Master's Thesis: Accounting, Auditing, and Control

The influence of risk management on profitability

What is the influence of the level of risk management for organizations within the information technology industry?

Author: Martijn den Heijer, 619046

Supervisor: Dr. Y. Li

Second Reader: Dr. J. Yu

Abstract

This study aims to extend the literature on the association between the level of risk management and organizational performance. More specifically, this study explores the association between the level of risk management and profitability by investigating a sample of US-based organizations within the information technology industry from 2018 to 2020. Ultimately, this resulted in a sample of 880 observations by which this study found evidence of a negative relation between the level of risk management and profitability. In addition, this study measured the level of risk management by an interaction term between two risk management variables. The risk management variables correspond to the number of appearances of the word risk in annual statements and the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors.

Furthermore, this study strengthens existing literature on a positive relation between the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors with improved and increased operations efficiencies. Moreover, this study also found evidence of a negative relation between the number of appearances of the word risk in annual statements and profitability measures. Finally, these findings give insights into the potential changes in the behavior of stakeholders and provide possibilities for further research.

Keywords: Risk Management, ERM, Profitability, Return on Equity, Earnings per Share, Return on Investment, Annual Statement Characteristics, Board Structure Characteristics

Table of Contents

1. Introduction

This research investigates the association between the level of risk management and firm performance metrics, namely profitability, within the information technology industry. To summarize, the research question states: *What is the influence of the level of risk management for organizations within the information technology industry on profitability?* This thesis used one hypothesis with three sub-hypotheses to make the research question more precise. These sub-hypotheses all investigate the effect of the level of risk management on a profitability dimension, by which this research could find positive or negative relations.

This thesis found several reasons for this research's interest. The first reason is that risk management can be classified as a vague concept because there is no uniform definition in practice. In addition, there are some similarities and differences in the definition of risk management, whereby some define risk management as the ability of the organization to mitigate risks (Liebenberg and Hoyt 2003). In contrast, others describe risk management as a process by the whole organization to realize certain objectives (COSO 2020). Moreover, there are also some benefits as limitations to risk management regards firm performances and operations. Therefore, this thesis assumes that not every organization uses risk management equivalently, resulting in different risk management levels.
The second reason for the relevance of this study is that not a lot of research is done on risk management in the field of management scholars (Bromiley et al. 2015). Also, there is not much existing research on the effects of the level of risk management on profitability. Additionally, this study's relevance partially depends on the different angles of investigation and data collecting. This results in that this study is one of the first that capture the level of risk management by manually collecting the number of appearances of the word risk in annual statements with the interaction of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors. Also, this research is essential to investigate due to the growth and importance of the information technology industry. The industry is growing between five to six percent yearly and already equals 10.5 percent of the US economy (CompTIA 2021). Finally, these arguments are the central foundation of this study, resulting in more confidence in the relation between the level of risk management and profitability. In addition, this study argues that the influence stakeholders are organizations, investors, students, and practitioners.

Further, this study consulted three data sources to gain all the necessary input data regarding the regression models to find the relation between the level of risk management and profitability. The consulted databases equal the Compustat, BoardEx, and Edgar Full-Text Search, where information is collected varying between balance sheet, income statement, organizational-specific, board structure, and annual statement information variables for fiscal years 2020, 2019, and 2018. In addition, the three fiscal years are relevant due to the time-consuming part of manually collecting data.
Furthermore, this research used three dependent and independent variables to capture the association between the level of risk management and profitability. The dependent variables explain profitability in different dimensions, e.g., return on equity, earnings per share, and

return on investment. The independent variables explain the level of risk management by two individual risk management variables and the interaction between those variables. With the interaction term, this study computes the overall level of risk management by the number of appearances of the word risk in annual statements and the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors.
Finally, this study investigated the association between the level of risk management and profitability by three ordinary least squared regression models. The three ordinary least squared regression models correspond to the sub-hypotheses and provide empirical evidence for the relation between the level of risk management and profitability.

After investigating the empirical results, this study claims that it found enough evidence to reject the central hypothesis that suggested a positive relation between the level of risk management and profitability. Therefore, this study claims that the level of risk management negatively influences profitability. To summarize, this thesis found evidence that there is a negative relation between the level of risk management and profitability for organizations within the information technology industry. Furthermore, these conclusions came from analyzing the empirical results of the interaction term coefficients between the number of appearances of the word risk in annual statements and the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors.
However, the individual variables show various outcomes on the effects of the level of risk management on profitability dimensions. First, the variable that determines the number of appearances of the word risk in annual statements found significant negative results related to profitability measures earnings per share and return on investment. This finding indicates that an increase in disclosure of the word risk in annual statements results in lower profitability measures. Moreover, the variable determining whether a chief risk officer, chief financial officer, or chief compliance officer is on the board of directors shows contradictory results. This variable found significant positive results in all scenarios, indicating that profitability measures increase when one of the described function members is within the board of directors.
Additionally, this study implemented two additional tests. The first additional test reduces omitted correlated variables biases concerns by providing more confidence in the association between the individual risk management variables and profitability. Then, the second additional test reduces potential reverse causality concerns regarding the differences in performances of organizations with and without a chief risk officer, chief financial officer, or chief compliance officer on their board of directors.

Subsequently, these research findings result in a contribution to the existing literature. First, this study found that the level of risk management negatively influences profitability measures for organizations within the information technology industry between 2018 and 2020. These findings align with González et al.'s (2020) results, which did not find a positive association between enterprise risk management and performance changes. Second, this study contributes to the literature in a form whereby a different angle is used to determine the level of risk management, which was previously not done before. Also, the variable that determines the number of appearances of the word risk in annual statements is not used frequently.

Therefore, these outcomes provide new insights whereby the conclusion is that increases in the number of appearances of the word risk in annual statements lead to reduced profitability measures. These findings are in line with the research by Quon et al. (2012), who did not find a significant positive relation between enterprise risk management information and business performances.
Additionally, this research contributes to the literature by strengthening the evidence of improved profitability by the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors. These findings align with Bertinetti et al. (2013), who found that appointing one of these members reduces information asymmetry and improves risk management. Also, these findings align with Li et al. (2022), who found that an appointment of one of these functions increases operations efficiency.

Finally, this thesis also contains some implications for its stakeholders. This thesis's first implication is for organizations. It is between the association of profitability and the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors. As the results showed, the influence of one of these members on the board of directors positively affects profitability measures. Therefore, there is a possibility that organizations will likely hire and appoint one of these function members onto their board of directors to increase organizational performance. Moreover, this thesis also considers some implications for investors, implying that investors will likely invest in organizations based on annual statements and board structure characteristics.
At last, this thesis also found implications for students and practitioners. These implications arise from extending the existing literature on the link between the level of risk management and profitability and possibilities for further research.

In the remainder of this research, this thesis will first elaborate on the literature review whereby this thesis defines risk management, draws benefits and limitations towards risk management, and explains the existing links between risk management and firm performances. Then, in chapter three, this thesis presents the research question's hypothesis building process with expected outcomes per sub-hypotheses. In chapter four, this thesis outlines the research design toward the theoretical constructs, control variables, regression models, and sample and data. Further, chapter 5 discusses the empirical results. Finally, chapter six will conclude this research.

2. Literature Review

2.1 Definition of Risk Management

Out of the generally accepted risk management frameworks and academic literature publications, this thesis concludes that there is no uniform definition of risk management. COSO (2020) is one of the most used risk management frameworks in practice and describes risk management as a process by the whole organization to realize certain objectives. Another commonly used risk management framework, ISO 31000 (2018, p.2), describes risk management as the "coordinated activities to direct and control an organization with regard to risk." Additionally, the COBIT framework (2012) describes risk management as one of the governance objectives, whereby risks are recognized, the impact and likelihood are estimated,

and strategies are developed. Eventually, these steps ensure that organizations can reduce the effects of risks, resulting in an appropriate organizational risk appetite level.

Further, in most academic literature publications, there is also no uniform definition of risk management, while researchers most often define risk management as enterprise risk management, hereafter ERM. For example, Liebenberg and Hoyt (2003) describe ERM as the ability of firms to manage a wide area of risks in an integrated framework. Also, existing literature explains ERM as an approach that organizations company-wide deploy for identifying, assessing, and managing risks (Kleffner et al. 2003). Dickinson (2001) defines ERM as a part of the strategic planning process, resulting in an integrated approach to the total risks an organization faces.

To conclude, this section provides some similarities and differences in the definition of risk management. These differences are essential for the relevance of this study. This claim is because there is no precise definition of risk management used in practice, which results in the consequence that not every organization determines risk management the same. In most definitions, risk management consists of a framework to recognize and mitigate risks. However, the link between organizational performances and objectives is often missing, which is crucial for organizational performances.

2.2 Benefits and Limitations of Risk Management Practices

Organizations must disclose a certain amount of mandated information in the annual and quarterly reports. These reports provide investors with detailed information about the company's business, performance, and results (SEC 2021). One form of information organizations disclose is *Item 1A Risk Factors*, whereby organizations give insights into the most significant risks. However, the length of risk disclosure differs between organizations due to *Rule 12b-2 of the Exchange Act*[1]. This rule decides that small organizations with annual revenue below $100 million and a public float of less than $250 million only have to disclose a small part of risk management information (SEC 2018). Furthermore, this paragraph outlines risk management practices' most important benefits and limitations.

The most common benefit of risk management is that it increases awareness of risks, resulting in more confidence in the organization setting objectives and goals (Tucci 2021). Second, the risk models that capture risks ensure that organizations can mitigate and provide insights into current risks. Third, Nocco and Stulz (2006) found that effective ERM use results in a competitive advantage against competitors that have not implemented and used ERM correctly. These advantages arise at macro levels, whereby management can quantify and manage risk-return trade-offs. At a micro level, the organization's managers and employees are aware of risk management, resulting in an early and efficient reduction of current risks. Also, research found that risk management can result in the ability to determine better investment opportunities and the avoidance of adverse economic impacts that derive from risks (Andersen 2009).

[1] Adjusted rules from June 2018 of *Rule 12b-2 of the Exchange Act.*

Further, Hoyt and Liebenberg (2011) found a positive relation between firm value and ERM use. Bertinetti et al. (2013) also found this positive relation, whereby size, beta, and the return on assets were significant indicators for ERM engagement. However, the positive association between risk management and firm value is not always significant. For example, McShane et al. (2011) did not find an increase in firm value for firms with higher ERM ratings, as Standard and Poor provide.

