MSc Accounting, Auditing & Control

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The influence of internal information quality on tax risk

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Abstract: This thesis studies the relation between internal information quality and tax risk. This relation is based on assumptions of decision theory, such as rationality and optimality. Tax risk management has become more important over the recent years, however research on this topic is limited. The definition of tax risk that is used in this study is that tax risk reflects the sustainability of a firm its tax position, uncertainty related to taxes and the probability of a large tax loss. Tax risk is measured as the volatility of the cash effective tax rate. This study analyzes panel data, using a sample that consists of firm-year observations of U.S. firms between 1998 and 2015. The results show a positive relation between the two concepts, but only partially significant. More specifically, the findings suggest that a higher internal information quality leads to a lower tax risk but this relation has to be further investigated. The study contributes to the existing literature by providing evidence that the quality of the internal information plays an important role in a firm its tax risk. The findings of this thesis are furthermore important for managers, investors, tax authorities and policy makers.

Keywords: internal information quality, tax avoidance, tax risk

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1 Introduction

The European commission found that 35 companies across Europe owe 760 million dollars in back taxes (Thielman, 2016). American companies keep 60 percent of their cash oversees and untaxed (Thielman, 2016). Multinationals such as Google, Starbucks, Apple and Microsoft have been called out in the media for avoiding taxes, aggressive tax planning and a lack of transparency (Davies, 2015; Hickey, 2013; Inman, 2016; Shevlin, 2016; Thielman, 2016). Google and Microsoft have established complex, massive, international corporate structures to avoid taxes and have been successful in reducing their effective tax rates far below the statutory tax rates. In 2011, Microsoft lowered its federate tax bill by 2.43 billion dollars as a consequence of its corporate structure and the exploitation of ambiguities in the US corporate tax code and paid a rate of 13.4 percent instead of the statutory percentage of 35 percent. By diverting the profits from non-US businesses to the low-tax jurisdiction of Bermuda, Google was able to establish an effective tax rate between two and three percent instead of the statutory percentage of 20 percent in the UK (Hickey, 2013; Inman, 2016). Like Google and Microsoft, Starbucks and Apple use international networks to shift profits out of the UK into lower tax territories as well. In October 2015 the European commission determined that elements of Starbucks' tax structure are unlawful (Davies, 2015; Thielman, 2016).

1.1 Research question

The purpose of this thesis is to study whether more attention should be paid to the role of internal information environment with regard to the tax risk of a firm. More specifically, the aim is to measure the relation between the quality of internal information and firms' their tax risk. The research question that this thesis aims to answer is:

"Does internal information quality influence firms' tax risk?"

1.2 Practical relevance

The results of this thesis are first of all relevant for managers, because managers base their decisions on internally generated information (Feng et al., 2009). Establishing a high quality internal information environment may be costly and time consuming and a trade-off must be made between the allowed tax risk and the internal information quality. The results are also relevant for investors, while they have an increased interest in how responsible a firm acts (Erle, 2008). Additionally the proxy used for tax risk has been shown to increase uncertainty regarding a firm its future stock return, indicating that a reduced tax risk as anticipated in this thesis reduces the firm risk (Guenther et al., 2013; Hutchens & Rego, 2015). It is furthermore relevant for tax authorities and policy makers to realize the relevance of high internal information quality.

1.3 Scientific relevance

Recently book-tax differences, tax avoidance, tax aggressiveness and tax risk are receiving more interest (Shevlin, 2016). This thesis contributes to the existing literature by showing the importance of the internal information environment in tax issues. In particular, it studies the influence of the internal information quality on a firm its tax risk by studying the relation between management forecast accuracy, the speed of earnings announcements, analyst forecast accuracy and tax risk.

This thesis is related to two streams of literature. Firstly, it relates to the literature on internal information quality and environment. Information quality is assessed with a focus on the extent to which the information can be used in decision making (Vaassen et al., 2009). In this assessment several characteristics are important. According to Vaassen et al. (2009) information must be efficient and effective. Information is reliable when it is valid, accurate and complete, and it is relevant when it is precise, on time and understandable. Information that is reliable and relevant is considered effective (Vaassen et al., 2009). The Financial Accounting Standards Board (2006) states that information needs to be relevant, comparable, understandable and a faithful representation in order to be useful for decision making.

Internal information is used for several purposes. Managers base their forecasts and day-to-day operational decisions on information that is internally generated (Dorantes et al., 2013; Feng et al., 2009). Information is furthermore useful to managers to signal their own capabilities and to trade their stock holdings (Healy & Palepu, 2001; Trueman, 1986). Additionally, managers are held responsible for the firm its stock performance. Managers use their information to lower the probability of undervaluation and to justify poor earnings performance (Healy & Palepu, 2001). Gallemore and Labro (2015) found that firms with high information quality are able to enhance tax avoidance while facing lower tax risk.

The information environment also affects external users. The earnings forecast bias of analysts is larger for companies with low quality information environments (Ackert & Athanassakos, 1997, 2003; Lim, 2001). Companies with low quality information environment also have a greater analyst following (Ackert & Athanassakos, 2003) and investors demand more analyst research and information gathering activities (Barniv & Cao, 2009).

Secondly, this thesis relates to the literature on tax risk. Tax risk management has become more important since the Sarbanes-Oxley Act of 2002 (Hutchens & Rego, 2015). A recently conducted survey shows that managers of 81 percent of the surveyed firms agreed or strongly agreed that tax risk will become more important in the following years (EY, 2014). However, tax issues lack awareness and up until now there is not yet an agreed upon set of measures of tax risk (Erle, 2008; Shevlin, 2016).

The traditional views only observe tax risk in term of overpayments, underpayments, tax penalties and assessments (Deloitte, 2015). Other important aspects that should be included are compliance, reputational, transactional and operational risks (Deloitte, 2015; Erle, 2008; EY, 2014).

1.4 Research method

The relation between internal information quality and tax risk is studied by analyzing panel data. The relation is estimated using an ordinary least squares regression. Three proxies are used to measure internal information quality. The first proxy is the accuracy of forecasts made by management, the second proxy is the time lag between a firm its fiscal year-end and its earnings announcement and the third proxy is the bias in forecasts of analysts. The forecast accuracy of management is measured as the earnings per share as forecasted by management minus the actual earnings per share, scaled by the actual earnings per share. The time lag between a firm its fiscal year end and the earnings announcement date is measured in numbers of days. The bias of forecasts made by analysts is measured as the consensus forecast of earnings per share minus the actual earnings per share, scaled by the actual earnings per share. A firm its tax risk is measured by the volatility of the cash effective tax rate. This variable is measured as the standard deviation of the annual cash effective tax rate during five years, ending in t. To enhance the internal validity of the study, several control variables are added. The operationalization of the conceptual relation between internal information quality and tax risk is shown in Chapter 3.

The sample used in this thesis consists of 657 U.S. firms with 3,632 firm-year observations between 1998 and 2015. For hypothesis 1 a subsample is used, which consists of 281 U.S. firms with 1,323 firm-year observations between 1998 and 2015. The sample selection procedure and the research method are further described in Chapter 4.

1.5 Thesis outline

This thesis is structured as follows: first the previous literature is discussed to provide the theoretical background. Next, the hypothesis and research design are discussed, including the sample selection, an overview of variables and the methods used. Then the results are discussed, followed by the conclusions, insights and limitations of this thesis.

2 Theoretical background

The purpose of this thesis is to examine whether the internal information quality of an organization influences a firm its tax risk. This chapter starts with describing different theories related to the topic, then identifies and elaborates on the underlying theory and ends with a literature review of the two main concepts: internal information quality and tax risk.

2.1 Relevant theories

In order to develop the hypothesis that is tested to answer the research question, an appropriate theoretical framework to guide the actual study has to be identified. In this section different relevant theories and how these theories have been used in prior studies are reviewed, these are in no specific order: agency theory, voluntary disclosure theory and decision theory.

2.1.1 Agency theory

In the field of accounting the agency theory has been one of the most prevalent theories (Khlifi & Bouri, 2010). Agency theory focuses on the relationship between two parties, the principal who delegates tasks, and the agent who fulfills these tasks. The theory contains assumptions with regard to human behavior, organizations and information. Humans are assumed to be self-interested, have bounded rationality and are risk averse. Within organizations partial conflicts of goals can arise. And, according to agency theory, information is an item that can be bought (Eisenhardt, 1989). Following agency theory, the voluntary disclosure of detailed information decreases information asymmetry, which is the most important incentive for managers to make these disclosures (Khlifi & Bouri, 2010).

The segregation of ownership and control suggests that when owners find tax avoidance valuable, they provide proper incentives for managers to make decisions that enhance the after-tax profit of the owners of the firm. These incentives can be based on tax outcomes or they can be implicitly via remuneration based on after-tax returns or stock price (Hanlon & Heitzman, 2010).

When applied to the interest of this study, the influence of internal information quality on tax risk, the owners of the firm can be seen as the principals. Tax risk is related to firm risk (Guenther et al., 2013; Hutchens & Rego, 2015) and thus of interest to the owners of this firm. The manager is the agent and is responsible for a firm its current stock performance (Healy & Palepu, 2001). However, the aim of this study is to research the influence of the quality of the information on a firm its tax risk and not the principal-agent relationship.

2.1.2 Voluntary disclosure theory

There are several forces that affect managers their motives for voluntary disclosure (Healy & Palepu, 2001). First, the capital markets transactions hypothesis implies that the expectations of investors are important when managers are intended to issue public debt or equity or to take over

another firm. Managers voluntarily disclose information to lower the costs of external financing by decreasing the information asymmetry (Healy & Palepu, 2001).

Second, the corporate control contest hypothesis is driven by evidence that managers are held responsible for a firm its current stock performance by the board of directors and investors. The hypothesis states that poor stock performance is associated with CEO turnover and the probability of hostile takeovers (Healy & Palepu, 2001). Following voluntary disclosure theory, managers disclose information to lower the probability of undervaluation and to justify poor earnings performance (Healy & Palepu, 2001).

Third, the stock compensation hypothesis is driven by the fact that managers receive remuneration using several stock-based compensation plans. Because of this, managers who are interested in trading their stock holdings have incentives to make disclosures of private information in order to meet constraints that are enforced by insider trading and enhance the stocks liquidity of the firm. Furthermore, the managers have incentives to correct perceived undervaluation compared to their own information before the stock option rewards expire. If managers act in the interest of the shareholders, they have incentives to make voluntary disclosures in order to lower the contracting costs that are related to stock compensation for new employees (Healy & Palepu, 2001).

Fourth, the risk of litigation by shareholders can lower managers their incentives to disclosure information. Managers may think that they will get penalized for forecasts because the legal system cannot separate incidental, unexpected from deliberate forecast errors (Healy & Palepu, 2001).

Fifth, the management signaling hypothesis is based on the study of Trueman (1986) that is discussed in section 2.3 internal information quality, and states that managers disclose earnings forecasts to show their own abilities to anticipate changes (Healy & Palepu, 2001).

Last, the proprietary cost hypothesis states that managers will not disclose information that can harm their competitive position (Healy & Palepu, 2001).

The theory of voluntary disclosure is not sufficient to make predictions about the relation between internal information quality and tax risk. However, the accuracy of management forecasts is used as proxy for the internal information quality and management forecasts are voluntary disclosed (Trueman, 1986). Summarized, it is important to note that managers have different incentives for voluntary disclosure. Furthermore, the accuracy of management forecasts determines the extent to which these forecasts decrease information asymmetry in the capital market or reflect the abilities of management (Healy & Palepu, 2001).

2.1.3 Decision theory

Decisions are an important organizational activity (Brunsson, 1990). The quality of the information that is used for decision-making influences the quality of the decision and its outcome (Gallemore & Labro, 2015). The study of judgment and decision-making is descriptive and compares

decisions and judgments to normative models (Baron, 2004). The normative models that are used for normative decision theory arise from probability theory and utility theory, from which several assumptions arise. These assumptions are that people live to strive to maximize utility, that this utility can be measured and compared and that it is transitive and connected (Baron, 2004). Other important assumptions that arise from normative models are rationality and optimality (Einhorn & Hogarth, 1981). People are rational and are able to rank different possibilities, which are transitive, and live to maximize a goal (Brunsson, 1990; Edwards, 1954; Simon, 1978). Optimality entails that people make decisions and judgments that maximize or minimize a criterion conditional on certain assumptions and restrictions (Einhorn & Hogarth, 1981). Furthermore individuals should only be influenced by relevant information (Glover, 1997; Hackenbrack, 1992).

Several deviations from normative decision theory are found, including the Allais paradox, the dilution effect and anchoring (Ashton, 1982; Glover, 1997; Hackenbrack, 1992; Kennedy et al., 1998). The Allais paradox proves that individuals do not always choose the options that maximize their expected utility (Ashton, 1982). The dilution effect shows that individuals are influenced by irrelevant information when making judgments and decisions (Glover, 1997; Hackenbrack, 1992). Anchoring is the phenomenon that decision makers who are faced with uncertainty, they anchor on certain guidelines when making decisions and judgments (Kennedy et al., 1998).

The aim of this study is to research whether the quality of the internal information environment influences a firm its tax risk. Normative decision theory provides assumptions that allow predicting that there is a relation between these two concepts. The concepts of rationality and optimality are cornerstones in normative studies (Einhorn & Hogarth, 1981). An individual ranks possibilities and makes decisions with the goal to maximize or minimize an explicit criterion (Brunsson, 1990; Edwards, 1954; Einhorn & Hogarth, 1981; Simon, 1978). Judgments and decisions are based on available information, both diagnostic and nondiagnostic (Einhorn & Hogarth, 1981; Glover, 1997; Hackenbrack, 1992). Additionally, based on decision theory, the assumption can be made that the quality of the information that is used for making decisions influences the quality of the decision itself and its outcome (Gallemore & Labro, 2015).

