Handelshøyskolen BI

GRA 19703 Master Thesis

Thesis Master of Science 100% - W

Predefinert informasjon

Startdato:	16-01-2022 09:00	**Termin:**	202210
Sluttdato:	01-07-2022 12:00	**Vurderingsform:**	Norsk 6-trinns skala (A-F)
Eksamensform:	T		
Flowkode:	202210||10936||IN00||W||T		
Intern sensor:	(Anonymisert)		

Deltaker

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Informasjon fra deltaker

Tittel *:	Enterprise Risk Management and the effect on Audit Fees
Navn på veileder *:	Flemming T. Ruud

Inneholder besvarelsen konfidensielt materiale?:	Nei	**Kan besvarelsen offentliggjøres?:**	Ja

Gruppe

Gruppenavn:	(Anonymisert)
Gruppenummer:	244
Andre medlemmer i gruppen:	

Enterprise Risk Management and the effect on Audit Fees

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Master thesis, Business

Major: Accounting and Business Control

BI NORWEGIAN BUSINESS SCHOOL

Acknowledgments

First, we would like to thank Professor Flemming T. Ruud of the Department of Accounting and Operation Management at the BI Norwegian Business School. To help us gain a deeper understanding of Enterprise Risk Management, he has provided us with a wealth of knowledge and challenged our preconceived notions. The Strategic Risk Management course taught by Flemming at BI sparked our interest in risk management. Hence, we would like to extend our gratitude for your engagement and knowledge in the field.

We also want to thank BI Norwegian Business School for being an outstanding institution of higher education and providing us with the necessary resources to obtain a higher education. Your commitment to assisting your students has been acknowledged, and it has been five years to remember.

Finally, we would like to extend our greatest gratitude to our family and friends for their support throughout this hectic period.

BI Norwegian Business School

Oslo, June 2022

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Abstract

Enterprise Risk Management (ERM) has introduced a paradigm shift in the way companies manage risk. Academics and practitioners alike are becoming increasingly interested in ERM, yet the impact of ERM system quality remains unclear. This study aims to evaluate how the quality of ERM can impact the amount of audit fees paid by companies. We used panel data and a model with fixed effects to construct a sample that includes 137 U.S. firms from 2014 through 2020. Contrary to the expectations, a significant positive relationship is shown between ERM quality and audit fees, demonstrating that companies with higher ERM quality demand a higher audit quality, leading to an increase in audit fees.

Keywords – Enterprise risk management, ERM, Audit Fees, CRO, internal control & risk management.

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1 Introduction

1.1 Motivation

The classic Modigliani and Miller (1958) theorem suggest that a firm's value is independent of its capital structure in a perfect market with rational investors. The capital assets pricing model (CAPM) suggests that investors care solely about a company's systematic risk since firm-specific risk can be individually controlled via diversification (Sharpe, 1964). According to these theories, risk management should be unnecessary and not contribute to value creation. It turns out that this is not the case, as we will further explore in more detail.

Scholars introduced the term risk management in the late 1950s, later labeled Traditional Risk Management (TRM) (Kloman, 1992). However, as time goes by and events like the Enron Scandal and the Global Financial Crisis of 2009, risk management becomes more evident. Recent studies show that controlling a firm's entire risk creates shareholder value by lowering financial and operating faults and boosting possibilities (Smithson and Simkins, 2005; Stulz, 2008). Concerning the financial crisis of 2009, it has clearly shown that some banks that took risk management seriously and diversified appropriately performed much better than others who neglected such efforts (Lam, 2017).

The question that arises is why businesses have neglected efforts in risk management. According to Lam (2017), managers and executives generally negatively perceive risk. Given the negative outlook on risk, it would be easy to think that risks should be minimized or avoided entirely. However, there is an upside to risk; without risk, there would be no chance for return (Lam, 2017).

Therefore, how would a company be able to manage risk if we established that risk might have a beneficial outcome? For instance, given the results of recent events, businesses cannot rely on market conditions to lower their risk exposure. Consequently, firms should manage risk from an enterprise-wide perspective, paving the way for Enterprise Risk Management (ERM).

In response to the financial crisis, ERM has initiated a paradigm change. The paradigm change transforms department executives' management of risk from a siloed to a more open and comprehensive perspective. In addition, the new paradigm rejects arbitrary and selective risk management methods. Instead, the new paradigm highlights a coordinated and continuous enterprise-wide approach that addresses all potential financial, economic, and strategic risks and opportunities.

In response to the global financial crisis, the Security Exchange Commission (SEC) enacted rule 33-9089 to provide stakeholders with more accurate and relevant information regarding risk oversight (SEC, 2002). Rule 33-9089 suggests that there may have been managerial inactivity regarding ERM implementation. Research by Beasley et al. (2008) confirms a continuous distinction to completely adopt ERM, revealing significant diversity in ERM adoption/maturity and challenges associated with ERM implementation. On the contrary, The Committee of Sponsoring Organizations of the Treadway Commission (COSO) and other shareholder advocacy groups states that ERM should be a value-added exercise (COSO, 2004).