Nevertheless, there are also some limitations to the use of risk management. The most common limitation is that risk management can be relatively expensive and time-consuming (Tucci 2021). Also, risk management can create limitations if the quality and completeness of information are insufficient (Elms 2019). In addition, this study found that the completeness of the information within risk models and small changes that a risk will occur can result in unreliable predictions and outcomes. Further, Kleffner et al. (2003) found that limitations can arise when organizations are not conducive to ERM, employees do not want to give up responsibilities, lack of understanding, and measuring risks and consequences can lead to difficulties. Additionally, ERM cannot completely rule out risks (Nocco and Stulz 2006). So, with intensive use of risk management, risk will still occur.

In conclusion, there are different benefits and limitations to risk management practices. Because of these differences, organizations handle risk management differently, resulting in varying levels of risk management. This is because some organizations will likely always mitigate and prevent risks, while others may want to decrease risk management costs.

2.3 Link between Risk Management and Firm Performances

This paragraph outlines the association between risk management and firm performances, varying between organizational, operating, and business performances. First, Léon et al. (2007) found a positive association between risks and expected returns. Consequently, this finding indicates that the more risks an organization is willing to take, the higher the expected returns of investments.

Second, many studies investigated the relation between risk management and firm performance-specific dimensions. For example, Florio and Leoni (2017) found that organizations with successful ERM implementation conduct higher performances. These increased performances come from an increase in financial performance and market evaluation. In addition, this study found that higher levels of ERM implementation cause a reduction in risk exposure. Also, academic literature argues that risk management positively affects organizational performance (Yahaya et al. 2015). This finding has the consequence that more promising performances accompany higher risk management.
Further, academic literature shows that higher ERM levels improve operating performance (Callahan and Soileau 2017). However, Quon et al. (2012) did not find a significant positive association between ERM information and business performances between 2007 and 2008. Instead, the researchers found minor increases in risk exposure, consequences, and risk strategies in the published disclosure documents. In addition, this indicates that risk management information is not always in line with the organization's performance.

Otherwise, Quon et al. (2012) would find increases in risk management disclosure in times of financial crisis.

Furthermore, academic research shows that higher-quality risk management results in lower earnings volatility for organizations that report profits or losses (Edmonds et al. 2015). In addition, the economic impact of high-quality risk management is more visible for organizations that report losses. The claim is because the effect of lower earnings volatility is more present, whereby lower earnings volatility results in more persistence and predictability of future performances. Additionally, Miller and Chen (2003) found that risk management is essential because the appearance of risks increases the cost of doing business. At first, costs increase due to operating inefficiencies that risks cause, resulting in adjustment costs. Second, costs increase because organizations must compensate stakeholders for the organization's risks due to the risk-return trade-offs.

2.4 Contribution to the Literature

In a few different ways, this research contributes to the existing literature. At first, little research is done on risk management in the domain of management scholars (Bromiley et al. 2015). Second, not many studies investigated the relation between risk management and profitability. Most often, existing literature investigated the effect of ERM on firm performances. Also, this particular research setting has not been researched before, e.g., a variable that determines an organization's level of risk management by the number of appearances of the word risk in annual statements with the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors.
Finally, this research contributes to the literature by determining the association between the level of risk management and profitability in different dimensions within the information technology industry.

3. Hypothesis Building

3.1 Hypothesis and Sub-hypotheses

With the following hypothesis, this research will investigate the influence of the level of risk management for organizations within the information technology industry on profitability.

Hypothesis 1: The level of risk management has a positive effect on profitability.

As hypothesis one shows, this research will investigate the level of risk management on profitability whereby the expectation is that the level of risk management positively affects profitability. This thesis will explain the reasoning behind this positive expectation in *3.3 The Leading Theory Behind the Central Hypothesis*. Further, this study argues that only one variable cannot measure profitability entirely. Therefore, this study implemented three sub-hypotheses to provide a reliable overview of an organization's profitability. All three sub-hypotheses capture profitability within different dimensions, e.g., return on equity, earnings per share, and return on investment. Furthermore, with the outcomes of the sub-hypotheses,

this research can interpret the outcome of the central hypothesis. Finally, the sub-hypotheses are visible below:

Hypothesis 1a: The level of risk management has a positive effect on return on equity.
Hypothesis 1b: The level of risk management has a positive effect on earnings per share.
Hypothesis 1c: The level of risk management has a positive effect on return on investment.

3.2 The Importance of Profitability

The central hypothesis and research question indicate that profitability is essential for this research. However, profitability is somewhat vague because researchers use different and multiple measures to capture and interpret profitability. For example, Petersen and Schoeman (2008) determined probability by two measures: return on equity and return on assets. In contrast, Zamifir et al. (2016) used another variable to measure a firm's profitability: return on investment. Additionally, this thesis argues that the earnings per share are also an appropriate measure to determine profitability, whereby this measure gives insights into the amount of profit by the number of outstanding shares.

Further, this study argues that profitability is one of the primary organizational goals because an organization will likely not survive without it (Hofstrand 2019). Therefore, every organization must consider how they can make profits and keep their organization operational for the future. Also, profitability gives insights into how well the organization performs in some specific regions and areas (Vendavo 2021). This is very helpful for investors and stakeholders because, with profitability measures, investors and stakeholders can compare the organization to its peers. Finally, existing literature describes profitability as the ability to generate future profits, which determines operational success, whereby high profitability results in growth and development opportunities (Iswajuni et al. 2018).

3.3 The Leading Theory Behind the Central Hypothesis

The leading theory behind the central hypothesis originates from the link between risk management and firm performance. As paragraph *2.3 Link between Risk Management and Firm Performances* explains, successful implementation and use of risk management can result in positive firm performances. These positive firm performances differ from financial, organizational, and operating performance improvements. Also, risk management can reduce risk exposure and result in lower earnings volatility.

Further, the leading theory in association with our central hypothesis is the theory that suggests a positive association between risk management and firm performance. With the commonly used risk management frameworks, organizations can capture and mitigate risks, resulting in organizations being less exposed to risks and threats. When organizations are less sensitive to risks, this would positively affect firm performance because fewer risks can occur, and the organization's standard operation can continue. Therefore, the expectation is that a higher level of risk management results in higher profitability. However, some can also

question that an increase in risk management only results in more costs, decreasing profitability measures return on equity, earnings per share, and return on investment.

Furthermore, this thesis also considers the disclosure theory for determining the association between the level of risk management and profitability. The reason for this claim is that this thesis captures the level of risk management by investigating the disclosure of the word risk in annual statements with the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors. The proprietary costs hypothesis stands by investigating the disclosure of the word risk in annual statements (Healy and Palepu 2001). While it is mandated to disclose risk management information in annual statements, the management of organizations still has incentives to disclose more or less. A potential reason for management to disclose more of the word risk can be to deter competitors from entering the market or developing new products. However, management can also choose to disclose fewer times the word risks, resulting in not revealing sensitive information to competitors and losing their competitive advantage. These possibilities can ensure that the organizations keep their advantage over their competitors, resulting in higher profitability.
In addition, this study also considers that organizations can trigger their investors by disclosing that they have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors. This claim is because, with one of these functions, organizations can show that they consider investors' perceptions. Also, chief risk officers, chief financial officers, and chief compliance officers possess tremendous knowledge and experience in risk management. With this increased knowledge, organizations can maximize their operations resulting in higher profitability.

3.4 Expected Outcomes per Sub-hypotheses

For hypothesis 1a, the expectation is to find a significant positive relation between the level of risk management and the return on equity. This study makes this claim by consulting existing research publications. At first, Sharfman and Fernando (2008) found that ERM leads to lower capital costs in an environmental setting. The firms that adopt ERM benefit from this due to a reduction in the cost of equity, shifts from equity to debt financing, and tax benefits. Another study found the same results for insurance organizations, indicating that ERM adoption results in a reduced cost of capital (Berry-Stölzle and Xu 2018). Edmonds et al. (2015) also found similar results, whereby higher disclosure quality lowers capital costs. Ultimately, a reduced cost of capital results in an increased return on equity due to less equity and the same amount of net income.
Further, Fathi et al. (2012) found a positive relation between the impact of risk management and stockholder's wealth, measured by the return on equity. As described in *2.2 Benefits and Limitations of Risk Management practices*, several other research publications also found that risk management positively affects firm value. In contrast, some research publications did not find this positive effect. Furthermore, not all researchers found positive associations between the level of risk management and the return on equity. For example, González et al. (2020) did not find a positive association between the return on equity and ERM adoption by performance changes.

The expectation for hypothesis 1b is a significant positive association between the level of risk management and the earnings per share. At first, Kerraous (2018) found that ERM integration positively affects the performances of medium and large Moroccan organizations. The study found considerable increases in turnover, operating profits, net income, and return on assets, whereby net income is the most noteworthy finding for the effect of risk management on the earnings per share. Second, Edmonds et al. (2015) found that higher risk management quality systems lower earnings volatility. Lower earnings volatility is a positive sign for organizations because it results in more persistence and predictability of future performances, which most likely increases earnings per share. However, this thesis also considers the chance of a potential negative relation. For example, Baxter et al. (2012) found that improved accounting performances accompany ERM quality while it depends on the overall market conditions. The study by Baxter et al. (2012) found no relation between improved ERM quality and accounting performance before and during market collapses, e.g., financial crises, while it found a positive relation when markets recovered. Therefore, this thesis assumes that the overall market conditions can play a role in the importance of risk management and the potential benefits towards accounting performances, e.g., earnings per share.

At last, for hypothesis 1c, the expectation is to find a significant positive relation between the level of risk management and the return on investment. The first argument for this claim is that risk management can result in lower capital costs, making investments more profitable due to lower discount rates. Therefore, the expectation is that organizations can engage in more investment opportunities, resulting in more growth opportunities and a higher return on investment. Further, Mu et al. (2009) found that risk management significantly improves the success of new product developments. These improved new product developments can be seen as the outcomes of investments in the organization, reflecting the return on investment. Also, Al-Nimer et al. (2021) showed that ERM significantly influenced business model innovations and financial performances. These influenced business model innovations can again be seen as directly affecting organizational investments.
Furthermore, Anderson (2009) found a positive relation between risk management and organizational performances for firms investing in innovation. This positive relation implies that risk management affects investment opportunities whereby organizations only engage in suitable investment opportunities, increasing performance and the return on investment. However, this thesis also considers the chance of a potential negative relation. This negative relation may come from organizations' huge investment costs to develop new technologies or products. The expectation is that these investment costs do not directly result in positive cashflows but result in negative accounting numbers.