Therefore, decision theory is further elaborated in the next section.

2.2 Decision theory further elaborated

Chua (1986, p. 609) describes that the objective of accounting information is to provide "useful and relevant information for the making of economic decisions". Like human knowledge, accounting is generated by people, used by people, and it is about people and their social and physical environment. It is a social artifact; knowledge is created by human needs and objectives and serves a purpose. Models of human intention and rationality are warranted as a basis for social science. In this

setting, it is because usefulness makes the assumption that a need or objective exists and mainstream accounting research assumes that people live to fulfill one goal: utility maximization (Chua, 1986).

Decision theory can be split in normative and descriptive decision theory. Normative decision theory prescribes methods that agree with the beliefs and values of the decision maker (Simon, 1979; Slovic et al., 1977). When biases, systematic deviations from these standards, are found, descriptive models are developed to explain why (Baron, 2004). Descriptive decision theory deals with evaluating the beliefs and values and the way decision makers use them in making decisions. Normative models are of great importance in descriptive research. If the decision maker is as rational as he can be due to his capabilities and the available information, then normative and descriptive decision theory are closely related (Simon, 1979; Slovic et al., 1977).

The study of judgment and decision-making compares judgments and decisions to normative models. Normative models are standards that mainly arise from probability theory, utility theory and statistics. There are three approaches of probability theory. First, the logical view states that probability is an extension of logic. In the logical view, the chance of drawing a king from a deck is 1 in 13. Second, the objective view reasons that the chance of drawing a king from a deck is determined by the relative frequency of kings to draws with a limitless number of draws. Third, the personal view states that the probability reflects to what extent a person believes in the truth of propositions. In order for the personal view to serve as a normative model, the requirements of calibration and coherence have to be met. Calibration is a manner to combine the objective and personal view (Baron, 2004). Judgments are calibrated when for the events with probability p, the relative amount that actually occurs is indeed p (Wallsten & Budescu, 1983). Coherence prescribes that judgments have to obey basic rules. These rules are certainty, additivity, the conditional probability of proposition A given proposition B and the multiplication rule. The main idea behind utility theory is that the best alternative is the alternative that does the most good. The assumptions that are made in utility theory are that goodness can be measured and compared and that it is transitive and connected (Baron, 2004).

Rationality and optimality are cornerstones in normative studies. Rationality is a subjective concept; its meaning depends on the circumstances (Einhorn & Hogarth, 1981). In short, a rational person can rank the possibilities and makes decisions with the goal to maximize something (Brunsson, 1990; Edwards, 1954; Simon, 1979). In order to rank the possibilities, they must be transitive. Transitivity entails that if the economic man, a rational individual (Shearer, 2002), favors alternative A over B, and alternative B over C, then he favors alternative A over alternative C (Baron, 2004; Edwards, 1954). Minor changes in the context can cause an infringement of transitivity and other normative principles (Einhorn & Hogarth, 1981). According to Einhorn and Hogarth (1981, p. 3), optimality consists of "decisions or judgments that maximize or minimize some explicit and measurable criterion (e.g. profits, errors, time) conditional on certain environmental assumptions and a specified time horizon". However, like rationality, optimality is subjective. Often people pursue

multiple goals and have to make a tradeoff to conclude what is optimal (Baron, 2004; Chua, 1986; Einhorn & Hogarth, 1981). In the literature, the processes for evaluating information are treated statically; judgments and decisions are based on available information (Einhorn & Hogarth, 1981).

As mentioned before, the utility theory is one of the normative models that is important in the research of judgment and decision making (Baron, 2004). It is furthermore used to create optimal decision rules for auditors. However, in general humans do not act in agreement with the optimal decision models (Ashton, 1982).

One of these violations of the decision theory is the Allais paradox (Ashton, 1982). Assume the following problem:

"I. Do you prefer situation Al or B1?

Situation A1: Certainty of receiving 1 million dollars

Situation B1: 10 chances in 100 of gaining 5 million dollars 89 chances in 100 of gaining 1 million dollars 1 chance in 100 of gaining nothing

II. Do you prefer situation A2 or B2?

Situation A2: 11 chances in 100 of gaining 1 million dollars 89 chances in 100 of gaining nothing

Situation B2: 10 chances in 100 of gaining 5 million dollars 90 chances in 100 of gaining nothing" (Ashton, 1982, pp. 415-416)

Following utility theory, individuals should choose the options that maximize their expected utility, in this case that would be options A1 and A2, or B1 and B2 (Ashton, 1982; Baron, 2004). Nevertheless, in several studies subjects chose option A1 and B2 and thus violate the utility theory. This is called the Allais paradox (Ashton, 1982).

Ashton (1982) researches if auditors are also subject to the Allais paradox. To test this, she provides 439 audit partners with seven decision problems, consisting of the original Allais problem and the Allais problem mirrored in different situations with an audit setting.

The author finds that the violation rate is significantly lower in the audit setting than in the original Allais problem. However, three of the seven decisions are regarding the issuance of an audit opinion. Subjects complained that the factors that were emphasized are not factors that auditors take into account in real life (Ashton, 1982).

Another deviation from normative decision theory is the dilution effect. Normative decision theory describes that individuals should only be influenced by diagnostic (relevant) information. The dilution effect is the effect that individuals are affected by nondiagnostic (irrelevant) information. Judgments and decisions based on both diagnostic and nondiagnostic are likely to be more moderate than those based on diagnostic information only (Glover, 1997; Hackenbrack, 1992).

Hackenbrack (1992) researches the role of nondiagnostic information in an audit judgment. The author conducted an experiment where the subjects had to complete two tasks. In the case study task the subjects had to make an assessment of the exposure to fraudulent reporting of a hypothetical company. The subjects were exposed to three kinds of nondiagnostic information: favorable nondiagnostic information which consisted of positive client features, unfavorable nondiagnostic information which consisted of negative client features, and neutral nondiagnostic information that provided non-fraud-related information. During the rating task the subjects have to rate to what extent ten independent fraud-related events would affect their view on a company its exposure to fraudulent reporting. The subjects of this study are 39 auditors with an average experience in auditing of 36 months. The author finds that, in agreement with the hypotheses, the fraud risk assessments of the subjects are moderated by nondiagnostic information (Hackenbrack, 1992).

The study of (Glover, 1997) is an extension of the study of Hackenbrack (1992) in researching the influence of irrelevant information on the judgments of auditors. The author examines the influence of time pressure and accountability on the dilution effect by conducting an experiment. Subjects have to assess risks based on only diagnostic information and then based on both nondiagnostic and diagnostic information. The subjects consist of 156 auditors with an average experience in auditing of 24 months. The results of the study show that the auditors considered the information that was intended to be nondiagnostic indeed as nondiagnostic. The subjects are influenced by the nondiagnostic information. Accountability has no significant influence and time pressure decreased the dilution effect. One explanation for this is that when individuals are faced with time pressure they use a filtration strategy and select and consider only the most important information (Glover, 1997).

Another phenomenon that affects decisions and judgments is anchoring. When decision makers are faced with uncertainty, it is possible that they try to come up with upper and lower limits of possible outcomes and to make an estimation of the maximum, minimum and most likely outcome. These limits are based on best guess reference points or anchors (Kennedy et al., 1998).

Kennedy et al. (1998) examine the effect of anchoring on judgments and decisions made by financial statements users when they are presented with alternative disclosures of a firm its contingent environmental liabilities. The researchers conduct an experiment with a between-subjects design. The subjects are 293 bankers, financial executives and managers and MBA students and are divided into five groups. Each group is provided with information about contingent liabilities that is the best estimate, minimum, maximum or range, the control group has received no parameter. The authors find that when financial statement users have a guideline of possible outcomes regarding a contingent liability, they anchor on that guideline to construct the distribution of those outcomes. If these findings have implications for the real world, which might not be the case because the participants were making hypothetical decisions and not real ones, then authorities might want to reconsider the use of their

standards (for example the requirement of the FASB for managers to report a minimum rather than a maximum or the range). Managers may also want to keep anchoring in mind. When a manager has good information regarding the distribution of losses in future periods, the manager can decide to disclose the minimum because the users will use this minimum as an anchor and assess the potential environmental liability lower. But, keeping low expectations might increase litigation risk, because it is possible that realizations exceed users their expectations based on this minimum anchor (Kennedy et al., 1998).

Both normative and descriptive research can improve the detection and prevention of material misstatements in financial statements. Such research needs to take into account the strategic nature of auditing to be useful. It is also important to note that auditors and auditees have cognitive costs when they make judgments and decisions (Zimbelman & Waller, 1999). Zimbelman and Waller (1999) study the relation between the auditor and the auditee in a context where intentional misstatements may occur. They study the effect of the incentive of the auditee to misstate financial statements and ambiguity of the auditor on the auditee his misstatements and the auditor his sampling rate and rejection rate.

Strategic thinking can be divided into three levels. Zero-order strategic thinking entails that the player only takes into account conditions that directly influence his choice. First-order thinking entails that the player takes into account conditions that directly influence the opponent player. The third level is called higher-order strategic thinking. In this case the player takes into account additional, possibly infinite, tiers of complexity. In their hypotheses the authors assume that the decisions of auditors and auditees mirror zero- and first-order thinking, but that higher-order strategic thinking is not possible due to cognitive limitations (Zimbelman & Waller, 1999).

Zimbelman and Waller (1999) conduct an experiment consisting of four sessions with six auditors and six auditees. There are two between-subjects variables: low/high incentive to misstate financial statements of the auditee and high/low ambiguity of the auditor. The subjects are 48 auditing students. The results indicate that the incentive of the auditee to misstate enhances the auditor his sampling and rejection rate. Ambiguity of the auditor only enhances the auditor his sampling rate. Furthermore, the misstatements of the auditee are positively correlated with the incentives of the auditee to misstate, but negatively correlated with the auditor his ambiguity. The latter relation is enhanced when the incentive to misstate is low compared to when this incentive is high (Zimbelman & Waller, 1999).

Decisions are a relevant organizational activity (Brunsson, 1990). Based on decision theory the assumption can be made that the quality of the information that is used for making decisions influences the quality of the decision itself and its outcome (Gallemore & Labro, 2015). The theory

has several purposes, such as providing a basis for economics, describing interesting phenomena and giving advice to decision makers in business and governments (Simon, 1979).

Another relevant organizational activity is the evaluation of employee performance. This evaluation is done in varying degrees of hindsight; some information of the outcomes is already available (Brown & Solomon, 1987). Brown and Solomon (1987) examine the influence of outcome information on the evaluation of decisions made by managers. The possible effects can be described from a normative and a descriptive perspective. From the normative decision theory perspective decision processes are important for evaluating the information quality. In some cases the outcomes may be relevant inputs to assess the quality of decisions. For example, the evaluations of managerial decisions should take into account the outcomes if these outcomes indicate that the manager did not consider relevant information sufficiently, or if the manager did consider relevant information which the evaluator did not take into account or did not give the manager credit for (Brown & Solomon, 1987). The descriptive perspective takes into account the hindsight bias. This bias describes that information about the outcomes may influence the appraisal of the decisions. Whether this is appropriate depends on the extent to which the decision process is observable (Brown & Solomon, 1987). The authors study two factors that may be relevant for the effects of outcome information: the prior advisory involvement of the evaluator and whether the manager was accountable for anticipating the outcome. The experiment, conducted with 96 upper-level under-graduate and master's level graduate business students, shows that outcome information does affect the evaluation of managerial decisions when the evaluator had no advisory involvement and when the manager was responsible for anticipating the outcome. It also shows that outcome information has a smaller effect when the evaluator was involved in the decisions than when there was no involvement. Furthermore the results indicate that the effect of outcome information varies in direct relation to the responsibility of the manager for anticipating the outcome, as indicated by the reported outcome (Brown & Solomon, 1987).

The process, and influences on this process, of representation of a task are critical in judgment and decisions. Most decision research assumes that the optimal model better represents the task than a person's cognitive model of the task through which a response is generated (Einhorn & Hogarth, 1981).

The decision process consists of the following stages: information search, alternative development and evaluation, alternative selection and the evaluation of past choices (Biggs, 1984). Biggs (1984) wants to extend the knowledge of the first two stages because understanding the behavior in these stages helps understanding and improving decisions. This also provides insights about the representation of the task. The author approaches this by describing the information search behavior of financial analysts who are concerned with assessing the corporate earning power. The

definition of earning power used is when a firm is able to produce income over a period of three to five years (Biggs, 1984).

Subjects are asked to assess the earning power of hypothetical companies in the same industry and have to choose the one they considered to have the biggest earning power. To trace the decision processes of the subjects, the verbal protocol analysis is used. The results show that 60% of the subjects their decision process involved information search, which indicates a complex task. Two information search strategies are used: historical and predictive strategies. Subjects that use the historical information search strategy base their opinion on an analysis of past performances. Subjects that use the predictive information search strategy choose a proxy to measure earning power, such as earnings per share and use the past information to predict the future values of this proxy (Biggs, 1984).

2.3 Internal information quality

The field of information quality is quite broad. In this section several studies are reviewed, including a short summary at the end. There are several definitions and proxies for internal information quality. One of the definitions of information quality is the definition of Vaassen et al. (2009). They state that information quality is assessed with a focus on the degree to which the information can be used in decision-making. In assessing information quality several characteristics are of importance. The two main characteristics are efficiency and effectiveness. Effectiveness consists of reliability (validity, accuracy and completeness of information) and relevance (precision, timeliness and understandability) (Vaassen et al., 2009).