In addition to the risk management suggestions, regulatory measures have sought to strengthen the independence of external auditors. As a result, studies investigating the relationship between ERM and audit risk adjustment

have increased (Desender and Lafuente, 2009; Knechel and Willekens, 2006). Recent survey work also suggests that firms adopting ERM may see an underutilization of ERM outputs by their external auditor (Cohen et al., 2017).

However, internal control within ERM has received a great deal of attention in recent years due to the enactment of the Sarbanes-Oxley Act (SOX) in the United States. The SOX Act mandates that auditors evaluate the strength of clients' internal controls and certify their internal control reports (ICRs). Prior research examines the effect of the SOX Act on audit fees.

Audit fees can be considered one of the primary audit risk-adjustment mechanisms. Moreover, auditing has a supply perspective suggesting that clients‘ internal control weaknesses (ICWs) in financial reporting represent audit risks that could adversely affect clients. The risk effects of auditing can affect companies by misstatements and errors in financial statements and in terms of potential future litigation concerns (Bedard et al., 2008; Choi et al., 2010; Elder et al., 2009; Foster et al., 2007; Hogan and Wilkins, 2008; Hoitash et al., 2008; Raghunandan and Rama, 2006). The outcome of perceived audit risk and increase in audit hours, due to the efforts of the SOX Act, results in risk adjustments by auditors. Consequently, higher audit fees.

There are, however, shortcomings of earlier research on internal control risk and audit fees. The studies confine auditors' response to ICWs that occur exclusively in the financial reporting-related domain. The reason for this is mainly because the SOX Act is an internal control law with an emphasis on financial reporting. ERM, however, advocates that auditors adopt a broader view of risk management. Examining clients' internal control at the management level may have a more direct and profound effect on the quality

of judgments and estimates made for financial statements than focusing solely on accounting errors (COSO, 2019, 2004; Knechel, 2007).

Therefore, this study aims to investigate how the level of Enterprise Risk Management (ERM) and the presence of a Chief Risk Officer (CRO) affect the audit fees. Rather than only focusing on financial reporting as implied by the SOX Act, we would examine whether a holistic approach to the company's risk would set the conditions for better internal control and effective audit processes. The primary perception is that ERM-active firms are associated with lower audit fees because effective ERM measures create conditions for better internal monitoring and facilitate smooth auditing (Desender, 2007).

1.2 Research Question

In this research, we investigate the relationship between ERM and audit fees. Prior research shows different results about the relationship between risk management tools and audit fees. For example, Abbott et al. (2003) report a positive correlation between audit committee effectiveness and audit fees. This relationship explains why a more effective audit committee requires more audit work or a broader audit scope. However, Bailey et al. (2018) show that a higher quality ERM system is negatively associated with external audit fees. It means that firms are more likely to experience a decrease in audit fees with a more robust ERM implementation. Likewise, Desender (2011) reports that firms that rely heavily on ERM report significantly lower external audit fees. Hence, the research aims to clarify this relationship, and therefore, our research question is:

Does improved ERM quality result in lower external audit fees?

1.3 Structure

This study is organized as follows: first, the literature review will be presented to identify research gaps and build the theoretical framework upon which the hypotheses will be developed. The second step is assessing the methodology, supporting the sample, variable measurement, and model build. Next, we present descriptive data about our sample, followed by the empirical study's outcomes and a conclusion.

1.4 Contribution

This study primarily contributes to the topic of corporate governance by presenting new evidence on the relationship between external audits and ERM. Using data from 2014 to 2020, we distinguish ourselves from prior research on the same topic. In addition, we proxy for ERM in firms by scraping companies' 10K's rather than using the S&P Credit rating for accuracy in measuring ERM.

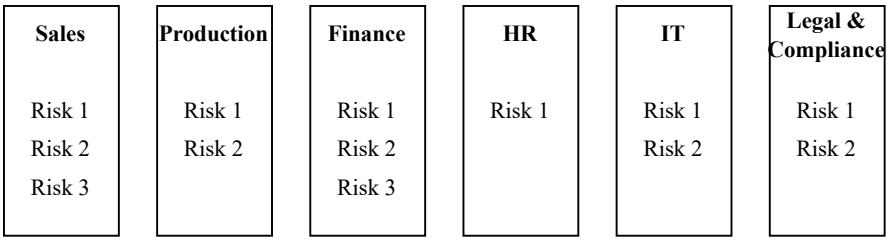
2 Literature Review

2.1 Traditional Risk Management

Before we present the details of traditional risk management, we need a clear definition of what risk is. A proper definition of risk should recognize its cause (a variable or uncertain factor) and effect (positive and negative deviation from an expected outcome). For example, Lam (2017) defines risk as a variable that can cause deviation from an expected outcome and, as such, may affect the achievement of business objectives and the overall organization's performance.