4. Research Design

4.1 Dependent Construct and Variables

The dependent construct of this thesis equals organizational performance, specifically profitability, whereby this thesis captures the theoretical contrast by three dependent

variables. The three variables capture profitability into different dimensions, e.g., return on equity, earnings per share, and return on investment.
In this paragraph, this research will define each variable by its definition, use, and formula. The first dependent variable that captures profitability is the return on equity. The return on equity is a commonly used profitability measure and measures the return of equity holders' returns (Petersen and Schoeman 2008). The return on equity also estimates how effectively an organization generates profits (Fernando, Return on Equity (ROE) 2021). Further, this study measures the return on equity in percentage points and with the following formula:

Equation 1. $\boldsymbol{ROE} = \frac{Net\ Income}{Equity}$ **(1)**

The second dependent variable that captures profitability is the earnings per share. The earnings per share determine the amount of profit per share, whereby higher earnings per share result in more added value to the shareholders (Fernando, Earnings Per Share (EPS) 2022). This study determines the earnings per share by the reported numbers of the annual statements in US dollars. The last dependent variable that captures profitability is the return on investment. The return on investment determines how well the organization invests its capital which determines future cash flows (Fernando, Return on Investment (ROI) 2022). Finally, this study determines the return on investment in percentage points by the following formula:

Equation 2. $\boldsymbol{ROI} = \frac{Net\ Income}{Long-term\ Debt + Preferred\ stocks + minority\ interest + Common\ Equity}$ **(2)**

4.2 Independent Construct and Variables

The independent construct of this thesis equals risk management practices. This research measured the theoretical construct by an interaction term between two risk management variables. With this interaction term, this thesis determines the level of risk management within organizations.

The first independent variable that captures a part of the level of risk management equals *RiskCount. RiskCount* is an independent variable that determines the number of appearances of the word risk in annual statements, which is part of the annual statement disclosure. The expectation is that when organizations are more risk-aware, they will likely disclose more information about this topic to inform their shareholders. Furthermore, the expectation is that more awareness due to more appearances of the word risk leads to fewer risk threats to organizations. In addition, the expectation is that when organizations disclose more risk information in their annual statements, they focus more on risk management, increasing their level of risk management. However, this thesis also considers that more appearances of the word risk can result in adverse effects. For example, if an organization discloses more of the word risk, it can indicate that more risks occurred that year, lowering current profitability. Moreover, the variable *RiskCount* is not often used in practice, making this research more interesting. However, Callahan and Soileau (2017) used a similar setting to investigate ERM adoption, where they explored the appearance of particular ERM-related methodology words,

like *Chief Risk Officer* and *Enterprise Risk Management*, in their robustness test. Edmonds et al. (2015) also did a similar test whereby they analyzed the length of risk management disclosure of annual statements to investigate the level of risk management. Finally, Huang (2010) developed an algorithm to extract information from annual reports whereby the finding was that the number of risk factors affects organizations' risk measures and financial performances.

The second independent variable that captures a part of the level of risk management within organizations equals *BoardStructure*. *BoardStructure* is an independent variable that examines the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors. The board of directors finds ERM a proposed solution to mitigate agency and information asymmetry problems (Jankensgård 2019). Further, prior research showed that the appointment of a chief risk officer is widely used to determine ERM implementation (Callahan and Soileau 2017). Furthermore, Florio and Leoni (2017) also investigated the appointment of a chief risk officer as a variable to assess risk management integration. In addition, Florio and Leoni (2017) also used the appointment of an ICR officer, ICR committee, and risk committee to determine risk management integration.
Moreover, Bertinetti et al. (2013) found that the appointment of a chief risk officer reduces information asymmetry, resulting in improved risk management. Also, Li et al. (2022) found that a chief risk officer appointment results in fewer risks with enhanced operational efficiencies. Finally, this study also expects that the appointment of a chief financial officer or a chief compliance officer affects the level of risk management. This claim is that a chief financial officer prepares financial reports and involves in strategic planning and assisting (Ojeka et al. 2019). On the other hand, a chief compliance officer is responsible for overseeing compliance, ensuring compliance and laws, regulatory requirements, policies, and procedures, whereby risk management plays a part (Spooner 2022).

4.3 Control Variables

This research also contains some control variables that are important for the association between the level of risk management and profitability. These variables are linked to the risk management and dependent variables and are necessary to decrease the chance of possible omitted correlated variables biases. Further, three fixed effect control variables ensure that this research could investigate the level of risk management on profitability in specific years, months, and industries.

This research consulted the study by González et al. (2020) to determine standard control variables in a research setting regarding the effect of ERM on firm performance. González et al. (2020) used three control variables: size, leverage, and liquidity. First, the size of an organization is related to the degree of diversification, and González et al. (2020) determined the size by the natural logarithm of total assets. Second, leverage determines the ratio of debt to equity. The expectation is that higher leverage levels result in more risk awareness by searching for solutions to mitigate as many risks as possible. González et al. (2020) also used liquidity as a control variable, whereby liquidity determines the number of liquid assets the

organization has in store. A high amount of liquidity is preferable because it will likely reduce risks, whereby a solvency ratio determines liquidity.

Furthermore, this research includes four more control variables that reduce the chance of omitted correlated variables biases. At first, this research includes the board size of an organization to prevent possible omitted correlated variables towards the variable *BoardStructure*. The reason for including this control variable is that some can expect that larger boards will likely have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors because there are more board members. Additionally, prior research showed that organizations take more risks and engage in riskier investment policies with smaller boards (Wang 2012; Huang and Wang 2015). Also, a larger board can play a more advisory role, and an increase in the proportion of independent directors can lower corporate risk-taking (Younas et al. 2019). The second control variable equals the number of employees and is a sign of an organization's level of risk management. The expectation is that larger organizations contain more employees and therefore must have a higher level of risk management because more errors and threats can occur. Finally, two more control variables capture the organizational financial health by the quick and current ratios. These ratios determine the organization's ability to pay back its short-term debts.

Additionally, this study included three fixed effects to control for constant factors within this sample. The first fixed effect equals a year-fixed effect by examining the fiscal year of reporting. Then, the second fixed effect equals an industry-fixed effect at the main levels of the GIC industry codes. Third, this study added the fixed effect fiscal month of reporting to determine if there are any differences in the month of reporting.

4.4 Regression Models

This paragraph describes the tested regression models that determine the outcome of this research by answering the hypothesis and research question. Below is an overview of the three regression models visible:

Regression Equation 3. $\boldsymbol{ROE} = \alpha_0 + \beta_1 * RiskCount + \beta_2 * BoardStructure + \beta_3 * RiskCount * BoardStructure + \beta_4 * BoardSize + \beta_5 * Size + \beta_6 * Leverage + \beta_7 * Liquidity + \beta_8 * Employees + \beta_9 * CurrentRatio + \beta_{10} * QuickRatio + \beta_{11} * Year + \beta_{12} * Industry + \beta_{13} * FiscalMonth + \varepsilon$ **(3)**

Regression Equation 4. $\boldsymbol{EPS} = \alpha_0 + \beta_1 * RiskCount + \beta_2 * BoardStructure + \beta_3 * RiskCount * BoardStructure + \beta_4 * BoardSize + \beta_5 * Size + \beta_6 * Leverage + \beta_7 * Liquidity + \beta_8 * Employees + \beta_9 * CurrentRatio + \beta_{10} * QuickRatio + \beta_{11} * Year + \beta_{12} * Industry + \beta_{13} * FiscalMonth + \varepsilon$ **(4)**

Regression Equation 5. $\boldsymbol{ROI} = \alpha_0 + \beta_1 * RiskCount + \beta_2 * BoardStructure + \beta_3 * RiskCount * BoardStructure + \beta_4 * BoardSize + \beta_5 * Size + \beta_6 * Leverage + \beta_7 * Liquidity + \beta_8 * Employees + \beta_9 * CurrentRatio + \beta_{10} * QuickRatio + \beta_{11} * Year + \beta_{12} * Industry + \beta_{13} * FiscalMonth + \varepsilon$ **(5)**

This study will test the sub-hypotheses by applying the above regression equations based on the ordinary least square regression models, whereby this research investigates continuous variables. A benefit of an ordinary least square regression model is that it efficiently explores the linear relation between the independent and dependent variables. As regression equation three indicates, the dependent variable is the return on equity. The return on equity is

available from the formula in *4.1 Dependent Construct and Variables* and Appendix Table A1, whereby this research measures the return on equity in percentage points. Next, regression equation four investigates the profitability measure of the earnings per share in US dollars. Then, regression equation five estimates profitability measure return on investment in percentage points. Further, the following section explains the independent variables of the regression models.

The first independent variable equals *RiskCount* and investigates the number of appearances of the word risk in the annual statements. The second independent variable is a dummy variable, *BoardStructure,* and explores if a chief risk officer, chief financial officer, or chief compliance officer is within the board of directors. The dummy variable equals one if one of the functions is within the board of directors and zero if none are within the board of directors. The third variable equals an interaction term between *RiskCount* and *BoardStructure* and determines the organizational risk management level. The fourth independent variable is equal to *BoardSize* and measures the number of board members within the board of directors. The fifth variable is equal to the size of an organization, and this study determines the size by the logarithm of total assets. Then, the sixth independent variable equals the organization's leverage, dividing debt by equity in US dollars. The seventh independent variable is *Liquidity* in absolute terms by applying the corresponding formula of Appendix Table A1. β_8 equals the number of employees within the organization, as reported in the annual reports by the number of employees in thousands.
Further, β_9 and β_{10} are ratios, and this study determines them in absolute terms. Subsequently, the fixed effect variable *Year* equals the fiscal year of reporting. Finally, β_{12} equals the industry-fixed effect available by GIC standard codes, and β_{13} determines the fixed effect during the fiscal month of reporting.

