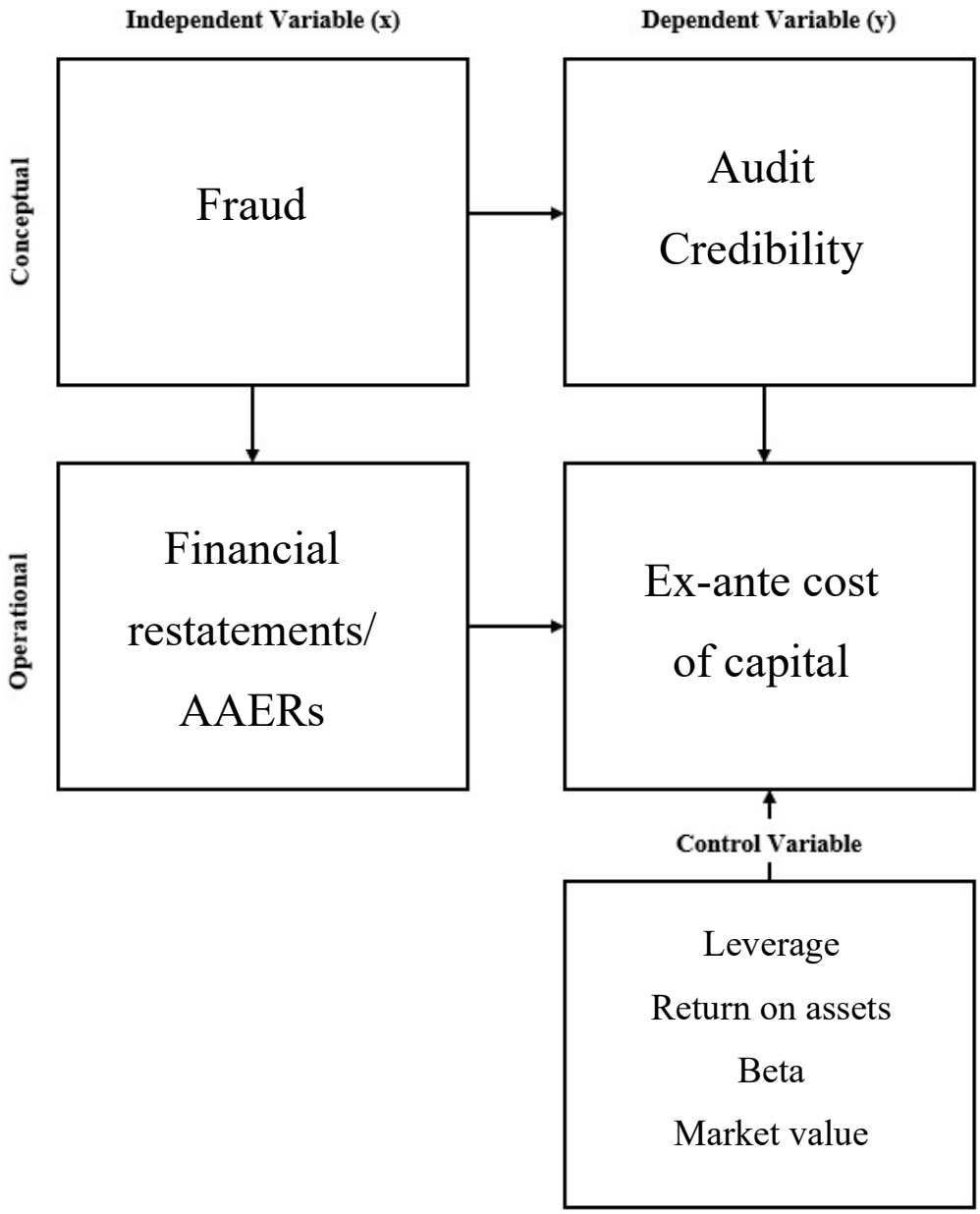
# 7. Appendix

### 3.1 Methodology

*Libby boxes*




*Appendix 7- a: Libby box for Research question 1: What is the effect of fraud cases of clients of Big 4 auditors on the audit quality of Big 4 auditors in the United States?*




*Appendix 7- b: Libby box for Research question 2: What is the effect of fraud cases of clients of Big 4 auditors on the audit credibility of Big 4 auditors in the United States?*

*Regression models*

Variable overview

| Variables of interest | |
|---|---|
| Audit quality | Absolute discretionary accruals$_t$ (COMPUSTAT). |
| Audit credibility | Ex-ante cost of capital$_t$ (I/B/E/S). |
| Fraud | 1 if a firm has an AAER, 0 otherwise (SEC).<br>1 if a firm has a restatement disclosure, 0 otherwise (AuditAnalytics). |
| **Control variables (1)** | |
| Firm size | Natural log of total assets$_t$ of the company (COMPUSTAT). |
| Audit tenure | 1 if the auditor has audited the same company for more than 3 years, 0 if the number of years smaller or similar to 3 (AuditAnalytics). |
| Audit Fee | Natural log of the audit fee$_t$ (AuditAnalytics) |
| Return on assets | Net income$_t$ / total assets$_t$ (COMPUSTAT). |
| Market value | Natural log of the market value$_t$ of equity at the end of year of the company (COMPUSTAT). |
| **Control variables (6)** | |
| Leverage | (Long-term debt$_t$ + debt in current liabilities$_t$) / total assets$_t$ (COMPUSTAT). |
| Return on assets | Net income$_t$ / total assets$_t$ (COMPUSTAT). |
| Beta | Systematic market risk using monthly stock returns (Datastream). |
| Market value | Natural log of the market value of equity at the end of year$_t$ of the company (COMPUSTAT). |