Accounting information must be relevant, comparable, understandable and a faithful representation to be useful for decision-making (Financial Accounting Standards Board, 2006). Aryani and Krismiaji (2013) examine the relation between the implementation of enterprise resource planning systems and the quality of accounting information. The authors measure relevance as the time between the fiscal year-end and the date of the earnings announcement. To measure faithful representation they use absolute discretionary accruals as proxy. Based on their literature study, they conclude that enterprise resource planning (ERP) systems enhance the access and control to information by management and reduce the protection of audit quality, thereby enhancing the opportunity for management to manage information. Additionally, evidence shows that firms try to find the right moment to release its financial accounting information and that there is a smaller time lag between a firm its fiscal year end and its earnings announcement for firms that announce “good news”. Furthermore, the implementation of ERP systems should enhance the timeliness, and thus the relevance, of accounting information for external users. By estimating regression models, the authors find that discretionary accruals increase and that the reporting lag of firms that announce good news are significantly shorter after the implementation of ERP systems. However, it is important to note that

this study used a specific, narrow sample, namely the firms listed in Indonesian Stock Exchange (Aryani & Krismiaji, 2013).

Another study in this field is the study of Dorantes et al. (2013). They research how the implementation of enterprise systems influences the firm its information environment. Enterprise systems include enterprise resource planning, supply chain management and customer relationship management. Earnings forecasts of management are used as a proxy for internal information quality. The information generated by the firm its internal information system is fundamental for management its forecasts. These forecasts are also used to reduce information asymmetry and to enhance transparent and credible reporting. The sample used consists of 353 unique firm ES implementations, which were collected through media announcements between 1995 and 2008. By estimating three regression models with forecast issuance, specificity and accuracy as dependent variables and comparing firms that have implemented ES with firms that have not implemented ES, Dorantes et al. (2013) find that the implementation of enterprise systems improves the information environment (Dorantes et al., 2013).

Feng et al. (2009) investigate the influence of internal control quality on management guidance accuracy. Managers have incentives to report accurate forecasts because guidance is one of the fundamental disclosure mechanisms that is used to influence earnings expectations and lower litigation risk. Management reports that are not audited are the basis for management guidance and therefore, looking at management guidance allows to better research how internal control quality influences the financial reporting system. Additionally, managers base their day-to-day operational decisions on the internal management reports. Therefore, their results may have implications for other management decisions that are based on these reports (Feng et al., 2009). The authors predict that firms that have ineffective internal controls have a lower management forecast accuracy. The sample consists of 2,994 firm years from the period 2004 to 2006. The findings of their regression analysis indicate that management forecast accuracy is statistically and economically lower within firms that have weak internal controls (Feng et al., 2009).

Trueman (1986) researches why managers release internally generated earnings forecast in advance of the actual earnings announcement. The market value of a firm mirrors the perceptions of investors of the ability of managers to deal with future changes and adjust the firm its strategy. The author develops a model to test the prediction that when the manager learns new information related to the expected earnings, he will make an amended forecast. The findings of the study indicate that managers are motivated to present the most supportive information about his own abilities as possible by issuing an amended earnings forecast immediately when the economic environment of the firm changes. By immediately issuing a new forecast, the manager signals investors that he has obtained new information regarding the earnings of the period (Trueman, 1986).

Verrecchia (1990) examines what the influence of information quality is on the motivation of the manager to disclose this information to external users. Verrecchia (1990) relies on an analysis done in the study of Verrecchia (1983) where information is a signal that shows the true value of risk assets, such as the firm, disturbed by noise (Verrecchia, 1983, 1990). The author finds that the higher the information quality is, the lower the threshold is for disclosing such information (Verrecchia, 1990).

In his literature review of studies of the relation between capital markets and financial statements, Kothari (2001) describes that financial statements are an important aspect of the firm its market valuation. Financial statements "should provide information that is useful to present and potential investors and creditors and other users in assessing the amounts, timing and uncertainty of prospective cash receipts from dividends or interest and the proceeds from the sale, redemption, or maturity of securities or loans" (FASB 2008, p.3). Two of the articles mentioned in Kothari (2001) are the studies of Das et al. (1998) and Lim (2001).

Das et al. (1998) examine the influence of the predictive accuracy of past information on analysts their earnings forecasts biases. Their sample consists of 239 firms that have their fiscal year-end in December. To ensure that there are enough observations, firms are required to have data on annual earnings per share and related information in the years between 1969 and 1994, and data on quarterly earnings per share between 1979 and 1994. Das et al. (1998) use a cross-sectional regression to estimate the forecast bias and find that this forecast bias is greater for firms with less predictable earnings. They furthermore state that the predictive accuracy of past information is related to the extent of optimism in analysts' forecasts (Das et al., 1998). The study of Lim (2001) supports this notion. Rational analysts who try to make accurate forecasts are likely to make optimistically biased forecasts, because they trade off bias to enhance management access and the accuracy of the forecast. The magnitude of the positive bias is larger for companies with low quality information environments and when analysts are more dependent on management access to obtain information (Lim, 2001). Lim (2001) uses firm size and analyst coverage as proxies for the richness of the information environment and the standard deviation of weekly stock returns as a proxy for firm-specific uncertainty. The sample used is collected from the first quarter of 1984 to the fourth quarter of 1996, which leads to 52 quarters of data. The results indicate that when the richness of the information environment enhances, analyst forecast bias decreases. When uncertainty increases, analyst bias increases as well. Additionally, positive forecast bias is larger to the extent that companies who performed poorly are associated with more uncertainty. Furthermore, analysts employed by smaller firms or with relative less experience, issue more optimistic forecasts (Lim, 2001).

Other related studies are those of Ackert and Athanassakos (1997, 2003) and Barniv and Cao (2009). Ackert and Athanassakos (1997) study the relation between analysts their overoptimism and their uncertainty. They measure uncertainty as the standard deviation of earnings forecasts and find that analysts are overoptimistic for firms with high uncertainty, meaning analysts their forecasts are

more accurate for firms with low uncertainty. The sample used consists of estimates of annual earnings per share for the years 1980 to 1991. The final sample consists of 34,876 observations for 167 firms. Firms are divided into quartiles based on the uncertainty of analysts and these quartiles are compared with each other for the level of optimism and abnormal stock returns (Ackert & Athanassakos, 1997). Ackert and Athanassakos (2003) use a simultaneous equations approach to study the relation between firm size, uncertain information environment, stock price and analysts their optimism. Their sample consists of 455 firms with a total of 72,141 monthly observations. They find that firms with an uncertain information environment have greater analyst following and more optimistic forecasts of analysts. Smaller firms have more optimistic forecasts as well (Ackert & Athanassakos, 2003).

Barniv and Cao (2009) study the investors' response to revisions of individual analysts' forecasts in an uncertain information environment and to what extent investors use information regarding characteristics of analysts that are related to the accuracy of the revisions. The authors use accounting restatements as proxy for information uncertainty because the restatements are a reasonable measure of uncertainty in the capital market (Barniv & Cao, 2009). Barniv and Cao (2009) use the Brunswik's lens model adapted by Bonner et al. (2003). The original model was developed to study to what extent people evaluate how factors influence outcomes when predicting future outcomes (Bonner et al., 2003), but Bonner et al. (2003) adapted it to their own setting where they have market-level data instead of data about individuals. The sample consists of 477 firms and a control sample of 477 non-restatement firms is used to examine how the increased uncertainty after a restatement influence the investors' use of information in forecast revisions. The findings indicate that when the uncertainty about a firm its future economic performance increases, investors demand more analyst research and cause individual analysts to engage in more activities to gather information (Barniv & Cao, 2009).

Gallemore and Labro (2015) define internal information quality as "the accessibility, usefulness, reliability, accuracy, quantity, and signal-to-noise ratio of the data and knowledge collected, generated, and consumed within an organization" (p. 149). Four proxies for internal information quality are time lag between a firm its fiscal year end and its earnings announcement, the accuracy of management its earnings forecasts, the absence of material weaknesses in internal controls and the absence of restatements. The authors use a regression to measure the relation between internal information quality and tax avoidance and find that firms with high internal information quality avoid more taxes while facing lower tax risk Gallemore and Labro (2015). This article is further discussed in section 2.3 tax risk.

2.3.1 Summary

A high quality internal information environment provides management with a real-time whole view of the firm its financial condition. Timelier and more accurate information, removes barriers between accounting cycles, grants them access to greater amounts of information, reduces information

asymmetry and facilitates more effective tax planning (Aryani & Krismiaji, 2013; Dorantes et al., 2013; Gallemore & Labro, 2015). Accounting and non-accounting information generated by a firm its internal information system form the basis for many day-to-day operational decisions and management guidance. One of the outcomes of managerial decision-making is the earnings forecasts of management (Dorantes et al., 2013; Feng et al., 2009; Gallemore & Labro, 2015).

Aryani and Krismiaji (2013) measure the relevance of accounting information as the time between the firm its fiscal year-end and the date of the earnings announcement and its faithful representation as absolute discretionary accruals. Dorantes et al. (2013) measure internal information quality using the issuance, specificity and accuracy of management its earnings forecast. Gallemore and Labro (2015) use four proxies for internal information quality, namely the time between the firm its fiscal year-end and its earnings announcement, the accuracy of management its earnings forecasts, the absence of material weaknesses in internal controls and the absence of restatements. The internal information quality relates to the accessibility, usefulness, reliability, accuracy, quantity and signal-to-noise ratio of data and to the collected, generated and consumed data within an organization (Gallemore & Labro, 2015).

Managers who base their forecasts on lower internal information quality issue less accurate and less frequently earnings forecasts (Feng et al., 2009). Thus, higher internal information quality leads to more earnings forecasts. According to Trueman (1986) the reason for this is that managers want to show their own capabilities by releasing updated forecasts when and if new information arises about the firm its economic condition. Higher information quality leads to more voluntary disclosures in general (Verrecchia, 1990).

Furthermore, the information environment has also an influence on stakeholders outside the firm, such as shareholders, investors and lenders. The financial statements are one of the inputs for the market valuation of a firm (Kothari, 2001) and "should provide information that is useful to present and potential investors and creditors and other users in assessing the amounts, timing and uncertainty of prospective cash receipts from dividends or interest and the proceeds from the sale, redemption, or maturity of securities or loans" (Financial Accounting Standards Board, 2008, p. 3). Furthermore, prior studies found that companies with more uncertain information environments are associated with greater analyst inefficiency or bias (Ackert & Athanassakos, 1997, 2003; Das et al., 1998; Kothari, 2001; Lim, 2001) and with an increased investor demand for analyst research (Barniv & Cao, 2009).

Lim (2001) measures the richness of the information environment as firm size and analyst coverage. Firm-specific uncertainty is measured as the standard deviation of weekly stock returns (Lim, 2001). Ackert and Athanassakos (1997, 2003) measure analyst uncertainty surrounding a firm as the standard deviation of earnings forecasts. Barniv and Cao (2009) measure the uncertainty of an information environment using accounting restatements as proxy.

2.4 Tax risk

Since the Sarbanes-Oxley Act of 2002 tax risk management has become more important (Hutchens & Rego, 2015). However, tax issues lack understanding and awareness (Erle, 2008). A survey conducted under tax and finance executives in 2014 shows 81 percent of the respondents agreed or strongly agreed that tax risk will become more important in the following years (EY, 2014). But, executives have been complaining about the complexness of tax reductions and the costliness of complying with tax incentives (McKinnon, 2012). It is important to understand what tax risk entails but up until now there is not yet an agreed upon set of measures of tax risk (Shevlin, 2016). There are however several definitions used in prior literature.

The traditional views only observe tax risk in terms of potential overpayments, underpayments, tax penalties and assessments, but nowadays a broader view is warranted (Deloitte, 2015). Tax risk consists of different aspects, including compliance risks, reputational risks, transactional risks and operational risks (Deloitte, 2015; Erle, 2008; EY, 2014). It has become more challenging for companies to comply with all legal requirements. Tax laws have become significantly more complex, are constantly changing and are often related to additional legal topics. In addition, legal regulations are subject to interpretation which enhances uncertainties (Erle, 2008). Moreover, there is more aggressive and more focused tax enforcement nowadays (EY, 2014). A firm its reputation is established by how the firm is perceived and this strongly interrelates to its success. Stakeholders show much more interest in the firm values that underlie actions and demand ethical behavior (Erle, 2008). The reputation of a firm can be harmed by negative attention from the media and nongovernmental organizations even though their tax strategies may be appropriate and comply with legal regulations (Deloitte, 2015). If a firm moves to a tax shelter, it risks reputational damage and legal actions if there are no evident business reasons for the move (Erle, 2008). Other risks are over- or underpaying taxes, the risk of being unable to meet tax requirements, unforeseen cash taxes, and the risk of making wrong business decisions which rises when tax effects are wrongly assessed (Deloitte, 2015; Erle, 2008).

To understand tax risk, tax avoidance is first explained. Like tax risk, tax avoidance has no universally accepted definitions or constructs (Hanlon & Heitzman, 2010). Tax avoidance can be seen as a continuum of tax planning strategies. This continuum exists of strategies that lower explicit taxes and are completely legal, such as municipal bond investments, at one end and terms like noncompliance, evasion, aggressiveness and sheltering at the other end. However, tax aggressiveness, the determinant of where tax planning activities and strategies lie along the continuum, is subjective (Hanlon & Heitzman, 2010). Tax aggressiveness increases agency costs, because it reduces corporate transparency and thereby reduces the quality of financial reporting for stakeholders (Balakrishnan et

al., 2012; Desai & Dharmapala, 2006, 2009). In general, tax avoidance can be seen as the reduction of explicit taxes (Dyreng et al., 2008; Hanlon & Heitzman, 2010; Shevlin, 2016).