4.5 Sample and Data

This thesis chose to investigate the information technology industry for several reasons. At first, the information technology industry is enormous, looking at the direct impact of the information technology industry on the US economy. A report by CompTIA (2021) showed that the direct impact equals 10.5% of the total US economy. Also, this report showed that the industry is growing fast, namely between five and six percent year to year. Furthermore, this study chose the information technology industry due to the highly time-consuming data collection procedure. For one part of the data, variable *RiskCount*, all data must be manually collected by the Edgar Full-Text Search database. Due to the time-consuming part of retrieving all this specific data, this research investigates one industry with a sample period of three years. Also, this study believes that three years of data is acceptable to make valid conclusions about the association between the level of risk management and profitability. So, the sample period is between 2018 and 2020, containing three fiscal years of data.

Further, this study consulted different data sources to conduct this research successfully. The first data source equals North America: Compustat Daily Updates - Fundamentals Annual. This database contains almost all necessary information, like balance sheet items, income statement items, and organizational-specific data. It is essential to mention that this study only investigates organizations within the information technology industry by applying the

Table 1. Overview of the Data Cleaning Process

Process	Number of observations
Step 1: Select organizations that correspond to the US, are active, and are within the information technology industry.	6.268
Step 2: Remove observations with missing data.	-3.375[2]
Step 3: Remove missing observations in the BoardEx database.	-1.898
Step 4: Remove missing observations in the Edgar Full-Text Search database.	-115
Selected number of observations	**880**
Note: This table shows an overview of the data cleaning procedure. In step 1, this thesis selects all the organizations within the information technology industry out of North America: Compustat Daily Updates - Fundamentals Annual database. Then, in step 2, this thesis removed all observations with missing values corresponding to the input variables needed to form the regression models. Next, in step 3, this thesis filtered out the portion of observations with missing data out of the BoardEx - North America - Individual Profile Employment database. At last, step 4 filters out data with missing observations from the Edgar Full-Text Search database.	

outcomes of the study by Kile and Phillips. Kile and Philips (2009) studied the ideal procedure for selecting a sample of high technology organizations. Their outcome was an overview of GICS industry codes corresponding to the information technology industry. An overview of the GICS industry codes is available in Appendix Table A2. The second data source equals BoardEx - North America - Individual Profile Employment. This study uses this data source to investigate if a chief risk officer, chief financial officer, or chief compliance officer is within the board of directors. Also, this data source gives this study insights into the board sizes. The last data source equals the Edgar Full-Text Search database. With this tool, this research can analyze the number of appearances of the word risk in annual statements. The only downside is that this research must manually collect the data by individual searches because web scraping text out of SEC filings is extremely hard and poorly functions. However, the Edgar Full-Text Search database source contains almost all remaining observations, increasing comparability. Finally, Appendix Table A1 shows an overview of the used data sources per selected variable with accompanying formulas.

Furthermore, this research implemented a data cleaning procedure. The first step in this procedure is selecting organizations with a US currency and active company status. This study chooses to implement this step because comparing organizations with different currencies would not be fair. Also, companies must be active to give a reliable overview of the outcomes. Then, this research removed all observations with missing data for determining the regression models. Additionally, some observations are removed because the BoardEx or Edgar Full-Text Search databases did not include these organizations. To conclude, Table 1 shows an overview of the data cleaning process steps and the number of removed observations.

[2] A large fraction of the removed data originates from missing data by the variable *Prepaid Expenses*, which is required to determine the *QuickRatio*. Out of the 3.375 removed observations, 3.138 stems from missing data of the variable *Prepaid Expenses*.

5. Empirical Results and Analysis

5.1 Descriptive Statistics

This section outlines the descriptive statistics of this study. A key aspect is that this study prevented outliers by equivalently winsorizing all input and output variables towards a winsorization procedure[3]. A benefit of winsorization is that it replaces the extreme values, e.g., outliers, with less extreme values instead of deleting those extreme values. This is beneficial for this study due to the small number of observations out of the data cleaning procedure. In addition, the descriptive statistics consist of every variable, the number of observations, the mean, the standard deviation, and minimum and maximum values.

Table 2 provides an overview of the descriptive statistics of the whole sample, whereby the number of observations equals 880. In addition, Appendix Table A3 provides an overview of the same descriptive statistics, specifically for 2020, 2019, and 2018, corresponding to panels A, B, and C, whereby the subsamples correspond to 275, 298, and 307 observations. Further, this section will first describe and analyze the descriptive statistics of the dependent variables. Then, this paragraph investigates the descriptive statistics of the risk management variables followed by the relevant control variables.

The first dependent variable in line with hypothesis 1a equals the return on equity. Tables 2 and Appendix A3 show that the mean return on equity is negative in all circumstances, e.g., a negative value for the full and subsamples. For example, the mean equals -12.39 percent points for the entire sample with a standard deviation of 57.56 percent. A possible explanation for this negative coefficient is that the average company's net income or equity is negative within this sample. The second dependent variable is equal to the earnings per share and is in line with hypothesis 1b. By investigating the descriptive statistics, the conclusion is that the mean earnings per share equals $0.35**.** These positive earnings per share are also visible in 2020, 2019, and 2018. The last dependent variable is in line with hypothesis 1c and equals the return on investment. In all circumstances, the mean of the return on investment is negative. The mean equals -15.92 percent for the whole sample with a standard deviation of 43.95 percent. These outcomes align with the return on equity results because, most likely, the ratio's numerator is negative, e.g., negative net incomes.

Further, the descriptive statistics also show insights into the characteristics of the risk management variables. At first, the mean of the variable *RiskCount* equals 40.89 with a standard deviation of 20.07. This means that the average annual statement consists of 40.89 times the word risk. Furthermore, by examining the specific years, the conclusion is that the level of disclosure is increasing. For example, for 2020, the average amount of the word risk in annual statements equals 44.49, compared to 39.60 and 38.91 for 2019 and 2018. This increase could result from an overall rise in disclosure or the insecure events of the beginning

[3] This study developed a winsorization procedure to replace the outliers. As a result, this study winsorized all the independent variables that correspond to the regression models at a one and ninety-nine percent level. Further, the dependent variables contained more outliers; therefore, this study winsorized these variables at a ten and ninety percent level. However, this thesis not winsorized all variables. For example, this study did not winsorize the dummy variable BoardStructure and fixed effect control variables Year, Industry, and FiscalMonth.

Table 2. Descriptive Statistics of the Sample

Variable	N	Mean	St. Dev.	Min	Max
ROE	880	-12.39	57.56	-131.55	71.17
EPS	880	0.35	1.83	-2.18	4.00
ROI	880	-15.92	43.95	-108.51	35.63
RiskCount	880	40.89	20.07	7.00	96.00
BoardStructure	880	0.12	0.32	0.00	1.00
BoardSize	880	8.10	3.29	1.00	17.00
Size	880	2.28	1.50	-2.75	5.24
Leverage	880	0.18	0.22	-0.10	1.01
Liquidity	880	-1.00	2.28	-12.63	1.46
Employees	880	11.94	62.26	0.00	1,298.00
CurrentRatio	880	3.74	4.48	0.00	26.67
QuickRatio	880	3.31	4.35	0.00	26.17
Year	880	2,018.96	0.81	2,018.00	2,020.00
Industry	880	38.78	7.05	20.00	50.00
FiscalMonth	880	10.50	2.85	1.00	12.00

Note: This table shows the descriptive statistics of the whole sample. For every variable, it provides the number of observations, the mean, standard deviation, minimum, and maximum values. The dependent variables, e.g., ROE, EPS, and ROI, are winsorized at a ten and ninety percent level. The other variables are winsorized at a one and ninety-nine percent level; Amount of observation equals 880; ROE and ROI are in percentage points; EPS is in dollars and cents; RiskCount and BoardSize are in the number of observations; BoardStructure is in percentage (1 = if chief risk officer, chief financial officer, or chief compliance officer is on the board of directors and 0 = none chief risk officer, chief financial officer, or chief compliance officer on the board of directors); Size equals the logarithm of total assets; Leverage, Liquidity, CurrentRatio, and QuickRatio are ratios in absolute terms; Employees are in the number of thousands; Year equals the fiscal year of reporting; Industry equals the industry an organization is operating in by GIC sector codes; FiscalMonth equals the fiscal month of reporting.

of COVID-19. Moreover, from the descriptive statistics, this study concludes that the minimum number of risk disclosure equals seven while the maximum number of risk disclosure equals ninety-six times.

The second risk management variable equals *BoardStructure*, which measures if a chief risk officer, chief financial officer, or chief compliance officer is on the board of directors. The mean for the whole sample equals 0.12, which indicates that twelve percent of the organizations have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors. In addition, this percentage is stable over the sample period.

Finally, this study provides the descriptive statistics of all control variables. This section will analyze and describe the most relevant control variables in line with their findings. For example, the first control variable of influence is *BoardSize*, which determines the number of board members on the board of directors. For the entire sample, the mean board members equal 8.10 with a standard deviation of 3.29. This result indicates that, on average, organizations in this sample consist of a board of directors with 8.10 members. Organizations with the largest board of directors have seventeen board members, while some organizations have only one board member. The second control variable of interest is *Employees*, which determines the reported number of employees. For the entire sample, the mean number of

employees equals 11.94 thousand. This finding indicates that, on average, 11.940 employees work per organization in this sample. In addition, by examining the specific years, this study concludes that the number of employees increases yearly.
Additionally, the variables *CurrentRatio* and *QuickRatio* also provide exciting findings. The mean results of these variables equal 3.74 and 3.31, respectively, which indicates that the organizations in this sample can pay back their short-term debts. These findings also indicate that the sample's organizations are financially healthy and can operate continuously.

5.2 Empirical Results

This section outlines the empirical results of this study by examining the association between the level of risk management and the different profitability measures. First, Table 3 provides the linear regression outcomes in line with regression equations three, four, and five. The influence variables are *RiskCount*, *BoardStructure*, and the interaction coefficient between these two variables. Second, this paragraph describes and analyzes the empirical results, which provide outcomes for hypotheses 1a, 1b, and 1c. Finally, this paragraph outlines the results toward the central hypothesis by which this study can answer the research question.