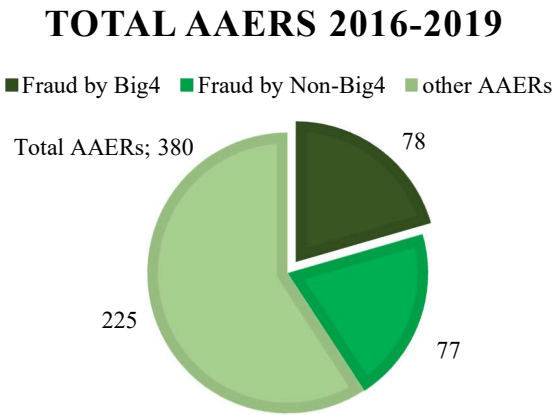
*A.table 7.1: An overview of the variables and control variables used for the two research questions.*

### 3.2 Data and sample selection

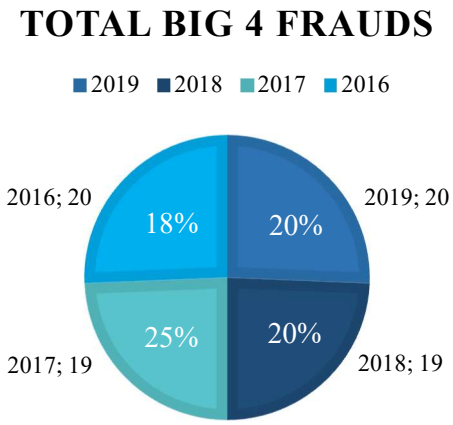
AAER reports sample

| | | Year | Total AAERs | Of which fraud by Big 4 audit firms | % of total AAERs that year |
|---|---|---|---|---|---|
| Total AAERs 2016-2019 | 380 | | | | |
| Violations of 10(b)-5 and 17(a) | 155 | 2019 | 98 | 20 | 20,4% |
| Of which by Big 4 audit firms | 78 | 2018 | 96 | 19 | 19,8% |
| Of which by non-Big 4 audit firms | 77 | 2017 | 76 | 19 | 25,0% |
| | | 2016 | 110 | 20 | 18,2% |

*A.table 7.2: an overview of the results from collecting the AAER reports via the website of the SEC (Securities and Exchange Commission, 2020)*




*Appendix 7- d: A pie diagram of the results of the left side of A.table 7.2. To give a clear image of the distribution of AAER reports.*




*Appendix 7- c: A pie diagram of the results of the right side of A.table 7.2. To give a clear image of the distribution of AAER reports*

### 4.2 Multivariate regression results

VIF scores of regressions with the absolute discretionary accruals as dependent variable

| Variables | Independent variables | 1 control variable | 2 control variables | 3 control variables | 4 control variables | Full regression |
|---|---|---|---|---|---|---|
| AAERs | 1,07 | 1,07 | 1,07 | 1,07 | 1,07 | 1,07 |
| Restatements | 1,10 | 1,10 | 1,10 | 1,10 | 1,10 | 1,10 |
| Natural logarithm of firm size | - | 1,71 | 1,74 | 5,30 | 5,79 | 11,23 |
| Tenure | - | - | 1,12 | 1,12 | 1,12 | 1,12 |
| Natural logarithm of audit fee | - | - | - | 4,88 | 4,97 | 4,98 |
| Return on assets | - | - | - | - | 1,72 | 1,78 |
| Natural logarithm of market value | - | - | - | - | - | 5,92 |
| Mean VIF score including industry and year fixed effects | 3,12 | 3,12 | 3,11 | 3,13 | 3,13 | 3,16 |

*A.table 7.3: The VIF scores can be seen per regression. The dependent variable are the discretionary accruals. The VIF score per variable is shown and calculated separately for every regression. In case of a risk of multicollinearity the VIF score will be higher than the maximum value of 5. This is the case for audit firm size in the regression with 3 and 4 control variables, and the full regression. Another variable that increases the maximum VIF score of 5 is the market value. The independent variables AAERs and Restatements have a VIF score that is lower than 5.*

VIF scores of regressions with the ex-ante cost of capital

| Variables | Independent variables | 2 control variable | 2 control variables | Full regression |
|---|---|---|---|---|
| AAERs | 1,07 | 1,07 | 1,07 | 1,07 |
| Restatements | 1,10 | 1,10 | 1,10 | 1,10 |
| Leverage | 1,35 | 1,37 | 1,37 | 1,38 |
| Return on Assets | - | 1,54 | 1,54 | 1,79 |
| Beta | - | - | 1,38 | 1,39 |
| Natural logarithm of market value | - | - | - | 1,65 |
| Mean VIF score including industry and year fixed effects | 3,12 | 3,11 | 3,11 | 3,11 |

*A.table 7.4: The VIF scores can be seen per regression. The dependent variable are the ex-ante cost of capital. The VIF score per variable is shown and calculated separately for every regression. In case of a risk of multicollinearity the VIF score will be higher than the maximum value of 5. This is not the case for any of the independent variables or control variables. The independent variables AAERs and Restatements have a VIF score of 1,07 and 1,10 which are lower than 5.*