Financial accounting effects affect tax incentives. Hanlon and Heitzman (2010) argue that taxes as well as book-tax tradeoff can affect investment decisions and capital structure, which subsequently affect economic activity and the structure and efficacy of tax policy. Furthermore, firms will tradeoff taxes for higher accounting earnings when engaging in earnings management, when debt levels are high, or when corporate tax rates are low (Mills & Newberry, 2001; Shackelford & Shevlin, 2001; Zang, 2012).

Tax avoidance has several advantages, such as higher net after-tax cash flows and sometimes financial reporting benefits via lower GAAP effective tax rates (Hutchens & Rego, 2015). On the other hand there are several reasons for companies not to minimize taxes. Reporting lower financial accounting earnings, for example, may increase the probability of violating bond covenants, lead to lower management compensation and lower stock prices. Other reasons not to minimize taxes are agency costs, reputation costs, political costs and increased IRS scrutiny (Shevlin, 2016). These costs generally increase as a consequence of uncertainty. It may be costly to implement the unique transactions that are associated with uncertain tax avoidance. Another cause for increasing tax costs is the auditing of uncertain tax positions by tax authorities such as IRS. That is, the company can face high costs in complying with the audit and paying unpaid taxes, penalties and interest. The tax-related financial reporting risk rises as well, because the company has to determine which uncertain tax positions need contingent tax liabilities and the size of these (Hutchens & Rego, 2015).

Gallemore and Labro (2015) state that tax risk is the firm its uncertainty regarding its tax liability in their study of the relation between the internal information environment and both tax avoidance and tax risk. By using a regression and different proxies for internal information quality and tax risk they study this relation. The authors use cash effective tax rate volatility as proxy for tax risk and find that internal information quality is negatively correlated with tax risk. To check their results they use unrealized tax benefits is an alternative proxy for tax risk because it shows the riskiness of a tax position. Their sample consists of 38.223 firm-year observations and does not include financial firms. To ensure consistency in accounting for income taxes the sample period starts in 1994, after the enactment of SFAS No. 109. The study shows that a higher internal information quality reduces cash effective tax rate volatility and thus decreases tax risk. On the contrary, when unrealized tax benefits is used as a proxy for tax risk, this relation is only found with two proxies for internal information quality; the absence of material weaknesses in internal controls and the accuracy of management earnings forecast. Only the latter relation is significant (Gallemore & Labro, 2015).

Higgins et al. (2015) study the influence of a firm its business strategy on its tax aggressiveness. They reason that it is hard to sustain more aggressive tax strategies and this will lead to more volatility

in the outcomes of these strategies and argue that two distinct strategies of the theoretical framework of Miles and Snow (1978, 2003) influence the level and aggressiveness of tax avoidance: the strategy of defenders and the strategy of prospectors. Firms that have a cost leadership strategy diminish their risks and uncertainties, want to be organizationally and operationally stable, do not actively exploit new opportunities and have an assortment of goods that have available substitutes, are defenders. Prospectors, on the other hand, have an innovation strategy, are open to uncertainty and change, actively exploit new opportunities, enter new markets and are likely to sell unique goods. The sample consists of 29,324 firm year observations between 1993 and 2010 with nonnegative assets and sales. Firm years with loss or insufficient data were excluded from the sample. The authors use an ordinary least squares regression and find that prospectors engage in more tax avoidance using more uncertain and aggressive tax planning than defenders. Furthermore, prospectors have more volatile measures of tax avoidance than defenders. Tax avoidance is measured by book and cash effective tax rates and the permanent book-tax differences. Tax aggressiveness is measured by the firm its additions to its unrealized tax benefits and whether the firm is operating in a tax haven (Higgins et al., 2015).

Additionally, Neuman et al. (2012) study the relation between the transparency of information environments and the sustainability of tax activities, measured as the coefficient of variance for annual cash effective tax rates. The authors use a regression model to test their hypotheses. The transparency of the information environment is measured by five proxies: the absolute value of discretionary accruals, the speed of disclosure of the firm its annual report, analyst forecast dispersion, the average bid-ask spread and the average daily trading volume. Their sample includes firms that are incorporated in the United States with total assets greater than zero. Financial services and utilities firms are excluded, as well as firms that are missing the values of pre-tax income. The sample period starts in 1998 to make sure that the accounting for income taxes and the statutory tax rates are consistent throughout the sample. The authors examine uncertain tax activities that fall into three areas: transactional, compliance and operational tax uncertainty. Discontinued operations are used as a proxy for transactional uncertainty, locations in tax havens and foreign income are used as a proxy for operational uncertainty and tax-related material weaknesses are used as a proxy for compliance uncertainty. The authors show that uncertain tax activities and transparent information environment are negatively correlated. Firms with more sustainable tax strategies have a more transparent information environment (Neuman et al., 2012).

Tax strategies can have different outcomes, ranging from highly certain to highly uncertain outcomes, which indicates that the extent of tax risk varies across firms even when they have comparable rates of tax avoidance (Hutchens & Rego, 2015). The authors study the relation between tax risk and firm risk using an ordinary least squares regression model and a sample of 4,103 firm years with firms that have available data for the fiscal years ending between December 31, 1992 and December 31, 2013. Tax risk is defined as “all tax-related uncertainties that surround a firm its

transactions, operations, financial reporting decisions, and corporate reputation" (Hutchens & Rego, 2015, p. 1). Examples of these uncertainties are the financial accounting for corporate taxes, how to apply the tax law, the chance of being audited by tax authorities and also the quality of the internal information which are fundamental for tax decisions (Hutchens & Rego, 2015). The authors use four proxies for tax risk; the ending balance of unrecognized tax benefits, additions to unrecognized tax benefits related to the tax returns of the current year, discretionary permanent book-tax differences, cash effective tax rates volatility. The latter is not positively correlated with the rest of the proxies, while these are positively correlated with each other. This implicates that cash effective tax rate volatility captures a different aspect of tax risk. The results further indicate that discretionary permanent book-tax differences and cash effective tax rate volatility are superior proxies to measure the extent to which a firm is exposed to tax risk. An increased tax risk leads to an increase in firm risk (Hutchens & Rego, 2015).

Another study that finds that tax risk is related to firm risk is the study of Guenther et al. (2013). The authors study the relation between tax policies, which is defined as tax avoidance, tax aggressiveness and tax risk, and firm risk. Tax avoidance consists of strategies to reduce income tax fees. Tax aggressiveness is the extent to which firms engage in tax strategies that are not likely to survive an audit by a tax authority. At last, tax risk reflects to what extent the tax position of a firm is sustainable. The authors use separate regressions to examine the relation between the three aspects of tax policies and firm risk and do not find a significant relation between tax avoidance and tax aggressiveness and firm risk. Their sample period starts in 1987, because this is the first year that the necessary data is available, and ends in 2011. The sample consists of firms in the United States that have a positive pre-tax income and sufficient data. The results suggest that enhanced tax risk, measured as the standard deviation of cash effective tax rate, does lead to an increased firm risk (Guenther et al., 2013).

De Simone et al. (2014) research whether high levels of tax avoidance are associated with tax risk, which they define as the probability that claimed benefits will not be maintained in the future, whether because of audit, changes in law, or operational changes that reduce the benefits of current tax planning. They acknowledge that firms have different tax avoidance opportunities and divide their sample into non-income mobile firms and income mobile firms. The sample that is used consists of 46,044 firm year observations with no unprofitable firm years and no observations with cash effective tax rates below zero or greater than one. The sample period is 1993 to 2012. Using disclosures of the reserve for uncertain tax positions, cash effective tax rate volatility and the coefficient of variation of cash effective tax rate as proxies for tax risk, the authors find that the income mobile firms attain larger long-term tax benefits without enhancing their tax risk (De Simone et al., 2014).

Bauer and Klassen (2014, p. 3) define tax risk as "the probability that a firm suffers a large tax loss; i.e., an unfavorable settlement with a tax authority in which additional tax or penalties result". To create this proxy for tax risk, the authors estimate a logistic regression on factors that are related to tax

risk, in a broad sample as well as in a one-to-five matched sample. Tax risk increases in higher cash effective tax rate volatility, foreign operations, number of business segments, the presence of SOX 404 material weaknesses in internal controls, the tax cushion accrual and more litigious industries. The risk decreases when the R&D increases. The sample period is from 2002 to 2012 and the sample used consists of 7,531 firm-year observations and 1,517 firm-level observations. Observations with an annual return on assets lower than 0.5 percent, observations without ten years of consecutive data to measure the benchmarks of cash effective tax rates and observations that were missing data for the control variables were excluded. The authors find that investors anticipate big tax losses and require more stock returns from firms with big tax loss events. Their findings further indicate that the probability of tax loss rises when cash ETR volatility and contingent tax liabilities rise (Bauer & Klassen, 2014).

2.4.1 Summary

Firms that reduce their explicit taxes engage in tax avoidance (Dyreng et al., 2008; Guenther et al., 2013; Hanlon & Heitzman, 2010; Shevlin, 2016). Tax avoidance is a continuum of tax planning strategies, with completely legal strategies to lower explicit taxes at one end and terms like noncompliance, evasion, aggressiveness and sheltering at the other end (Hanlon & Heitzman, 2010). Advantages of tax avoidance are higher net after-tax cash flows and financial reporting benefits via lower GAAP effective tax rates (Hutchens & Rego, 2015). Tax avoidance has also significant disadvantages. These disadvantages include agency costs, reputation costs, political costs and increased IRS scrutiny (Shevlin, 2016). In general these costs increase as a consequence of uncertainty (Hutchens & Rego, 2015).

Although tax risk has become more important since the Sarbanes-Oxley Act of 2002, tax issues still lack understanding and awareness (Erle, 2008; Hutchens & Rego, 2015). There is not yet an agreed upon set of measures for tax risk (Shevlin, 2016). Tax risk consists of several aspects, including over- and underpayments, the compliance with tax laws, reputational risks, transactional risks and operational risks (Deloitte, 2015; Erle, 2008; EY, 2014).

Gallemore and Labro (2015) state that tax risk is the firm its uncertainty regarding its tax liability. They measure tax risk as the volatility of the cash effective tax rate and find that this is decreased when the quality of the internal information increases (Gallemore & Labro, 2015).

The business strategy of a firm is related to its tax planning and avoidance (Higgins et al., 2015). Higgins et al. (2015) measure tax avoidance by book and cash effective tax rates and the permanent book-tax differences. Tax aggressiveness is measured by the firm its additions to its unrealized tax benefits and whether the firm is operating in a tax haven (Higgins et al., 2015). Neuman et al. (2012) measure the sustainability of tax activities as the coefficient of variance for annual cash effective tax rates. The transparency of a firm its information environment is measured as the absolute

value of discretionary accruals, the speed of disclosure of the firm its annual report, analyst forecast dispersion, the average bid-ask spread and the average daily trading volume. Firms with sustainable tax strategies have a more transparent information environment. Firms with more uncertain tax activities have a less transparent information environment. Proxies for uncertain tax activities are discontinued operations, locations in tax havens, foreign income and tax-related material weaknesses. Additionally, the authors measure tax-related complexity as deferred taxes and book-tax differences (Neuman et al., 2012).

Tax strategies can have highly certain or uncertain outcomes. The extent of tax risk can vary across firms with comparable rates of tax avoidance (Hutchens & Rego, 2015). Hutchens and Rego (2015) define tax risk as all tax-related uncertainties that a firm faces. The authors measure tax risk as the ending balance of unrecognized tax benefits, the additions to unrecognized tax benefits, discretionary permanent book-tax differences and cash effective tax rates volatility. The volatility of the cash effective tax rate and discretionary book-tax differences capture the tax-related uncertainties that are consistently associated with increased firm risk (Hutchens & Rego, 2015).

Tax policies consist of tax avoidance, tax aggressiveness and tax risk. Tax aggressiveness is the extent to which firms engage in tax strategies that are not likely to survive an audit by a tax authority. One definition of tax risk is that tax risk reflects to what extent the tax position of a firm is sustainable (Guenther et al., 2013). Guenther et al. (2013) measure tax risk as the standard deviation of cash effective tax rate. An increased tax risk leads to an increased firm risk (Guenther et al., 2013).

De Simone et al. (2014) define tax risk as the probability that claimed benefits will not be maintained in the future because of changes that reduce the benefits of current tax planning. They measure tax risk using disclosures of the reserve for uncertain tax positions, cash effective tax rate volatility and the coefficient of variation of cash effective tax rates. Income mobile firms have more tax avoidance opportunities and attain larger long-term tax benefits without enhancing their tax risk (De Simone et al., 2014).

Bauer and Klassen (2014) define tax risk as the likelihood that a firm endures a large tax loss. The authors create a proxy by estimating a logistic regression on factors that are related to tax risk. These factors include cash effective tax rate volatility, foreign operations, number of business segments, the presence of SOX 404 material weaknesses in internal controls, tax cushion accruals, litigious industries and R&D (Bauer & Klassen, 2014).

All in all, tax risk reflects the sustainability of a firm its tax position, uncertainty related to taxes and the probability of a large tax loss (Bauer & Klassen, 2014; De Simone et al., 2014; Gallemore & Labro, 2015; Guenther et al., 2013; Hutchens & Rego, 2015). Although there is not yet an agreed upon set of measures to measure tax risk (Shevlin, 2016), several studies measure tax risk using the volatility of the cash effective tax rate (Bauer & Klassen, 2014; De Simone et al., 2014; Gallemore & Labro, 2015; Guenther et al., 2013; Hutchens & Rego, 2015; Neuman et al., 2012), which is by the

majority of the studies measured as the standard deviation of the cash effective tax rate (Bauer & Klassen, 2014; De Simone et al., 2014; Gallemore & Labro, 2015; Guenther et al., 2013; Hutchens & Rego, 2015).