Column *ROE* provides evidence to reject hypothesis 1a. This claim is due to the outcomes of the interaction term between *RiskCount* and *BoardStructure*, which determines the level of risk management. This interaction term is negative and significant at a one percent level. More specifically, the negative effect of the level of risk management is always present when organizations do not have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors, respecting regression coefficients β_1 and β_3. However, for organizations with a chief risk officer, chief financial officer, or chief compliance officer on their board of directors, the effect of the level of risk management depends on the amount of disclosure of the word risk in annual statements. For these organizations, the negative impact is present when the word risk in annual statements exceeds 52 times, respecting regression coefficients β_1, β_2, and β_3.
Further, there is a distinction in the individual risk management variables. First, *RiskCount* is negative but not significant. Therefore, this thesis cannot make valid claims about the association between the number of appearances of the word risk in annual statements and the return on equity. Second, *BoardStructure* is positive and significant at a one percent level, indicating that a chief risk officer, chief financial officer, or chief compliance officer on the board of directors positively affects the return on equity. Out of this model, it seems that when one of these functions is within the board of directors, the return on equity increases by 79.51 percentage points.

The second column, column EPS, is in line with hypothesis 1b and investigates the association between the level of risk management and the earnings per share. Table 3 shows that the level of risk management negatively affects the earnings per share by analyzing the interaction term of *RiskCount* and *BoardStructure*. The interaction coefficient is negative and significant at a one percent level, which provides evidence to reject hypothesis 1b. Moreover,

Table 3. Linear Regression Outcomes for the Relation between the Level of Risk Management and Profitability Measures.

	Profitability measures		
Variable	**ROE (3)**	**EPS (4)**	**ROI (5)**
Intercept	-51.74 *** (16.25)	-0.84 * (0.47)	-39.89 *** (11.17)
RiskCount	-0.10 (0.12)	-0.02 *** (0.00)	-0.30 *** (0.08)
BoardStructure	79.51 *** (11.01)	2.01 *** (0.32)	71.45 *** (7.56)
RiskCount * BoardStructure	-1.43 *** (0.31)	-0.04 *** (0.01)	-1.36 *** (0.22)
BoardSize	-0.18 (0.74)	0.01 (0.02)	-0.14 (0.51)
Size	7.85 *** (2.30)	0.75 *** (0.07)	11.84 *** (1.58)
Leverage	7.28 (8.99)	-0.43 * (0.26)	-16.92 *** (6.18)
Liquidity	8.63 *** (0.94)	0.13 *** (0.03)	8.61 *** (0.64)
Employees	0.02 (0.03)	0.00 *** (0.00)	-0.01 (0.02)
CurrentRatio	-0.66 (2.89)	0.11 (0.08)	-1.59 (1.99)
QuickRatio	1.03 (3.03)	-0.14 (0.09)	2.53 (2.08)
Year fixed effects	Included	Included	Included
Industry fixed effects	Included	Included	Included
FiscalMonth fixed effects	Included	Included	Included
Observations	880	880	880
Adjusted R^2	0.23	0.37	0.38

Note: This table shows the linear regression outcomes for the relation between the level of risk management and profitability. This study determines the level of risk management by investigating the interaction term RiskCount * BoardStructure, whereby this study also investigates the individual variables to investigate the associations. Further, the columns ROE, EPS, and ROI, corresponds to profitability; Column ROE corresponds to hypothesis 1a and investigates the association between the level of risk management and return on equity in percentage points; Column EPS investigates hypothesis 1b and explores the relation between the level of risk management and earnings per share in US dollars; Column ROI corresponds to hypothesis 1c and researches the association between the level of risk management and return on investment in percentage points; Year is an fixed effect and can filter the data between 2018, 2019, or 2020; Industry is a fixed effect and can equal 20: industrials, industry 25 consumer discretionary, industry 35 health care, industry 45 information technology, and industry 50 communication services; FiscalMonth is an fixed effect and can differ between one and twelve, corresponding from January to December (1-12), none of the organizations reported their annual statements in August (8); The numbers in parentheses after the dependent variables correspond to the regression models as visible in *4.4 Regression models*; Standard errors are in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

this negative association is always present when organizations do not have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors, respecting

regression coefficients β_1 and β_3. However, for organizations with a chief risk officer, chief financial officer, or chief compliance officer on their board of directors, the effect of the level of risk management depends on the amount of disclosure of the word risk in annual statements. For these organizations, the negative association is present when the word risk in annual statements exceeds 36 times, respecting regression coefficients β_1, β_2, and β_3.
Further, Table 3 found contradictory evidence for the individual risk management variables. For example, for the variable *RiskCount*, this thesis found evidence of a significant negative relation between the number of appearances of the word risk and earnings per share at a one percent level. The coefficient equals -0.02, which indicates that every increase of the word risk in annual statements decreases $0.02 of earnings per share. Additionally, *BoardStructure* is positive and significant at a one percent level. This finding indicates that when a chief risk officer, chief financial officer, or chief compliance officer is within the board of directors, the earnings per share will be $2.01 higher than when one of these functions is not on the board of directors.

The last column equals ROI and is in line with hypothesis 1c and investigates the association between the level of risk management and the return on investment. By analyzing the interaction term coefficient between *RiskCount* and *BoardStructure*, this study found evidence to reject hypothesis 1c. This indicates that the level of risk management negatively influences the return on investment at a one percent significance level. More precisely, the negative effect of the level of risk management is always present when organizations do not have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors, respecting regression coefficients β_1 and β_3. However, for organizations with a chief risk officer, chief financial officer, or chief compliance officer on their board of directors, the effect of the level of risk management depends on the amount of disclosure of the word risk in annual statements. For these organizations, the negative association is present when the word risk in annual statements exceeds 44 times, respecting regression coefficients β_1, β_2, and β_3.
Further, the individual variables used to determine the level of risk management show again contradictory evidence. First, the coefficient of the variable *RiskCount* is negative at a one percent significance level. Therefore, this thesis can conclude that a one-word increase of the word risk in annual statements decreases 0.30 percent of the return on investment. Second, the variable *BoardStructure* found significant positive results at a one percent significance level. This finding indicates that an organization's return on investment increases by 71.45 percent points by appointing a chief risk officer, chief financial officer, or chief compliance officer to their board of directors. Finally, the adjusted R^2 equals 0.38, which indicates that regression equation five explains thirty-eight percent of the variation of the return on investment.

In conclusion, this study found evidence to reject the central hypothesis by combing the outcomes of sub-hypotheses 1a, 1b, and 1c. First, the linear regression outcomes found evidence to reject hypothesis 1a due to the negative coefficient of the interaction term between *RiskCount* and *BoardStructure*. This negative coefficient is significant at a one percent level and claims that the level of risk management negatively influences the return on equity. Second, Table 3 also found evidence to reject hypothesis 1b. The outcome of the

interaction term was again negative and significant at a one percent level. Third, this thesis also found evidence to reject hypothesis 1c. For hypothesis 1c, the conclusion was that the level of risk management negatively influences the return on investment by investigating the interaction term between *RiskCount* and *BoardStructure*, which is significant and negative at a one percent level. By incorporating these findings, this thesis concludes that it found enough evidence to reject hypothesis 1. So, the overall conclusion is that the level of risk management negatively influences profitability by investigating profitability measures, return on equity, earning per share, and return on investment.
Furthermore, this study found evidence that the number of appearances of the word risk is negative and significant in the circumstances within the earnings per share and the return on investment. This finding indicates that organizational profitability measures drop by increased disclosures of the word risk. One potential declaration for this phenomenon is that organizations disclosed more of the word risk when facing more risks that year, resulting in increased costs. Additionally, this thesis also found evidence that the influence of a chief risk officer, chief financial officer, and chief compliance officer on the board of directors positively affects profitability measures. These findings are significant and positive at a one percent significance level in all three circumstances.

5.3 Additional Tests

This study implemented two additional tests to strengthen the study's outcomes and reduce endogeneity concerns. The first additional test reduces potential omitted correlated variables biases by investigating the results when the hypotheses are tested based on individual risk management variables, e.g., without the interaction term and other risk management variables. In other words, this additional test individually investigates the effect of *RiskCount* and *BoardStructure* with control variables on profitability measures. In addition, this test reduces omitted correlated variables concerns by providing evidence that the results of the main test are not based on random luck but are still present in different circumstances. The second additional test reduces potential reverse causality concerns regarding the variable *BoardStructure*. This study reduces these concerns by investigating the effects on the dependent variables based on if a chief risk officer, chief financial officer, or chief compliance officer is within the board of directors or not. The reason for the relevance of this test is because this study wants to rule out the chance that the improved performances by having a chief risk officer, chief financial officer, or chief compliance officer on the board of directors are simply due to better performances of those organizations.

Table 4 provides the linear regression outcomes between the individual risk management variables and profitability measures whereby only the relevant information is visible. In Appendix Table A4, the whole output of the regression outcomes is observable with the used regression equations. Further, Table 4 provides evidence for supplementary strengthening findings regarding the effects of the individual risk management variables on profitability measures. For example, this additional test found negative associations between an increase in the disclosure of the word risk in annual statements and profitability measures. This effect is significant and negative at a one percent level for profitability measures earnings per share and return on investment. Furthermore, Table 4 provides evidence of a positive association

Table 4. Linear Regression Outcomes for the Individual Risk Management Variables and Profitability Measures.

Panel A: Linear regression outcomes between *RiskCount* and profitability measures including control variables.			
	Profitability measures		
Variable	**ROE (6)**	**EPS (7)**	**ROI (8)**
Intercept	-29.22 * (16.41)	-0.32 (0.47)	-20.62 * (11.51)
RiskCount	-0.18 (0.12)	-0.02 *** (0.00)	-0.37 *** (0.09)
Observations	880	880	880
Adjusted R^2	0.18	0.34	0.31
Panel B: Linear regression outcomes between *BoardStructure* and profitability measures including control variables.			
	Profitability measures		
Variable	**ROE (9)**	**EPS (10)**	**ROI (11)**
Intercept	-50.76 *** (16.41)	-0.92 * (0.48)	-40.63 *** (11.52)
BoardStructure	38.48 *** (6.45)	0.84 *** (0.19)	32.42 *** (4.53)
Observations	880	880	880
Adjusted R^2	0.22	0.34	0.34
Note: Panel A shows the linear regression outcomes between *RiskCount*, e.g., the variable that measures the number of appearances of the word risk in annual statements, and profitability measures. Panel B shows the linear regression outcomes between *BoardStructure*, e.g., the variable that measures if a chief risk officer, chief financial officer, or chief compliance officer is on the board of directors, and profitability measures; In Appendix Table A4, the regression outcomes including the control variables are visible with the used regression equations; Column ROE corresponds to the return on equity and is in percentage points; Column EPS corresponds to the earnings per share and is in US dollars; Column ROI corresponds to the return on investment and is in percentage points; The numbers in parentheses after the dependent variables correspond to the regression models as visible in Appendix Table A4; Standard errors are in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.			

between the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors and profitability measures. These associations are all significantly positive at a one percent level.

In conclusion, this additional test indicates that the specific findings for the risk management variables are constant and similar across different regression models, increasing the reliability of this study. Also, this additional test reduces endogeneity concerns towards omitted correlated variables. This claim is because the individual risk management variables in different circumstances provide corresponding outcomes between the additional and main tests.

Table 5 provides the differences in the mean of the profitability measures when organizations have or do not have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors by implementing a two-sided t-test. The first finding of Table 5 is that the mean profitability measures differ based on whether an organization has or does not have a chief risk officer, chief financial officer, or chief compliance officer on its board of

Table 5. Differences between Profitability Measures when a Chief Risk Officer, Chief Financial Officer, or Chief Compliance Officer is on the Board of Directors versus Not.

	BoardStructure = 1			BoardStructure = 0					
Variable	**N**	**Mean**	**St. Dev.**	**N**	**Mean**	**St. Dev.**	**df**	**t**	**p**
ROE	103	3.24	61.48	777	-14.47	56.74	126.12	-2.77	0.006
EPS	103	-0.18	0.87	777	0.42	1.92	259.01	5.39	0.000
ROI	103	-6.58	47.55	777	-17.15	43.33	125.50	-2.14	0.034

Note: This table shows the two-sided t-test between *BoardStructure* and profitability measures. This table investigates if there is a difference in the means of the profitability measures between the organizations that have and do not have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors. BoardStructure equals 1 if the organization has a chief risk officer, chief financial officer, or chief compliance officer on its board of directors and 0 otherwise; ROE corresponds to the return on equity and is in percentage points; EPS corresponds to the earnings per share and is in US dollars; ROI corresponds to the return on investment and is in percentage points; N stands for the number of observations; df stands for the degrees of freedom; t stands for the test statistic; p stands for the p-value.

directors. This finding is significant at a one percent level for profitability measures return on equity and earnings per share by investigating the t-and p-values. Additionally, for profitability measure return on investment, the finding is significant at a five percent level, indicating that both groups are not equal to zero.

Furthermore, Table 5 also gives insights into the potential reverse causality concern that only better-operating organizations have a chief risk officer, chief financial officer, or chief compliance officer on their board of directors. By investigating the mean profitability measures, this study claims that it found enough evidence to rule out these concerns. This claim is because organizations with a chief risk officer, chief financial officer, or chief compliance officer on their board of directors do not always perform better. For example, the mean earnings per share are positive and higher for organizations without a chief risk officer, chief financial officer, or chief compliance officer on their board of directors compared to organizations with one of these function members on their board of directors. However, this additional test did not find this phenomenon for the mean return on equity and return on investment.

6. Conclusion

This study investigated the association between the level of risk management and profitability for organizations within the information technology industry between 2018 and 2020. For determining the level of risk management, this study computed an interaction variable between the number of appearances of the word risk in annual statements and the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors. Further, profitability is measured by three specific profitability measures, e.g., return on equity, earnings per share, and return on investment.

The main finding of this study corresponds to a negative association between the level of risk management and profitability, whereby this negative relation corresponds to all three profitability measures. This study found enough evidence to reject all three sub-hypotheses and the central hypothesis by investigating the empirical findings. However, this study found

contradictory evidence by investigating the individual risk management variables. First, the variable that measures the number of appearances of the word risk negatively affects dependent variables earnings per share and return on investment. This finding indicates that increased disclosure of the word risk results in fewer earnings per share and return on investments. Second, the variable that measures if a chief risk officer, chief financial officer, or chief compliance officer is on the board of directors provides positive returns related to the dependent variables. Therefore, this finding indicates that organizations with one of these function members benefit from higher profitability measures, as measured by the return on equity, the earnings per share, and the return on investment.
To summarize, this study found a negative association between the level of risk management and profitability for organizations within the information technology industry. Additionally, this study implemented two additional tests. The first test strengthens the outcomes for the association between the individual risk management variables and profitability. It also reduces omitted correlated variables concerns, while the second test reduces reverse causality concerns.

The findings of this study also relate to the main contribution to the literature. At first, this study increases the existing literature on the link between risk management and profitability, whereby the main finding is that the level of risk management negatively affects profitability. Second, this study expands the existing literature by finding that a chief risk officer, chief financial officer, or chief compliance officer on the board of directors positively affects operational performances. Third, this study contributes to the literature by showing the negative association between the number of appearances of the word risk in annual statements and profitability measures.
These contributions lead to different implications for its stakeholders. The first stakeholder of interest equals organizations, whereby organizations will likely include or hire a chief risk officer, chief financial officer, or chief compliance officer on their board of directors. This claim is because these functions increase profitability measures and possess tremendous knowledge and experience in risk management. The second stakeholder equals investors, whereby this study assumes and expects that investors will invest their capital based on annual statements and risk management characteristics of organizations. Then, there are also implications for students and practitioners. These implications stem from the contribution to the literature of this study and possibilities for further research.

Furthermore, this thesis also considers alternative explanations of the findings. For example, one possible explanation of the negative association between the number of appearances of the word risk and profitability measures can be that more appearances of the word risk are negative instead of positive. For example, some can expect that more disclosure of the word risk indicates a higher level of current risks, increasing costs for mitigating and preventing risks and eventually lowering business operations. Therefore, the consequence of more risk disclosure is negative instead of positive.

Finally, this study contains some limitations that future research can further investigate. The first limitation that this study faces is the sample selection. The sample selection ensured that

this thesis could explore organizations without missing data and be active within the information technology industry. However, potential limitation arguments are in line with the sample size, period of investigation, and external validity. For example, some can question whether the sample size is too small and suggest a different or more extended investigation period. Also, some can question the external validity of this thesis because only the information technology industry is investigated instead of all industries. Another limitation of this thesis is the difficulty of determining the level of risk management because not one specific variable determines this. However, this study believes that the interaction between the number of appearances of the word risk in annual statements and the influence of a chief risk officer, chief financial officer, or chief compliance officer on the board of directors is a well-suited risk management variable. To conclude, this study contains some limitations that future research can investigate to further expand the literature between risk management and organizational performance.

Reference List

A. León, M. Nave, and G. Rubio (2007). The relationship between risk and expected return in Europe. *Journal of Banking & Finance*, 495-512.

A. Ojeka, A. Adegboye, K. Adegboye, O. Alabi, M. Afolabi, and F. Iyoha (2019). Chief financial officer roles and enterprise risk management: An empirical based study. *Heliyon*, 1-10.

A. Petersen and I. Schoeman (2008). Modeling of Banking Profit via Return-on-Assets and Return-on-Equity. *Proceedings of the World Congress on Engineering*, 1-6.

J. Andersen (2009). Effective risk management outcomes: exploring effects of innovation and capital structure. *Journal of Strategy and Management*, 352-379.

C. Callahan and J. Soileau (2017). Does Enterprise risk management enhance operating performance? *Advances in Accounting*, 122-139.

C. Florio and G. Leoni (2017). Enterprise risk management and firm performance: The Italian case. *The British Accounting Review*, 56-74.

COBIT (2012). *COBIT 5: A Business Framework for the Governance and Management of Enterprise IT.* COBIT .

CompTIA (2021). *IT Industry Outlook 2022.* CompTIA.

COSO (2020). *COMPLIANCE RISK MANAGEMENT: APPLYING THE COSO ERM FRAMEWORK.* COSO.

D. Hofstrand (2019, 8). *Understanding Profitability*. Retrieved from Iowa State University Extension and Outreach: https://www.extension.iastate.edu/agdm/wholefarm/pdf/c3-24.pdf

D. Miller and W. Chen (2003). Risk and Firms' Costs. *STRATEGIC ORGANIZATION* , 355-382.

G. Dickinson (2001). Enterprise Risk Management: Its Origins and Conceptual Foundation. *The Geneva Papers on Risk and Insurance*, 360-366.

E. Hoyt and P. Liebenberg (2011). The Value of Enterprise Risk Management. *The Journal of Risk and Insurance*, 795-822.

E. Kleffner, B. Lee, and B. McGannon (2003). THE EFFECT OF CORPORATE GOVERNANCE ON THE USE OF ENTERPRISE RISK MANAGEMENT: EVIDENCE FROM CANADA. *Risk Management and Insurance Review*, 53-73.

D. Elms (2019). Limitations of risk approaches. *Civil Engineering and Environmental Systems*, 2-16.

J. Fernando (2021, 11-30). *Return on Equity (ROE)*. Retrieved from Investopedia: https://www.investopedia.com/terms/r/returnonequity.asp#:~:text=Return%20on%20equity%20(ROE)%20is%20the%20measure%20of%20a%20company%27s,efficiently%20it%20generates%20those%20profits.

J. Fernando (2022, 5-24). *Earnings Per Share (EPS)*. Retrieved from Investopedia: https://www.investopedia.com/terms/e/eps.asp#:~:text=Earnings%20per%20share%20(EPS)%20is,items%20and%20potential%20share%20dilution.

J. Fernando (2022, 5-13). *Return on Investment (ROI)*. Retrieved from Investopedia: https://www.investopedia.com/terms/r/returnoninvestment.asp#:~:text=Return%20on%20I

nvestment%20(ROI)%20is%20a%20popular%20profitability%20metric%20used,its%20initial%20cost%20or%20outlay.

H. Li, K.S. Lam, W. Ho, and C.L. Yeung (2022). The impact of chief risk officer appointments on firm risk and operational efficiency. *Journal of Operations Management*, 241-269.

K. Huang (2010). Exploring the Information Contents of Risk Factors in SEC Form 10-K: A Multi-Label Text Classification Application. *SSRN Electronic Journal*, 1-48.