2.5 Conclusive

The information within a firm is generated by its internal information system. Managers use this information for their day-to-day operational decisions and management guidance (Dorantes et al., 2013; Feng et al., 2009; Gallemore & Labro, 2015). When the quality of the internal information environment is high, managers are provided with timelier and more accurate information, barriers between accounting cycles are removed, information asymmetry is reduced and more effective tax planning is facilitated (Aryani & Krismiaji, 2013; Dorantes et al., 2013; Gallemore & Labro, 2015). The definition of tax risk used in this study is that tax risk reflects the sustainability of a firm its tax position, uncertainty related to taxes and the probability of a large tax loss (Bauer & Klassen, 2014; De Simone et al., 2014; Gallemore & Labro, 2015; Guenther et al., 2013; Hutchens & Rego, 2015). Based on the assumptions of rationality and optimality, which rise from decision theory (Brunsson, 1990; Edwards, 1954; Einhorn & Hogarth, 1981; Simon, 1978), managers would try to minimize a firm its tax risk. Thus, decision theory is used to guide the study conducted in this thesis. As described before, the quality of the information, on which decisions and judgments are based, influences the outcome of this decision and the quality of the decisions and judgments (Gallemore & Labro, 2015). These decisions and judgments are based on all available information, both diagnostic and nondiagnostic (Einhorn & Hogarth, 1981; Glover, 1997; Hackenbrack, 1992).

3 Hypothesis development

This chapter presents the hypothesis that is tested in this study. The hypothesis is based on the insights of previous literature and the assumptions of decision theory. The research question of this thesis is:

"Does internal information quality influence firms' tax risk?"

First, the hypothesis that is tested is described. Then, the predictive validity framework is provided. Subsequently, the construct validity, internal validity and the external validity of this study are discussed.

3.1 Hypothesis

Decisions are an important organizational activity (Brunsson, 1990). The information generated by a firm its internal information system, both accounting and non-accounting information, is the basis for many managerial decisions (Feng et al., 2009; Gallemore & Labro, 2015; Glover, 1997). When the quality of the information environment is high, management is provided with a real-time whole view of the financial condition of the firm, information is timelier and more accurate and information asymmetry is reduced. Additionally, in a high quality information environment barriers between accounting cycles are removed and management has access to greater amounts of information. Tax planning can be done more effectively (Aryani & Krismiaji, 2013; Dorantes et al., 2013; Gallemore & Labro, 2015). Every function within a firm has a stake in tax management, tax risks and related processes due to the omnipresence of taxes (Deloitte, 2015). Firms that have a high quality internal information environment are able to handle tax documentation processes more effectively and distinguish transactions that yield tax benefits (Gallemore & Labro, 2015).

Based on the assumptions of decision theory, managers are rational and make optimal decisions (Brunsson, 1990; Edwards, 1954; Einhorn & Hogarth, 1981; Simon, 1978). In the context of this study this means that managers minimize tax risk. Since managers base their decisions and judgments on all available information (Einhorn & Hogarth, 1981; Glover, 1997; Hackenbrack, 1992) and the quality of this information influences the quality of the decisions and judgments as well as their outcomes (Gallemore & Labro, 2015), a higher internal information quality mirrors better decisions and judgments. Thus, managers of firms with a higher internal information quality should make better, well-informed decisions regarding a firm its tax risk and should be able to reduce this tax risk. Thus, a higher internal information quality should reduce a firm its tax risk. This leads to the following alternatively stated hypothesis:

A higher internal information quality leads to a lower tax risk.

The corresponding null hypothesis is that a higher internal information quality has no influence on a firm its tax risk.

3.1.1 Accuracy of management forecasts and tax risk

Management guidance is used to influence earnings expectations and to lower litigation risk. Therefore, managers have incentives to report accurate forecasts (Feng et al., 2009). The information that is produced by the firm its internal information system is fundamental for these forecasts (Dorantes et al., 2013) and for many day-to-day operational decisions (Feng et al., 2009). Managers of firms with a high quality information environment and managers of firms with strong internal controls make more accurate earnings forecasts (Dorantes et al., 2013; Feng et al., 2009). Hence, a lower management forecast bias signals higher internal information quality.

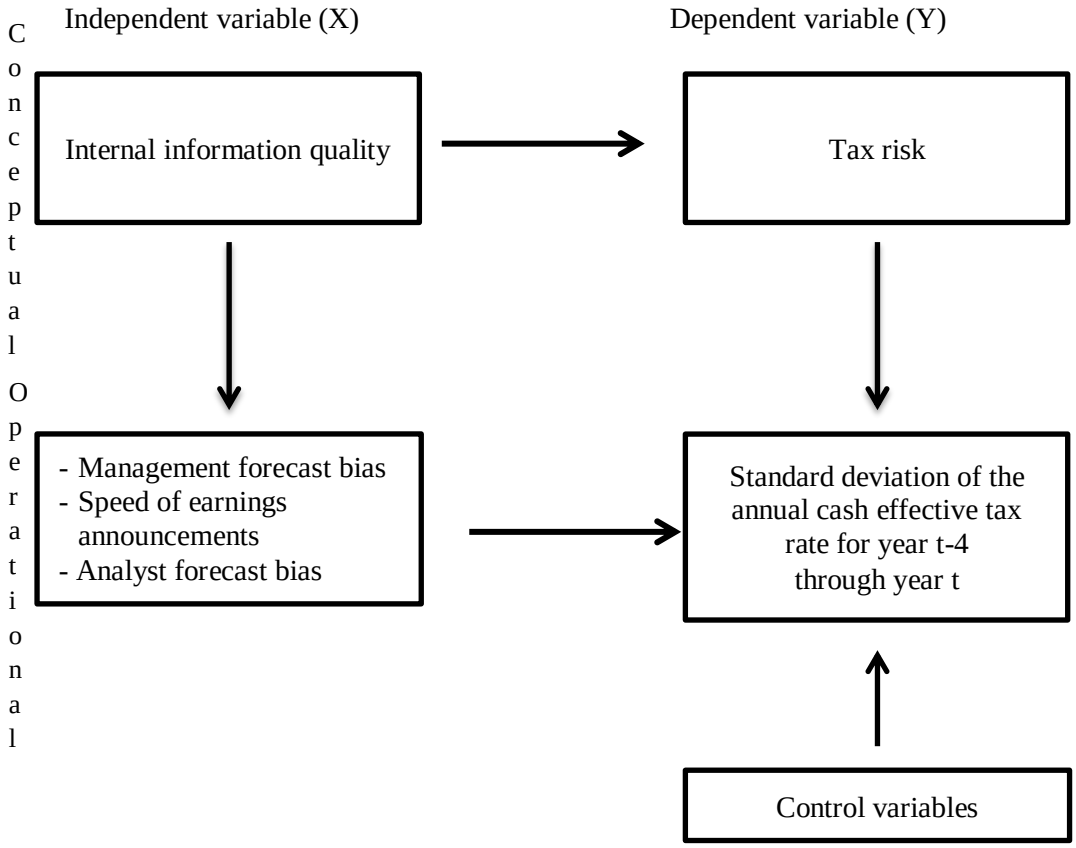
3.1.2 Earnings announcements and tax risk

Besides the accuracy of management forecasts, the speed of the earnings announcements is also connected to a firm its internal information quality. The relevance of accounting information can be measured by the time lag between their fiscal year end and the date of the earnings announcement (Aryani & Krismiaji, 2013). When this time lag is small, the information is more relevant and thus of higher quality (Aryani & Krismiaji, 2013; Vaassen et al., 2009). It is furthermore more useful for decision-making (Financial Accounting Standards Board, 2006). A smaller time lag between a firm its fiscal year end and the date of the earnings announcement thus indicates that the internal information is of higher quality.

3.1.3 Analyst forecast bias and tax risk

As mentioned before, firms with a higher internal information quality issue more accurate management forecasts (Dorantes et al., 2013; Feng et al., 2009), which enhances the transparency and credibility of financial reporting and reduces information asymmetry (Feng et al., 2009). Ergo, firms with a lower internal information quality issue less accurate management forecasts and have higher information asymmetry. This leads to more uncertainty and thus to higher analyst forecast biases (Ackert & Athanassakos, 1997, 2003). Additionally, when analysts are dependent on management for their information access, they tend to make overoptimistic forecasts. Analysts are furthermore overoptimistic when the information environment of a firm is of low quality. This overoptimism leads to a higher analyst forecast bias (Lim, 2001). Therefore a lower analysts forecast bias is associated with a higher internal information quality.

On the next page the predictive validity framework (“Libby boxes”) (Libby, 1981) of the hypothesis is provided.



The hypothesis is tested by analyzing panel data. Three ordinary least squares regression models are estimated to study the influence of the internal information quality on a firm its tax risk. Tax risk is measured by the volatility of the cash effective tax rate. This volatility is associated with the volatility of future stock return and firm risk (Guenther et al., 2013; Hutchens & Rego, 2015). Firms with higher tax risk presumably have more volatile tax outcomes (Gallemore & Labro, 2015). More volatile cash effective tax rates reflect uncertain tax positions in prior periods reversing in following years and thus the extent of sustainability of tax positions (Guenther et al., 2013; Hutchens & Rego, 2015). Furthermore, the probability of an event resulting in a tax loss is greater when the volatility in cash effect tax rate is high (Bauer & Klassen, 2014). The dependent variable cash effective tax rate volatility is operationalized by the standard deviation of the annual cash effective tax rate for year t-4 through year t.

The first operationalization of internal information quality is the bias of management forecasts. Management forecast accuracy depends on the quality of the internal information that is used by management for making these forecasts (Dorantes et al., 2013; Feng et al., 2009; Gallemore & Labro,

2015). The accuracy of management forecasts is measured by the scaled absolute value of reported earnings minus the management forecast. To measure the influence of the management forecast accuracy on the cash effective tax rate volatility more accurately, several control variables are included in the regression. These control variables are firm size, cash effective tax rate, foreign operations, volatility, return on assets, leverage and analyst forecast bias. These variables are further elaborated in chapter 4.

The second operationalization of internal information quality is the time lag between the fiscal year end and the earnings announcement. In prior literature, this variable is used to measure the relevance of accounting information, the accuracy of management guidance and the quality of internal information (Aryani & Krismiaji, 2013; Feng et al., 2009; Gallemore & Labro, 2015). Firms with a higher internal information quality are likely to announce their earnings faster than firms with a lower internal information quality because in these firms information is better integrated in different parts of firm (Gallemore & Labro, 2015). This variable is measured by the number of days between the fiscal year end and the date of the earnings announcement divided by 365. In this regression model control variables are included as well. The control variables that are included are firm size, cash effective tax rate, foreign operations, volatility, return on assets, leverage and analyst forecast bias.

The third operationalization of internal information quality is analyst forecast error. Analyst forecast bias is higher for firms with a low quality information environment (Ackert & Athanassakos, 1997, 2003; Lim, 2001). This is measured by the absolute value of reported earnings minus the analyst forecast, scaled by the absolute value of the reported earnings. Again several control variables are included. The controls that are included are firm size, cash effective tax rate, foreign operations, volatility, return on assets, leverage and analyst following.

3.2 Construct validity

The construct validity is the extent to which an operationalization of a construct measures the underlying theoretical construct it says it measures (Brown, 1996). The purpose of this thesis is to measure the influence of internal information quality on a firm its tax risk. Tax risk reflects the sustainability of a firm its tax position, the uncertainty related to taxes and the probability of a large tax loss (Bauer & Klassen, 2014; De Simone et al., 2014; Gallemore & Labro, 2015; Guenther et al., 2013; Hutchens & Rego, 2015). In this thesis tax risk is measured as the volatility of the cash effective rate. Following Bauer and Klassen (2014), De Simone et al. (2014), Gallemore and Labro (2015), Guenther et al. (2013) and Hutchens and Rego (2015), this volatility is operationalized by the standard deviation of the annual cash effective tax rate from year t-4 through year t.

First, the influence of management forecast bias on the volatility of the cash effective tax rate is studied. The management forecast bias is operationalized by the scaled management forecast of earnings minus the absolute value of reported earnings. This is consistent with the studies of Dorantes et al. (2013), Feng et al. (2009) and Gallemore and Labro (2015). Dorantes et al. (2013) and

Gallemore and Labro (2015) scale this absolute value by the stock price, Feng et al. (2009) by the lagged assets per share.

Subsequently, the relation between the time lag between fiscal year-end and earnings announcement and the volatility of the cash effective tax rate is studied. Several other studies use this time lag as a proxy for the internal information quality (Aryani & Krismiaji, 2013; Gallemore & Labro, 2015). The time lag is measured by the number of days between the fiscal year end and the date of the earnings announcement, divided by 365.

Finally, the relation between the analyst forecast error and the volatility of the cash effective tax rate is studied. Studies found that the analyst forecast error signals both uncertainty surrounding a firm and a low internal information quality (Ackert & Athanassakos, 1997, 2003; Lim, 2001). The analyst forecast error is operationalized by the absolute value of reported earnings minus the analyst forecast, scaled by the absolute value of the reported earnings.

The hypothesis and operationalization of the constructs are based on evidence of prior literature. The evidence shows that the accuracy of management forecast, the time lag between the fiscal year end and the data of the earnings announcement and the analyst forecast error all indicate whether the quality of the internal information is high or low. Prior literature furthermore shows that the volatility of the cash effective tax rate mirrors the tax risk a firm faces. Additionally, several control variables that are related with internal information quality, tax risk, or both are included. Therefore, the construct validity of the hypothesis is sufficient. It is however important to note that it is possible that there are other factors that influence the relation between the independent and dependent variable.

3.3 Internal validity

Internal validity refers to the extent to which variation in the dependent variable has been caused by changes in the independent variable and not by other causal factors (Reis & Judd, 2014). In this thesis panel data is used. This gives rise to endogeneity concerns, because the sample is not random and omitted correlated variables might be present. It is therefore difficult to ensure that there is no third factor that influences both the dependent and the independent variable (Moffitt, 2003). To mitigate these concerns several control variables are included in the regressions. Furthermore, the sample is subject to several limitations. For example, financial institutions are excluded of the sample, because these firms are subject to different regulations. Another issue is that the relation between the independent variable and dependent variable may have changed over time because of learning or physical changes. It is hard to identify these effects apart from the other correlations by analyzing panel data (Roe & Just, 2009). To control for this issue, year and industry fixed effects are added to the regression models in section 5.3.

3.4 External validity

External validity is about generalizability. It deals with the question whether the results of a study can be generalized and to what extent (Campbell & Stanley, 2015). The external validity of an experiment with panel data is relatively high (Roe & Just, 2009). The initial sample of this thesis consists of all U.S. firms with available data between 1998 and 2015. Because of the use of naturally occurring data, the external validity is high (Roe & Just, 2009). However, because of the restrictions on the sample, the final samples are relatively small and consist of 657 firms and 281 firms. This lowers the external validity, because the relation may not persist in a more diverse setting (Roe & Just, 2009). Additionally, the sample consists only of U.S. firms. As a consequence, the results presumably cannot be generalized for other countries. The sample selection procedure is described in section 4.1.2.

4 Research design

Decision-making is important in organizations (Brunsson, 1990). The quality of the information that is used influences the quality of the decision and its outcome (Gallemore & Labro, 2015). Previous studies found that judgments and decisions are based on both diagnostic and nondiagnostic information (Einhorn & Hogarth, 1981; Glover, 1997; Hackenbrack, 1992).

This chapter presents the empirical research design. Three ordinary least squares regression models are estimated to study the influence of the internal information quality on a firm its tax risk. First, the sample selection process is defined.

4.1 Sample

4.1.1 Sample period

This thesis investigates the relation between internal information quality and tax risk. When studying the sustainability of tax strategies and corporate transparency, Neuman et al. (2012) start their sample period in 1998 to ensure that the accounting for income taxes as well as for statutory taxes is consistent throughout the sample (Neuman et al., 2012). Gallemore and Labro (2015) start the sample of their study about internal information quality and tax avoidance in 1994, with the enactment of SFAS No. 109 (Gallemore & Labro, 2015). To ensure consistent accounting for income and statutory taxes, this sample period in this thesis runs from 1998 to 2015.

4.1.2 Sample selection

The initial sample consists of 113,084 firm-year observations of 14,235 U.S. firms. This initial sample is derived from the CRSP/Compustat Merged database. This database contains the merged data from the CRSP database and Compustat database. It provides information about balance sheet items, items of the income statement and data about stock prices. Next, this data is intersected with data from the History Detail section of the I/B/E/S database, which contains data of analysts' forecasts. This intersection results in a sample of 2,068 U.S. firms with 13,232 firm-year observations. Subsequently, this data is intersected with data from the Summary History section of the I/B/E/S database, to include data about the number of analysts that follow the companies. After this intersection the sample contains 13,132 firm-year observations of 2,062 U.S. firms. Next, the data to calculate the control variable 'volatility' is collected from the Compustat Quarterly database, as following prior literature, this variable is measured using quarterly cash flow volatility, earnings volatility and sales volatility (Feng et al., 2009). The sample is intersected with this data, which results in a sample of 13,126 firm-year observations of 2,061 U.S. firms. The sample is adjusted for duplicate observations. For the first regression model data of the I/B/E/S Guidance database is necessary. After the intersection with this database and adjusting for duplicate observations, the sample consists of 3,912 firm-year observations

of 820 U.S. firms. To warrant the external validity of this thesis, this subsample is only used for the first regression model. For the remaining two models the sample without intersection of I/B/E/S Guidance is used.

Subsequently, the sample has to meet certain criteria. First, financial firms are excluded from the sample, because these firms are subject to different regulations (Hutchens & Rego, 2015). Next, firms of which the fiscal year does not end in December are excluded in order to make an appropriate comparison of the firm-year observations (Ackert & Athanassakos, 2003). Following prior literature, firm-year observations where pre-tax income adjusted for special items is negative are excluded from the sample. Additionally, firm-year observations with a cash effective tax rate lower than zero and greater than one are excluded as well (Dyreng et al., 2008; Gallemore & Labro, 2015). If data on special items, extraordinary items and pre-tax foreign income is missing, the value is set to zero. Finally, firm-year observations with missing data on the remaining main and control variables are excluded from the sample. This results in an ending sample of 657 U.S. firms with 3,632 firm-year observations, for the period 1998-2015. The ending subsample used for the first regression model consists of 281 U.S. firms with 1,323 firm-year observations, for the period 1998-2015. A summary of this procedure can be found in Appendix A.

4.2 Key variables description

4.2.1 Dependent variable

The volatility of the cash effective tax rate is a proxy for the firm its tax risk. This volatility is positively correlated with the volatility of future stock return and firm risk (Guenther et al., 2013; Hutchens & Rego, 2015). Firms with higher tax risk presumably have more volatile tax outcomes (Gallemore & Labro, 2015), which reflects uncertain and unsustainable tax positions (Guenther et al., 2013; Hutchens & Rego, 2015). In addition, the probability of an event resulting in a tax loss is greater when the volatility in cash effect tax rate is high (Bauer & Klassen, 2014).

Following previous studies, the cash effective tax rate volatility is measured as the standard deviation of the annual cash effective tax rate for year *t-4* through year *t* (De Simone et al., 2014; Gallemore & Labro, 2015; Guenther et al., 2013; Hutchens & Rego, 2015). The annual cash effective tax rate is computed as the cash taxes paid divided by the pre-tax income adjusted for special items (Gallemore & Labro, 2015; Guenther et al., 2013; Hutchens & Rego, 2015). To calculate the cash effective tax rate volatility, firms are required to have at least three non-missing values of cash effective tax rate.

4.2.2 Independent variables

To proxy the internal information quality three variables are used. First, following several studies, management forecast bias is used. The accuracy of management forecasts depends on the quality of the internal information that is used by management for making these forecasts (Dorantes et al., 2013; Feng et al., 2009; Gallemore & Labro, 2015). In prior literature, management forecast bias is computed as the scaled management forecast minus the absolute value of reported earnings (Dorantes et al., 2013; Feng et al., 2009). In this thesis, the management forecast bias is computed by the earnings per share as forecasted by management minus reported earnings per share, scaled by the reported earnings per share. This data is derived from the I/B/E/S Guidance database.

Second, the time lag between a firm its fiscal year end and the date of the earnings announcement is used to proxy internal information quality. Studies use this variable to measure the relevance of accounting information, the accuracy of management guidance and the quality of internal information (Aryani & Krismiaji, 2013; Feng et al., 2009; Gallemore & Labro, 2015). Firms with a higher internal information quality are likely to announce their earnings faster than firms with a lower internal information quality because in these firms information is better integrated in different parts of firm (Gallemore & Labro, 2015). The time lag between a firm its fiscal year end and the date of the earnings announcement is computed as the number of days between the fiscal year end and the date of the earnings announcement (Aryani & Krismiaji, 2013). Following Gallemore and Labro (2015), this number is divided by 365. The dates of the fiscal year end and the earnings announcement are collected from I/B/E/S database.

Third, the analyst forecast bias is used. Several studies found that analyst forecast bias is higher for firms with a low quality information environment (Ackert & Athanassakos, 1997, 2003; Lim, 2001). Following Ackert and Athanassakos (1997, 2003) the analyst forecast bias is measured as follows:

$$OPT_{i,T-t} = \frac{\mathrm{FEPS_{i,T-t}} - \mathrm{EPS_{i,T}}}{\mathrm{EPS_{i,T}}}$$

In which $\mathrm{FEPS_{i,\ T\text{-}t}}$ is the consensus forecast of the earnings per share of firm *i* at time *T-t* and $\mathrm{EPS_{i,T}}$ is the actual level of earnings per share for firm *i* at time *T*. The data of analysts their forecasts and the earnings per share are retrieved from the I/B/E/S database.

4.2.3 Control variables

In order to enhance the internal validity of this research, it is important to control for several characteristics that are possibly correlated with both tax risk and internal information quality.

First, *firm size* is added as a control variable, because larger firms are more likely to have more experienced and knowledgeable employees causing the quality of management forecasts to be higher

(Dorantes et al. 2013; Feng et al. 2009). Additionally, previous literature has shown that firm size is associated with tax avoidance outcomes (Dyreng et al. 2008; Gallemore and Labro 2015). *SIZE* is measured by the natural logarithm of total assets. The value of the total assets of a firm is derived from the CRSP/Compustat Merged database.

Second, the *cash effective tax rate* is added as control variable. It is included to enhance the extent to which the tax risk proxy captures uncertainty instead of the cash tax benefits from uncertain tax positions (Hutchens and Rego 2015). *CASHETR* is measured as the cash taxes paid divided by pre-tax income adjusted for special items. The necessary data is collected from the CRSP/Compustat Merged database.

Next, *volatility* is added as control variable. Volatility is a known determinant of characteristics of management forecasts (Dorantes et al., 2013; Feng et al., 2009). It furthermore captures the general uncertainty regarding the firm its fundamentals (Gallemore & Labro, 2015). Following Feng et al. (2009), *VOL* is measured by three factors: cash flow volatility, earnings volatility and sales volatility. To calculate volatility, different weights are assigned to the three factors (Feng et al., 2009), resulting in the following formula:

$$\text{VOL} = 0.654 * \text{Cash Flow Volatility} + 0.568 * \text{Earnings Volatility} + 0.567 * \text{Sales Volatility}$$

Cash flow volatility is the standard deviation of quarterly operating cash flows over the seven years prior to *t*. Earnings volatility is the standard deviation of quarterly return on assets over the seven years prior to *t*. Sales volatility is measured by the standard deviation of quarterly sales over the seven years prior to *t*. In order to measure cash flow volatility, earnings volatility and sales volatility, at least three non-missing observations are required (Feng et al., 2009). To prevent that a few of the largest firms drive the results of this thesis, volatility is scaled by the total assets of a firm. The necessary data to calculate volatility is collected from the Compustat database, using the Quarterly section.

Another control variable is *pre-tax foreign income*. Pre-tax foreign income is included to control for investments and opportunities in tax planning (Higgins et al., 2015; Neuman et al., 2012). Additionally, it is connected to both tax risk and firm risk (Hutchens & Rego, 2015). It is also related to internal information quality because less transparent firms engage more in foreign operations (Neuman et al., 2012). *FI* is measured by dividing pre-tax foreign income by pre-tax income. The necessary data is collected from the CRSP/Compustat Merged database.

The next control variable is *leverage*. Leverage is associated with tax avoidance, as well as incentives and opportunities to engage in tax avoidance (De Simone et al., 2014; Gallemore & Labro, 2015; Hutchens & Rego, 2015). *LEV* is measured as total liabilities divided by total assets. The necessary data is collected from the CRSP/Compustat Merged database.

The next control variable is *return on assets*. According to Bauer and Klassen (2014) firms with a higher return on assets can be expected to engage in tax planning with more uncertainty and possibly higher rewards. The authors, however, do not find a significant relation between return on assets and the probability of a tax loss event (Bauer & Klassen, 2014). Return on assets is nonetheless included

because it influences management forecasts as it is related to the expected difficulty of making earnings forecasts (Dorantes et al., 2013). *ROA* is measured as pre-tax income adjusted for extraordinary items, divided by lagged assets. The necessary data is collected from the CRSP/Compustat Merged database.

The next control variable is *analyst forecast error*. This variable is only used when measuring the relation between the accuracy and the issuance speed of management its forecasts. Analyst forecast error is also associated with the expected difficulty of making earnings forecast (Dorantes et al., 2013; Feng et al., 2009). The measurement of the analyst forecast error is described in section 4.2.2. The necessary data is collected from the I/B/E/S database.

The last control variable is *analyst following*. Analyst following is included as control variable, because the degree of uncertainty in a firm its information environment is associated with analyst following. When the uncertainty increases, analyst following increases as well, because analysts may profit more from firms with an uncertain information environment (Ackert & Athanassakos, 2003). *FOLLOW* is measured as the natural log of the mean number of analysts that follow the firm during a year (Ackert & Athanassakos, 2003). The necessary data is collected from the I/B/E/S database.

4.3 Method

To study the relation between internal information quality and tax risk the hypothesis needs to be tested. To test the hypothesis, the following models are estimated using an ordinary least squares regression:

$$TAXRISK_t = a_0 + a_1MANBIAS_t + a_2SIZE_t + a_3CASHETR_t + a_4FI_t + a_5VOL_t + a_6ROA_t + a_7LEV_t + a_8ANALYSTBIAS_t + \varepsilon_t$$

$$TAXRISK_t = a_0 + a_1TIMELAG_t + a_2SIZE_t + a_3CASHETR_t + a_4FI_t + a_5VOL_t + a_6ROA_t + a_7LEV_t + a_8ANALYSTBIAS_t + \varepsilon_t$$

$$TAXRISK_t = a_0 + a_1ANALYSTBIAS_t + a_2SIZE_t + a_3CASHETR_t + a_4FI_t + a_5VOL_t + a_6ROA_t + a_7LEV_t + a_8FOLLOW_t + \varepsilon_t$$

Where:

TAXRISK=	The volatility of cash effective tax rate over a five-year period, ending in year t.
MANBIAS=	The absolute value of the earnings per share forecasted by management minus the realized earnings per share.
TIMELAG =	The number of days between the fiscal year end and the earnings announcement.