I. Iswajuni, A. Manasikana, and S. Soetedjo (2018). The effect of enterprise risk management (ERM) on firm value in manufacturing companies listed on Indonesian Stock Exchange year 2010-2013. *Asian Journal of Accounting Research*, 224-235.

ISO. (2018). *Risk management — Guidelines.* ISO.

J. Mu, G. Peng, and L. MacLachlan (2009). Effect of risk management strategy on NPD performance. *Technovation 29* , 170-180.

H. Jankensgård (2019). A theory of enterprise risk management. *Corporate Governance*, 565-579.

K. McShane, A. Nair, and E. Rustambekov (2011). Does Enterprise Risk Management Increase Firm Value? *Journal of Accounting, Auditing & Finance*, 641-658.

K. Quon, D. Zeghal, M. Maingot (2012). Enterprise Risk Management and Firm Performance. *Procedia - Social and Behavioral Sciences*, 263-267.

E. Kerraous (2018). The Impact of Enterprise Risk Management's Implementation on Performances: Evidence from the Moroccan Companies. *University Hassan II, Casablanca, Morocco*, 1-17.

L. González, P. Santomil, and A. Herrera (2020). The effect of Enterprise Risk Management on the risk and the performance of Spanish listed companies. *European Research on Management and Business Economics*, 111-120.

L. Spooner (2022). *The Chief Compliance Officer (CCO)*. Retrieved from Chief Compliance Officer: https://www.chief-compliance-officer.org/

M. Al-Nimer, S. Abbadi, A. Al-Omush, and H. Ahmad (2021). Risk Management Practices and Firm Performance with a Mediating Role of Business Model Innovation. Observations from Jordan. *Journal of Risk and Financial Management*, 1-20.

M. Zamifir, M. Manea, and L. Ionescu. Return On Investment - Indicator for Measuring the Profitability of Invested Capital. *Valahian Journal of Economic Studies* , 1-8.

O. Kile and E. Phillips (2009). Using Industry Classification Codes to Sample High-Technology Firms: Analysis and Recommendations. *Journal of Accounting, Auditing & Finance*, 35-58.

O. Yahaya, Y. Lamidi, U. Kutigi, and A. Mohammed (2015). The Correlation between Risk Management and Organizational Performance: An Empirical Investigation using Panel Data. *Research Journal of Finance and Accounting* , 136-146.

P. Bromiley, M. McShane, A. Nair, and E. Rustambekov (2015). Enterprise Risk Management: Review, Critique, and Research Directions. *Long Range Planning 48*, 265-276.

P. Healy and K. Palepu (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics*, 405-440.

P. Liebenberg and E. Hoyt (2003) THE DETERMINANTS OF ENTERPRISE RISK MANAGEMENT: EVIDENCE FROM THE APPOINTMENT OF CHIEF RISK OFFICERS. *Risk Management and Insurance Review*, 37-52.

P. Sharfman and S. Fernando (2008). Environmental risk management and the cost of capital. *Strategic Management Journal*, 569-592.

R. Baxter, C. Bedard, R. Hoitash, and A. Yezegel (2012). Enterprise Risk Management Program Quality: Determinants, Value Relevance, and the Financial Crisis. *Contemporary Accounting Research*, 1264-1295.

RiskMetrics Group. (2008). *ISS Governance Services – Proxy Research Company Financials – Compustat Data Definitions .* RiskMetrics Group.

R. Berry-Stölzle and J. Xu (2018). Enterprise Risk Management and the Cost of Capital. *The Journal of Risk and Insurance.*, 159-201.

S. Bertinetti, E. Cavezzali, and G. Gardenal (2013). THE EFFECT OF THE ENTERPRISE RISK MANAGEMENT IMPLEMENTATION ON THE FIRM VALUE OF EUROPEAN COMPANIES. *Department of Management at Università Ca' Foscari Venezia, Working Paper*, 1-22.

S. Fathi, F. Zarei, and S. Esfahani (2012). Studying the Role of Financial Risk Management on Return on Equity. *International Journal of Business and Management*, 215-221.

SEC. (2018, 9-10). *SEC*. Retrieved from SMALLER REPORTING COMPANY DEFINITION: https://www.sec.gov/rules/final/2018/33-10513.pdf

SEC. (2021, 1-26). *How to Read a 10-K/10-Q*. Retrieved from SEC: https://www.sec.gov/fast-answers/answersreada10khtm.html

T. Edmonds, E. Edmonds, D. Leece, and E. Vermeer (2015). Do risk management activities impact earnings volatility? *Research in Accounting Regulation*, 66-72.

L. Tucci (2021, 11). *What is risk management and why is it important?* Retrieved from TechTarget: https://www.techtarget.com/searchsecurity/definition/What-is-risk-management-and-why-is-it-important#:~:text=Risk%20management%20is%20the%20process,errors%2C%20accidents%20and%20natural%20disasters.

Vendavo. (2021, 8-17). *Why Is Profitability Analysis So Important?* Retrieved from Vendavo: https://www.vendavo.com/all/profitability-analysis/

W. Nocco and M. Stulz (2006). Enterprise Risk Management: Theory and Practice. *Journal of Applied Corporate Finance*, 8-20.

C. Wang (2012). Board Size and Firm Risk-Taking. *Review of Quantitative Finance and Accounting*, 1-24.

Y. Huang and C. Wang (2015). Corporate governance and risk-taking of Chinese firms: The role of board size. *International Review of Economics & Finance*, 96-113.

Z. Younas, C. Klein, T. Trabert, and B. Zwergel (2019). Board composition and corporate risk-taking: a review of listed firms from Germany and the USA. *Journal of Applied Accounting Research*, 526-542.

Appendix

Table A1. Explanation of Used Variables, Definitions, Data Sources, and Formulas

Variable	**Definition**	**Data source**	**Formula**	**Formula in Fundamental Annual database**
ROE	A measure of the return of equity holder's returns.	Compustat	$\frac{Net\ Income}{Equity} * 100$	$\frac{IBCOM}{CEQ} * 100$
EPS	A measure of the amount of profit per share.	Compustat	Reported earnings per share out of annual statements.	EPSPX
ROI	A measure of how well the organizations invest its capital.	Compustat	$\frac{Net\ Income}{x} * 100$ x stands for total long-term debt + preferred stocks + minority interest + common equity.	$\frac{IBCOM}{x} * 100$ x stands for DLTT + PSTK + MIB + CEQ
RiskCount	The number of appearances of the word risk in annual statements.	SEC Edgar	Sum of the count of the word risk in annual statements.	Does not apply
BoardStructure	A measure if a CRO, CFO, or CCO is on the board of directors.	BoardEx	1 if a CRO, CFO, or CCO is on the board of directors; 0 otherwise.	Does not apply
BoardSize	The number of board members on the board of directors.	BoardEx	Sum of the count of board members on the board of directors.	Does not apply
Size	The degree of diversification of the organization, measures how large the organization is.	Compustat	The natural logarithm of total assets.	Log10(AT)
Leverage	A measure that determines the ratio of debt to equity.	Compustat	$\frac{Total\ Debt}{Total\ Equity}$	$\frac{DLTT}{(AT-DLC)}$
Liquidity	A measure that determines the amount of the organization's liquid assets.	Compustat	$\frac{Net\ Income+Depreciation}{Total\ Liabilities}$	$\frac{(IBCOM+EBITDA-EBIT)}{LT}$
Employees	The number of employees working at the organization.	Compustat	The reported number of employees out of annual statements in thousands.	EMP
CurrentRatio	A measure that determines the ability to pay back short-term debts.	Compustat	$\frac{Current\ Assets}{Current\ Liabilities}$	$\frac{ACT}{LCT}$
QuickRatio	A measure that determines the	Compustat	$\frac{x}{Current\ Liabilities}$	$\frac{(ACT-INVT-XPP)}{LCT}$

	ability to pay back short-term debts with available current liquid assets.		x stands for current assets – inventory – prepaid expenses	
Year	The fiscal year of reporting	Compustat	The fiscal year of reporting in annual statements.	FYEAR
Industry	GIC industry codes	Compustat	The sector where organizations operate by *Global Industry Classification Standard (GICS)*.	GSECTOR
FiscalMonth	The fiscal month of reporting	Compustat	The fiscal month of reporting in annual statements.	FYRC

Note: This table shows an overview of the explanation of the used variables out of the regression models. In addition, this table shows insights into the definition, data source, and formula for every variable corresponding to the regression models; A report by *ISS Governance Services – Proxy Research Company Financials – Compustat Data Definitions* is used to determine the formulas of ROE, EPS, ROI, Leverage, Liquidity, CurrentRatio, and QuickRatio (RiskMetrics Group 2008); Abbreviation of CRO, CFO, or CCO corresponds to Chief Risk Officer, Chief Financial Officer, or Chief Compliance Officer.

Table A2. Optimal Combination for Sampling High-technology Organizations

GICS Code	Industry Name	N (Percent)	Percent Matching	Percent Not Matching (Type II Errors)
201040	Electrical Equipment	28 (0.9)	78.6	21.4
255020	Internet and Catalog Retail	62 (2.0)	74.2	25.8
351010	Health Care Equipment and Supplies	120 (3.8)	87.5	12.5
351030	Health Care Technology	13 (0.4)	100.0	0.0
352010	Biotechnology	112 (3.6)	99.1	0.9
352020	Pharmaceuticals	47 (1.5)	93.6	6.4
352030	Life Sciences Tools and Services	36 (1.2)	100.0	0.0
451010	Internet & Software Services	307 (9.8)	99.4	0.6
451020	Information Technology Services	97 (3.1)	97.9	2.1
451030	Software	258 (8.2)	98.1	1.9
452010	Communications Equipment	127 (4.1)	94.5	5.5
452020	Computers and Peripherals	60 (1.9)	96.7	3.3
452030	Electronic Equipment and Instruments	70 (2.2)	70.0	30.0
452050	Semiconductor Equipment	13 (0.4)	100.0	0.0
453010	Semiconductors	57 (1.8)	100.0	0.0
501010	Diversified Telecommunications Services	76 (2.4)	90.8	9.2
501020	Wireless Telecommunications Services	34 (1.1)	94.1	5.9
Combined sample of all the above SIC codes		1,517 (48.4)	94.1	5.9

Note: This table provides an overview of the optimal combination for determining an appropriate sample corresponding to the information technology industry. This study used the GICS sector codes to filter the organizations out of North America: Compustat Daily Updates - Fundamentals Annual database; Adapted Source: (Kile and Phillips 2009)

Table A3. Descriptive Statistics of 2018, 2019, and 2020.