ANALYSTBIAS =	The consensus forecast of earnings per share minus the actual earnings per share, scaled by the actual earnings per share.
SIZE =	Natural logarithm of total assets.
CASHETR =	Income taxes paid, divided by pre-tax income adjusted for special items.
FI =	Pre-tax foreign income divided by pre-tax income.
VOL =	Factor consisting of three variables: cash flow volatility, earnings volatility and sales volatility.
ROA =	Pre-tax income adjusted for extraordinary items, divided by lagged total assets.
LEV =	Total debt divided by total assets.
FOLLOW =	The mean number of analysts following the firm over year t

To correct for cross-observation correlation and heteroscedasticity, standard errors are clustered at firm level.

4.4 Data preparation

To mitigate the effect of outliers in the variables, winsorization is used. Observations in the 1st percentile are set equal to the smallest value in the 2nd percentile. Observations in the 100th percentile are set equal to the largest value of the 99th percentile.

5 Empirical results

This chapter presents the empirical results of the regression models that are described in chapter 4. First, the descriptive statistics and the correlation coefficients of the full sample and the subsample are provided. Subsequently the results of the ordinary least squares regression are discussed per regression model. Finally, several additional tests are discussed.

5.1 Descriptive statistics

Table 1 shows the descriptive statistics for both the subsample and the full sample used for the statistical analysis. For the first regression model the sample that is used consists of 1,323 observations. The mean value of tax risk is 0.150. The mean value of management forecast bias is 0.117, while the mean value of analyst forecast bias is 0.111. This shows that in general management forecasts are more accurate than the forecasts made by analysts.

The full sample consists of 3,632 observations for all variables. The mean value of tax risk is higher in the full sample than in the subsample used for the first regression model, namely .215. The mean value of time lag is .115, which means that the time lag between a firm its fiscal year end and the earnings announcement is approximately 42 days. The mean value of analyst forecast bias is 0.187.

Table 2 provides an overview of the Pearson correlation coefficients of the variables. These coefficients measure the strength of the linear association between two variables and can take a value ranging from -1 to 1 (Sedgwick, 2012). The correlations between the dependent and independent variables are discussed below.

Panel A of Table 2 shows that management forecast bias is highly correlated with analyst forecast bias (r=0.7400). As discussed in Chapter 3, firms with less accurate management forecasts and information asymmetry operate in an environment with more uncertainty. This leads to an increase in analyst forecast bias (Ackert & Athanassakos, 1997, 2003). Furthermore, consistent with the expectation of the hypothesis, management forecast bias is positively correlated with cash effective tax rate volatility.

Panel B of Table 2 shows that the time lag between a firm its fiscal year and its earnings announcement is positively correlated with cash effective tax rate volatility. This is in line with the hypothesis. The positive correlation between analyst forecast bias and cash effective tax rate volatility is also in line with the hypothesis. Furthermore, the correlation coefficients show that the analyst forecast bias and the time lag between a firm its fiscal year end and its earnings announcement date are positively correlated.

Table 1
Descriptive Statistics

Panel A: Descriptive statistics of the subsample used for Regression model 1

Variables	N	Mean Value	Standard Deviation	Minimum Value	Maximum Value
TAXRISK	1,323	.1502133	.3253787	.0024161	2.724922
MANBIAS	1,323	.1171459	.2480312	0	1.647059
ANALYSTBIAS	1,323	.1105568	.2028764	1.87e-08	1.445813
SIZE	1,323	7.559108	1.747409	4.41702	11.72548
CASHETR	1,323	.2245773	.1371879	.0067093	.6873624
FI	1,323	.3361391	.5691466	-1.615681	3.151899
VOL	1,323	.0387444	.0305227	.0095533	.2346373
ROA	1,323	.1129209	.0963805	-.1417996	.4851393
LEV	1,323	.1955288	.1680352	0	.6755708

Panel B: Descriptive statistics of the full sample

Variables	N	Mean Value	Standard Deviation	Minimal Value	Maximal Value
TAXRISK	3,632	.21509	.4999339	.0019937	3.907695
TIMELAG	3,632	.1150662	.0397951	.0493151	.2356164
ANALYSTBIAS	3,632	.1871698	.3503955	7.57e-09	2.415033
SIZE	3,632	7.194846	1.884436	3.703374	12.12288
CASHETR	3,632	.2271225	.1570245	0	.7804937
FI	3,632	.2772919	.6049419	-1.95403	3.343408
VOL	3,632	.0436125	.0369503	.0092466	.2645997
ROA	3,632	.1142413	.1066378	-.1382956	.5290631
LEV	3,632	.1924513	.1799051	0	.732981
FOLLOW	3,632	1.891121	.8694702	0	3.442019

Panel A of this table provides the descriptive statistics of the variables used in the regression model for the first hypothesis. Panel B presents the descriptive statistics of the variables used in the regression models for hypothesis 2 and hypothesis 3. All continuous variables are winsorized at the 1st and 99th percentiles.

Table 2
Pearson correlation table

Panel A: subsample used for regression model 1

	TAXRISK	MANBIAS	SIZE	CASHETR	FI	VOL	ROA	LEV	ANALYST BIAS
TAXRISK	-								
MANBIAS	0.0954	-							
SIZE	-0.0822	-0.1694	-						
CASHETR	0.1162	0.0569	0.0440	-					
FI	0.0760	-0.0395	0.2129	0.1307	-				
VOL	-0.0027	0.0773	-0.2395	0.0006	-0.1354	-			
ROA	-0.1428	-0.2381	-0.0674	0.0096	-0.0876	0.2085	-		
LEV	-0.0644	-0.0460	0.3927	0.0773	0.0489	-0.0936	-0.1456	-	
ANALYSTBIAS	0.1086	0.7400	-0.2063	0.0500	-0.0540	0.1031	-0.2721	0.0555	-

Panel B: full sample

	TAXRISK	TIMELAG	ANALYST BIAS	SIZE	CASHETR	FI	VOL	ROA	LEV	FOLLOW
TAXRISK	-									
TIMELAG	0.0701	-								
ANALYSTBIAS	0.1032	0.2143	-							
SIZE	-0.1178	-0.2952	-0.1600	-						
CASHETR	0.1020	-0.0071	0.0663	0.0906	-					
FI	0.0548	-0.0616	-0.0421	0.1465	0.1033	-				
VOL	0.0552	0.0342	0.0880	-0.2066	-0.0497	-0.0435	-			
ROA	-0.1357	-0.1694	-0.2641	-0.0599	0.0365	-0.0886	0.1103	-		
LEV	-0.0676	0.0677	0.0471	0.3209	-0.0035	0.0163	-0.1032	-0.1826	-	
FOLLOW	-0.1295	-0.3545	-0.2039	0.6370	-0.0063	0.0945	-0.1314	0.0665	0.0869	-

This table presents the Pearson correlations between the variables. Panel A presents the correlations between the variables used in the first regression model. Panel B presents the correlations between the variables used in the second and third regression model.

5.2 Results

In this section the results of the three regression models are discussed. The hypothesis that is tested is as follows:

A higher internal information quality leads to a lower tax risk.

Internal information quality is operationalized by management forecast accuracy, the speed of the earnings announcements and analyst forecast bias. The results are discussed per regression model.

5.2.1 Tax risk and management forecast accuracy

First, the relation between tax risk and management forecast bias is studied. The internal information environment is fundamental for management forecasts as it is shown in prior literature that the accuracy of earnings forecasts enhances when the quality of the internal information environment and the strength of internal controls enhance (Dorantes et al., 2013; Feng et al., 2009).

This relation is tested by estimating an ordinary least squares regression as described in Chapter 4. Consistent with the expectation there is a positive relation between management forecast bias and cash effective tax rate volatility. However, the relation is not significant (p=0.817). This is not in line with the results of Gallemore and Labro (2015). This may be due to the difference in sample period. Additionally, the different results may be due to the difference in measurement of the variables. In this thesis the variables are measured per firm year, Gallemore and Labro (2015) measured management forecast bias as the average bias over the five-year period over which they measured the cash effective tax rate volatility. Control variables are also matched over the same five-year period. However, this leads to sample attrition (Gallemore & Labro, 2015). In this study individual observations for all variables other than volatility and cash effective tax rate volatility are examined. Refer to Table 3 for the results of the regression.

The results furthermore show that the coefficients of firm size, return on assets and leverage are significantly negative, indicating that these control variables lower cash effective tax rate volatility. The coefficient of cash effective tax rate is significantly positive, indicating that foreign income and the cash effective tax rate increase volatility of the cash effective tax rate. The influences of a firm its volatility, foreign income and the analyst forecast bias are not significant.

5.2.2 Tax risk and time lag between fiscal year end and earnings announcement date

The date of the earnings announcement is connected to a firm its internal information quality (Dorantes et al., 2013). It is furthermore a measure for the relevance of accounting information and more useful for decision-making when the time lag between the announcement and the end of the

fiscal year is smaller (Aryani & Krismiaji, 2013; Financial Accounting Standards Board, 2006; Vaassen et al., 2009).

The results of the ordinary least squares regression show that there is indeed a positive relation between the cash effective tax rate volatility and the time lag between a firm its fiscal year end and the date of the earnings announcement. However, this relation is also not significant (p=0.617). This result is again not in line with the results of Gallemore and Labro (2015). This may be attributable to the difference in sample period and research design as well. The regression results are tabulated in Table 3.

The coefficients of all control variables are statistically significant, except the coefficient of volatility. The coefficients of firm size, return on assets, leverage and analyst forecast bias are negative, indicating that these variables decrease the cash effective tax rate of a firm. The coefficients of cash effective tax rate and foreign income are positive, indicating that these variables increase cash effective tax rate volatility.

5.2.3 Tax risk and analyst forecast bias

When the internal information quality is high, financial reporting is more transparent and more credible and information asymmetry is reduced. Consequently, analysts are less dependent on management and uncertainty is reduced (Ackert & Athanassakos, 1997, 2003; Feng et al., 2009). In addition, analysts tend to be overoptimistic when the information environment of a firm is of low quality (Lim, 2001).

The results of the ordinary least squares regression indicate that there is a significant positive relation between analyst forecast bias and cash effective tax rate volatility. This means that firms with a lower analyst forecast bias indeed have a lower volatility of cash effective tax rate. The results of the regression can be found in Table 3.

The coefficients of all control variables are statistically significant, except the coefficient of volatility. The coefficients of firm size, return on assets, leverage and analyst following are negative. This indicates that these variables have a decreasing influence on the cash effective tax rate volatility. The coefficients of cash effective tax rate and foreign income are positive, indicating that these factors increase the volatility of a firm its cash effective tax rate.

Table 3
Tax risk and internal information quality

	IIQ Proxy	Management bias	Time lag	Analyst bias
	Dep. variable	Cash ETR vol.	Cash ETR vol.	Cash ETR vol.
Variables	Pred. sign	+	+	+
IIQ		.0173767	.1542379	.0513589*
		(0.23)	(0.50)	(1.70)
SIZE		-.013877*	-.0280665***	-.018206**
		(-1.83)	(-4.43)	(-2.19)
CASHETR		.2696375***	.3543495***	.3420975***
		(2.66)	(3.43)	(3.25)
FI		.0408769	.042391*	.0425592*
		(1.61)	(1.92)	(1.92)
VOL		.0748702	.6393938	.6287366
		(0.19)	(1.50)	(1.48)
ROA		-.4712147***	-.6804391***	-.6671235***
		(-3.71)	(-5.48)	(-5.32)
LEV		-.1244466**	-.1622891**	-.1767362**
		(-2.10)	(-2.33)	(-2.55)
ANALYSTBIAS		.0631615	.0551323*	-
		(1.33)	(1.75)	
FOLLOW		-	-	-.0354021*
				(-1.74)
Intercept		.2464399***	.3778036***	.3967223***
		(2.69)	(5.08)	(6.39)
Observations		1,323	3,632	3,362
R-squared		0.0544	0.0577	0.0597

This table presents the results of the ordinary least squares regression models that are estimated with tax risk as dependent variable and several IIQ proxies as independent variables. Tax risk is measured as the cash effective tax rate. The different columns employ different IIQ proxies (management forecast accuracy, time lag between a firm its fiscal year end and its earnings announcement date, analyst forecast bias). The coefficients are presented with the t-value in brackets. Standard errors are clustered per company to correct for correlation and heteroscedasticity. The asterisks (*), (**), (***) represent significance at a 10, 5, 1 percent level respectively.

5.3 Additional tests

In this thesis an ordinary least squares regression model is used to measure the relation between the dependent and independent variables. Several additional tests are done to ensure that the regression is valid.

First, for each regression is checked if the sum of the residuals is zero. The results indicate that the sum of the residuals is nearly zero for all regression models. These results are tabulated in Appendix B. The normality of the residuals is tested as well. This is done with the Shapiro-Wilk test. The low p-values of the Shapiro-Wilk tests indicate that the assumption that the residuals are normally distributed is rejected. However, least-squares linear regressions are still valid if the outcomes are not normally distributed when the sample is sufficiently large (Lumley et al., 2002). The sample and subsample used in the regression models are respectively 3,632 and 1,323 observations. For this reason, no further work is performed regarding the normality of the residuals.

Additionally, the data is tested for multicollinearity by computing the variance inflation factor of the variables in the regression models. When multicollinearity is present, the results of the regression analysis are difficult to interpret because this multicollinearity may be caused by true synergic relations or by spurious correlations (Graham, 2003). An overview of the variance inflation factors can be found in Appendix C. The value of the variance inflation factor should be lower than 10 and the value of tolerance should be higher than 0.1 (Chen et al., 2003). This is true for all regression models, therefore there is no multicollinearity.