Panel A: Descriptive Statistics of 2020.					
Variable	**N**	**Mean**	**St. Dev.**	**Min**	**Max**
ROE	275	-11.62	54.85	-131.55	71.17
EPS	275	0.38	1.89	-2.18	4.00
ROI	275	-15.40	42.45	-108.51	35.63
RiskCount	275	44.49	20.80	7.00	96.00
BoardStructure	275	0.11	0.32	0.00	1.00
BoardSize	275	8.30	3.38	1.00	17.00
Size	275	2.42	1.42	2.75	5.24
Leverage	275	0.20	0.22	-0.10	1.01
Liquidity	275	-0.97	2.13	-12.63	1.46
Employees	275	14.25	83.65	0.00	1,298.00
CurrentRatio	275	4.27	5.06	0.00	26.67
QuickRatio	275	3.85	4.97	0.00	26.17
Year	275	2,020.00	0.00	2,020.00	2,020.00
Industry	275	38.51	7.02	20.00	50.00
FiscalMonth	275	10.89	2.37	1.00	12.00
Panel B: Descriptive Statistics of 2019.					
Variable	**N**	**Mean**	**St. Dev.**	**Min**	**Max**
ROE	298	-11.42	57.93	-131.55	71.17
EPS	298	0.28	1.82	-2.18	4.00
ROI	298	-15.55	43.84	-108.51	35.63
RiskCount	298	39.60	19.20	7.00	96.00
BoardStructure	298	0.12	0.33	0.00	1.00
BoardSize	298	7.98	3.22	1.00	17.00
Size	298	2.25	1.53	-2.75	5.24
Leverage	298	0.18	0.22	-0.10	1.01
Liquidity	298	-0.88	1.99	-12.63	1.46
Employees	298	11.31	53.73	0.00	798.00
CurrentRatio	298	3.28	3.81	0.00	26.67
QuickRatio	298	2.85	3.65	0.00	26.17
Year	298	2,109.00	0.00	2,019.00	2,019.00
Industry	298	38.93	7.10	20.00	50.00
FiscalMonth	298	10.31	3.02	1.00	12.00
Panel C: Descriptive Statistics of 2018.					
Variable	**N**	**Mean**	**St. Dev.**	**Min**	**Max**
ROE	307	-14.03	59.68	-131.55	71.17
EPS	307	0.38	1.81	-2.18	4.00
ROI	307	-16.73	45.47	-108.51	35.63
RiskCount	307	38.91	19.87	7.00	96.00
BoardStructure	307	0.12	0.31	0.00	1.00
BoardSize	307	8.04	3.27	1.00	17.00
Size	307	2.19	1.54	-2.75	5.24
Leverage	307	0.16	0.22	-0.10	1.01
Liquidity	307	-1.15	2.65	-12.63	1.46
Employees	307	10.47	45.41	0.00	647.50
CurrentRatio	307	3.71	4.48	0.00	26.67
QuickRatio	307	3.26	4.34	0.00	26.17
Year	307	2,018.00	0.00	2,018.00	2,018.00

Industry	307	38.89	7.05	20.00	50.00
FiscalMonth	307	10.33	3.05	1.00	12.00

Note: This table shows the descriptive statistics of the whole sample. For every variable, it provides the number of observations, the mean, standard deviation, minimum, and maximum values. The dependent variables, e.g., ROE, EPS, and ROI, are winsorized at a ten and ninety percent level. The other variables are winsorized at a one and ninety-nine percent level; Total amount of observation equals 880, whereby 275, 298, and 307 observation corresponds respectively to 2020, 2019, and 2018; ROE and ROI are in percentage points; EPS is in dollars and cents; RiskCount and BoardSize are in the number of observations; BoardStructure is in percentage (1 = if a chief risk officer, chief financial officer, or chief compliance officer is on the board of directors and 0 = none chief risk officer, chief financial officer, or chief compliance officer on the board of directors); Size equals the logarithm of total assets; Leverage, Liquidity, CurrentRatio, and QuickRatio are ratios in absolute terms; Employees are in the number of thousands; Year equals the fiscal year of reporting; Industry equals the industry an organization is operating in by GIC sector codes; FiscalMonth equals the fiscal month of reporting.

Table A4. Linear Regression Outcomes for the Individual Risk Management Variables and Profitability Measures for All Variables.

Panel A: Linear regression outcomes between *RiskCount* and profitability measures.			
	Profitability measures		
Variable	**ROE (6)**	**EPS (7)**	**ROI (8)**
Intercept	-29.22 * (16.41)	-0.32 (0.47)	-20.62 * (11.51)
RiskCount	-0.18 (0.12)	-0.02 *** (0.00)	-0.37 *** (0.09)
BoardSize	0.55 (0.75)	0.02 (0.02)	0.49 (0.53)
Size	0.08 (2.11)	0.57 *** (0.06)	5.07 *** (1.48)
Leverage	8.85 (9.26)	-0.38 (0.26)	-15.31 ** (6.49)
Liquidity	9.22 *** (0.96)	0.14 *** (0.03)	9.10 *** (0.68)
Employees	0.05 (0.03)	0.00 *** (0.00)	0.02 (0.02)
CurrentRatio	-0.17 (2.98)	0.13 (0.09)	-1.13 (2.09)
QuickRatio	0.40 (3.12)	-0.16 * (0.09)	1.93 (2.19)
Year fixed effects	Included	Included	Included
Industry fixed effects	Included	Included	Included
FiscalMonth fixed effects	Included	Included	Included
Observations	880	880	880
Adjusted R^2	0.18	0.34	0.31
Panel B: Linear regression outcomes between *BoardStructure* and profitability measures.			
	Profitability measures		
Variable	**ROE (9)**	**EPS (10)**	**ROI (11)**
Intercept	-50.76 *** (16.41)	-0.92 * (0.48)	-40.63 *** (11.52)
BoardStructure	38.48 *** (6.45)	0.84 *** (0.19)	32.42 *** (4.53)
BoardSize	-0.06 (0.74)	0.01 (0.02)	-0.05 (0.52)
Size	4.39 ** (2.06)	0.54 *** (0.06)	6.87 *** (1.45)
Leverage	10.31 (9.08)	-0.32 (0.27)	-13.73 ** (6.37)
Liquidity	8.70 *** (0.95)	0.14 *** (0.03)	8.76 *** (0.67)
Employees	0.03 (0.03)	0.00 *** (0.00)	0.02 (0.02)
CurrentRatio	0.68 (2.87)	0.22 *** (0.08)	0.69 (2.01)
QuickRatio	-0.61 (2.99)	-0.26 *** (0.09)	-0.13 (2.10)
Year fixed effects	Included	Included	Included
Industry fixed effects	Included	Included	Included

FiscalMonth fixed effects	Included	Included	Included
Observations	880	880	880
Adjusted R^2	0.22	0.34	0.34

Note: Panel A shows the linear regression outcomes between *RiskCount*, e.g., the variable that measures the number of appearances of the word risk in annual statements, and profitability measures. Panel B shows the linear regression outcomes between *BoardStructure*, e.g., the variable that measures if a chief risk officer, chief financial officer, or chief compliance officer is on the board of directors, and profitability measures; Column ROE corresponds to the return on equity and is in percentage points; Column EPS corresponds to the earnings per share and is in US dollars; Column ROI corresponds to the return on investment and is in percentage points; The numbers in parentheses after the dependent variables correspond to the regression models as visible below; Standard errors are in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.

Regression Equation 6. $\boldsymbol{ROE} = \alpha_0 + \beta_1 * RiskCount + \beta_2 * BoardSize + \beta_3 * Size + \beta_4 * Leverage + \beta_5 * Liquidity + \beta_6 * Employees + \beta_7 * CurrentRatio + \beta_8 * QuickRatio + \beta_9 * Year + \beta_{10} * Industry + \beta_{11} * FiscalMonth + \varepsilon$ **(6)**

Regression Equation 7. $\boldsymbol{EPS} = \alpha_0 + \beta_1 * RiskCount + \beta_2 * BoardSize + \beta_3 * Size + \beta_4 * Leverage + \beta_5 * Liquidity + \beta_6 * Employees + \beta_7 * CurrentRatio + \beta_8 * QuickRatio + \beta_9 * Year + \beta_{10} * Industry + \beta_{11} * FiscalMonth + \varepsilon$ **(7)**

Regression Equation 8. $\boldsymbol{ROI} = \alpha_0 + \beta_1 * RiskCount + \beta_2 * BoardSize + \beta_3 * Size + \beta_4 * Leverage + \beta_5 * Liquidity + \beta_6 * Employees + \beta_7 * CurrentRatio + \beta_8 * QuickRatio + \beta_9 * Year + \beta_{10} * Industry + \beta_{11} * FiscalMonth + \varepsilon$ **(8)**

Regression Equation 9. $\boldsymbol{ROE} = \alpha_0 + \beta_1 * BoardStructure + \beta_2 * BoardSize + \beta_3 * Size + \beta_4 * Leverage + \beta_5 * Liquidity + \beta_6 * Employees + \beta_7 * CurrentRatio + \beta_8 * QuickRatio + \beta_9 * Year + \beta_{10} * Industry + \beta_{11} * FiscalMonth + \varepsilon$ **(9)**

Regression Equation 10. $\boldsymbol{EPS} = \alpha_0 + \beta_1 * BoardStructure + \beta_2 * BoardSize + \beta_3 * Size + \beta_4 * Leverage + \beta_5 * Liquidity + \beta_6 * Employees + \beta_7 * CurrentRatio + \beta_8 * QuickRatio + \beta_9 * Year + \beta_{10} * Industry + \beta_{11} * FiscalMonth + \varepsilon$ **(10)**

Regression Equation 11. $\boldsymbol{ROI} = \alpha_0 + \beta_1 * BoardStructure + \beta_2 * BoardSize + \beta_3 * Size + \beta_4 * Leverage + \beta_5 * Liquidity + \beta_6 * Employees + \beta_7 * CurrentRatio + \beta_8 * QuickRatio + \beta_9 * Year + \beta_{10} * Industry + \beta_{11} * FiscalMonth + \varepsilon$ **(11)**