As a further analysis, firm-year fixed effects and industry fixed effects are added to the regression models. The results are presented in Table 4 and Table 5 below. Adding these fixed effects does not change the relation between the dependent and the independent variables as discussed in section 5.2. Although the coefficients of the control variables, as well as their significance, do slightly change, the relation between tax risk and management forecast accuracy and tax risk and the speed of the earnings announcements is still insignificant. The relation between tax risk and analyst forecast bias remains significantly positive.

Table 4

Tax risk and internal information quality (including industry fixed effects)

	IIQ Proxy	Accuracy	Time lag	Analyst bias
	Dep. variable	Cash ETR vol.	Cash ETR vol.	Cash ETR vol.
Variables	Pred. sign	+	+	+
IIQ		.0141963	.2832604	.052215**
		(0.27)	(1.26)	(2.11)
SIZE		-.0132494**	-.0262633***	-.0173119***
		(-2.16)	(-5.08)	(-2.75)
CASHETR		.277496***	.3635809***	.3523834***
		(4.27)	(6.95)	(6.72)
FI		.0367635**	.03688***	8.0378479***
		(2.27)	(2.68)	(2.75)
VOL		.0870411	.6802465***	.6576441***
		(0.28)	(3.00)	(2.90)
ROA		-.4732831***	-.66802***	-.6641172***
		(-4.77)	(-8.13)	(-8.15)
LEV		-.108351*	-.1420538***	-.1523784***
		(-1.84)	(-2.86)	(-3.07)
ANALYSTBIAS		.0651456	.0544537**	-
		(0.98)	(2.19)	
FOLLOW		-	-	-.0350886***
				(-2.79)
Intercept		.2380815***	.3424473***	.3822144***
		(4.51)	(6.22)	(9.36)
Observations		1,323	3,632	3,632
Overall R-squared		0.0542	0.0575	0.0596

This table presents the results of the ordinary least squares regression models including industry fixed effects that are estimated with tax risk as dependent variable and several IIQ proxies as independent variables. Tax risk is measured as the cash effective tax rate. The different columns employ different IIQ proxies (management forecast accuracy, time lag between a firm its fiscal year end and its earnings announcement date, analyst forecast bias). The coefficients are presented with the t-value in brackets. The asterisks (*), (**), (***) represent significance at a 10, 5, 1 percent level respectively.

Table 5
Tax risk and internal information quality (including year fixed effects)

	IIQ Proxy	Accuracy	Time lag	Analyst bias
	Dep. variable	Cash ETR vol.	Cash ETR vol.	Cash ETR vol.
Variables	Pred. sign	+	+	+
IIQ		.0178691	.0276221	.058258**
		(0.33)	(0.12)	(2.36)
SIZE		-.0126956**	-.0316837***	-.0224094***
		(-2.18)	(-6.05)	(-3.63)
CASHETR		.2867301***	.3823335***	.3703332***
		(4.37)	(7.30)	(7.05)
FI		.0416713***	.039096***	.0395061***
		(2.59)	(2.87)	(2.91)
VOL		.0864864	.5355418**	.530161**
		(0.28)	(2.36)	(2.35)
ROA		-.4896221***	-.6750087***	-.658289***
		(-4.87)	(-8.23)	(-8.06)
LEV		-.134907**	-.138384***	-.1544146***
		(-2.33)	(-2.81)	(-3.15)
ANALYSTBIAS		.0644097	.063007**	
		(0.97)	(2.54)	
FOLLOW				-.0308022**
				(-2.49)
Intercept		.2368819***	.4107899***	.4104021***
		(4.81)	(7.30)	(10.25)
Observations		1,323	3,632	3,632
Overall R-squared		0.0543	0.0574	0.0595

This table presents the results of the ordinary least squares regression models including year fixed effects that are estimated with tax risk as dependent variable and several IIQ proxies as independent variables. Tax risk is measured as the cash effective tax rate. The different columns employ different IIQ proxies (management forecast accuracy, time lag between a firm its fiscal year end and its earnings announcement date, analyst forecast bias). The coefficients are presented with the t-value in brackets. The asterisks (*), (**), (***) represent significance at a 10, 5, 1 percent level respectively.

6 Conclusion

This thesis shows that the internal information quality has an influence on a firm its tax risk. This is in line with the study of Gallemore and Labro (2015). The authors found that firms with a higher internal information quality are able to engage in more tax avoidance while reducing their tax risk (Gallemore & Labro, 2015). This study zooms in on the relation between internal information quality and tax risk, by focusing on defining these two terms and identifying proper measures of these concepts. To enhance the relevance of this study, the proxy used for tax risk, the volatility of the cash effective tax rate, is related to the volatility of future stock return and firm risk (Guenther et al., 2013; Hutchens & Rego, 2015).

This study contributes to current literature by examining a relation that has recently gained attention. The relation between internal information quality and tax risk has not been studied extensively, although tax risk management is a topic that has become more important in the recent years. Tax laws are constantly changing and have become significantly more complex (Erle, 2008). Additionally, nowadays the tax enforcement is more aggressive and more focused than ever (EY, 2014). On top of that, stakeholders have become much more interested in a firm its values and demand ethical behavior (Erle, 2008). Negative attention from the media and nongovernmental organizations can even harm a firm its reputation while the firm may have appropriate tax strategies and complies with legal regulations (Deloitte, 2015).

The relation between internal information quality and tax risk is studied by answering the following research question:

"Does internal information quality influence firms' tax risk?"

The research question is answered by estimating three ordinary least squares regression models. These three regression models all have a different proxy for internal information quality, respectively management forecast bias, the time lag between fiscal year end and the earnings announcement date, and analyst forecast bias.

The empirical results indicate that a higher internal information quality reduces a firm its tax risk. There is a positive relation between management forecast bias, the time lag between a firm its fiscal year end and the date of its earnings announcements, analyst forecast bias and a firm its tax risk. Consequently, the hypothesis that internal information quality influences tax risk is accepted. This is line with the findings of Gallemore and Labro (2015). However, the found relations between management forecast bias and tax risk and earnings announcement speed and tax risk are not significant. Therefore it is important to note the meaning of insignificant results. Insignificant results indicate that it cannot be ruled out that the found relation is due to chance. It indicates that the null

hypothesis cannot be rejected (Boyd, 2016; Lane et al., n.d.). Further research should be conducted to further investigate this relation. Refer to paragraph 6.1 for more implications for further research.

In the current environment that firms operate in, where tax risk management has become important and where stakeholders become more interested in the underlying values of a firm, the results of this thesis are relevant for managers. This is because it emphasizes the relevance of the internal information environment in tax issues. The results show that it is feasible to invest in the internal information quality by for instance improving internal controls or internal communication. The results are furthermore relevant for shareholders of a firm as they are becoming more interested in how a firm operates. The proxy that is used to measure tax risk is furthermore related to firm risk, indicating that a higher internal information quality also is a signal of more certainty of a firm its future stock return. Additionally, the results are relevant for tax authorities and policy makers, because they show that it is feasible to stimulate firms to enhance their internal information quality. They can set up rules to achieve this, by for instance demanding strong internal controls. Finally, the results suggest that when tax risk management is studied by academics, the internal information environment should be taken into consideration.

6.1 Limitations and further research

This study is subject to several limitations. Firstly, the external validity is relatively low for an observational study. This is because the sample is limited to firms that meet several requirements and because the sample consists of only U.S. firms. Therefore, one should be cautious when generalizing the results. Another limitation is that the assumption is made that managers want to realize a low tax risk. While this is a valid assumption, which is based on decision theory, this assumption may not always hold in the real world. For instance, according to agency theory individuals have bounded rationality and may have (partially) conflicted goals (Eisenhardt, 1989). This can cause managers to make decisions and choices that prioritize another goal above the goal of lowering tax risk. Another limitation is that correlated omitted variables might be present in the research design. Although several control variables are included in the regressions, it is possible that there are other factors that influence the relation between internal information quality and tax risk that are not accounted for. Finally, since the concept of tax risk is very broad, the operationalization of tax risk used in this study, the volatility of the cash effective tax rate, may not capture the entire tax risk of a firm but only a part of it.

This thesis emphasizes the importance of both the internal information quality and tax risk, and the relation between these two concepts. As described above, the findings of two of the three regression models are not significant. Future research can investigate how strong the relation is between the independent constructs management forecast bias and earnings announcement speed and the dependent construct tax risk. Moreover, further research can study if there are conditions that

strengthen or weaken this relation. It can furthermore focus on tax risk and the measurement of tax risk, since it becomes clear in this thesis that there is no general accepted definition or measurement of the concept. Additionally, further research can study how internal information quality influences different aspects of tax risk.

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Appendix A: Sample Selection

Table 6
Sample Selection Procedure

	Firms		Firm-year observations	
Intersection Procedure				
Initial sample from CRSP/Compustat Merged database, over the period 1998-2015	14,235		113,084	
• *Intersection I/B/E/S database, History Detail section*		(12,167)		(99,852)
• *Intersection I/B/E/S database, Summary Detail section*		(6)		(100)
• *Intersection Compustat Quarterly database*		(1)		(6)
Initial sample regression model 2 and 3	2,061		13,126	
• *Intersection I/B/E/S Guidance database*		(1,241)		(9,214)
Initial sample regression model 1	820		3,912	
Selection procedure regression model 1				
Initial sample	820		3,912	
• *Less:* Financial institutions (SIC 6000- 6999)		(58)		(238)
• *Less:* Firms with fiscal year ends other than December		(226)		(1,192)
• *Less:* negative pre-tax income adjusted for special items		(90)		(353)
• *Less:* cash ETR lower than zero and greater than one		(37)		(229)
• *Less:* missing main variables		(104)		(389)
• *Less:* missing control variables		(24)		(188)
Final sample for regression model 1	**281**		**1,323**	

Table 6 (continued)

	Firms		Firm-year observations	
Selection procedure regression model 2 and 3				
Initial sample	2,061		13,126	
• *Less:* Financial institutions (SIC 6000- 6999)		(218)		(1,361)
• *Less:* Firms with fiscal year ends other than December		(498)		(3,641)
• *Less:* negative pre-tax income adjusted for special items		(377)		(2,645)
• *Less:* cash ETR lower than zero and greater than one		(109)		(822)
• *Less:* missing main variables		(158)		(715)
• *Less:* missing control variables		(44)		(310)
Final sample for regression model 2 and 3	**657**		**3,632**	

This table provides a summary of the procedure of the sample selection. The numbers in brackets are subtracted from the initial samples. This leads to the final sample that is used for the empirical analysis.

Appendix B: Residuals Distribution

- *B.1 Regression model 1*

Table 7
Distribution Residuals

Panel A: Mean of residuals

Observations	Mean	Std. Dev.	Min.	Max.
1,323	-1.59e-07	0	-1.59e-07	-1.59e-07

Panel B: Shapiro-Wilk Test

Observations	W	V	z-value	P-value
1,323	0.39654	491.194	15.519	0.00000

Panel A of this table shows the mean of the residuals. Panel B shows the results of the Shapiro-Wilk test. The null hypothesis that residuals are normally distributed is rejected.

- *B.2 Regression model 2*

Table 8
Distribution Residuals

Panel A: Mean of residuals

Observations	Mean	Std. Dev.	Min.	Max.
3,632	1.44e-07	0	1.44e-07	1.44e-07

Panel B: Shapiro-Wilk Test

Observations	W	V	z-value	P-value
3,632	0.42223	1.175.918	18.361	0.00000

Panel A of this table shows the mean of the residuals. Panel B shows the results of the Shapiro-Wilk test. The null hypothesis that residuals are normally distributed is rejected.

- *B.3 Regression model 3*

Table 9
Distribution Residuals

Panel A: Mean of residuals

Observations	Mean	Std. Dev.	Min.	Max.
3,632	9.58e-07	0	9.58e-07	9.58e-07

Panel B: Shapiro-Wilk Test

Observations	W	V	z-value	P-value
3,632	0.42499	1.170.289	18.349	0.00000

Panel A of this table shows the mean of the residuals. Panel B shows the results of the Shapiro-Wilk test. The null hypothesis that residuals are normally distributed is rejected.

Appendix C: Variation Inflation Factor

- *C.1 Regression model 1*

Table 10
Variance Inflation Factor values

Variable	Variance inflation factor	Tolerance
ANALYSTBIAS	2.32	0.430561
MANBIAS	2.22	0.449806
SIZE	1.33	0.749939
LEV	1.21	0.824151
ROA	1.19	0.839717
VOL	1.13	0.886560
FI	1.08	0.924629
CASHETR	1.03	0.970357
Mean VIF	1.44	

This table shows the Variance Inflation Factor values for the first regression model. There are no values noted higher than 10.

- *C.2 Regression model 2*

Table 11
Variance Inflation Factor values

Variable	Variance inflation factor	Tolerance
SIZE	1.35	0.738734
TIMELAG	1.19	0.843615
LEV	1.18	0.846004
ROA	1.17	0.857932
ANALYSTBIAS	1.16	0.864314
VOL	1.07	0.937213
FI	1.04	0.958236
CASHETR	1.03	0.967270
Mean VIF	1.15	

This table shows the Variance Inflation Factor values for the second regression model. There are no values noted higher than 10.

- *C.3 Regression model 3*

Table 12
Variance Inflation Factor values

Variable	Variance inflation factor	Tolerance
SIZE	2.02	0.494763
FOLLOW	1.78	0.562251
LEV	1.18	0.847141
ROA	1.15	0.866595
ANALYSTBIAS	1.15	0.870835
VOL	1.07	0.937307
FI	1.04	0.958812
CASHETR	1.04	0.960412
Mean VIF	1.30	

This table shows the Variance Inflation Factor values for the third regression model. There are no values noted higher than 10.