Traditionally, firms manage risks by assigning business unit executives to manage risks within their respective areas of responsibility (Beasley, 2016). For instance, the Chief Technology Officer is responsible for managing the organization's information technology risks. At the same time, the Treasurer is responsible for managing risks associated with financing and cash flow. This conventional risk management approach is called TRM, in which each department head is responsible for managing or elevating risks within their silo. Figure 1 illustrates an example of such silos inside a company, where risks are assigned to each department.

Figure 1: Traditional Risk Management



The boxes represent a firm's departments, which can be viewed as silos.
Concerning risk management, utilizing a silo approach to risk management limits integration regarding risk adjustments for the company's different functions.

While it makes sense to assign department heads responsibility for monitoring risks associated with their silos, this traditional approach to risk management has drawbacks. For example, according to Beasley (2016), executives could let risks go undiscovered. We will now explore some of the constraints and limitations of TRM.

2.1.1 Limitations & constraints

The first constraint relates to operational department heads and managers examining risks from within the organization. Financial managers may be an exception to this restriction since they may also consider the external environment regarding pricing, interest rates, currency rates, and other financial indicators. However, very few looks at the external environment and surrounding influences, such as competitors, regulators, and new entrants, to understand what the entity will face in the near future (RSM, 2022).

Another constraint is that executives inherently concentrate on their particular silo, i.e., the risks that influence their unit and how to address and mitigate them. In addition, they frequently solely account for risks arising from their processes and operations. This approach could lead to "in-between silo" risks that no executive leader can detect (Beasley, 2016).

Thirdly, with a traditional approach to risk management, department heads may be unaware of how a response to a particular risk may affect other functions of a firm. In such a circumstance, Beasley (2016) argues that a department head may reasonably decide to respond in a certain way to a risk impacting his or her silo. However, this response may generate a substantial risk outcome in another area of the organization.

Figure 2: Limitations of Traditional Risk Management

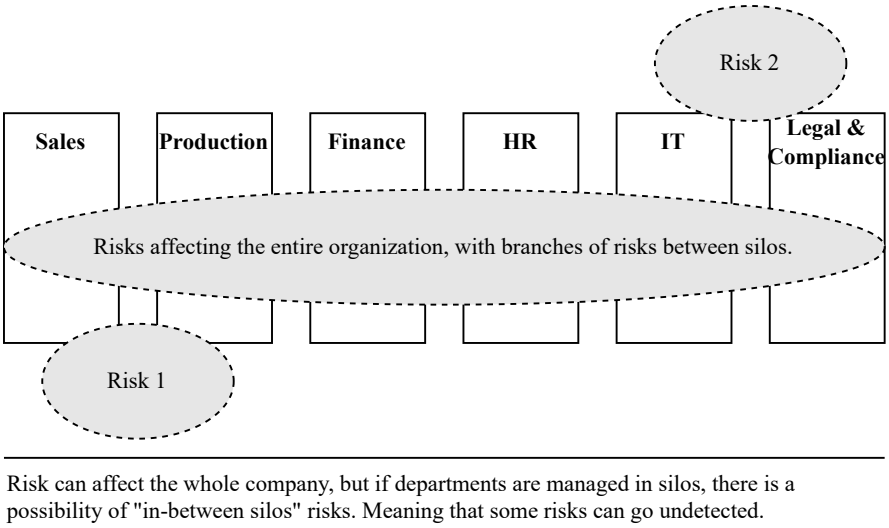


Figure 2 illustrates how management's traditional approach to risk management may overlook various impending risks. Unfortunately, some businesses do not understand these limitations in their risk management strategy until it is too late (Beasley, 2016). Therefore, we intend to introduce Enterprise Risk Management, which employs a more holistic framework to greater manage a company's risks.

2.2 Enterprise Risk Management

2.2.1 Definition of ERM

In order to properly build and understand the concept of enterprise risk management, we must first evaluate the different definitions of ERM given by scholars and independent organizations. A proper definition of ERM should describe what it is, how it works, its main objectives, and its components.

2.2.1.1 Definitions given by scholars

Lam (2017) defines ERM as:

"ERM is an integrated and continuous process for managing enterprise-wide risk - including strategic, financial, operational, compliance, and reputational risks - to minimize unexpected performance variance and maximize intrinsic firm value. This process empowers the board and management to make more informed risk/return decisions by addressing fundamental requirements for governance and policy (including risk appetite), risk analytics, risk management, and monitoring and reporting."

Lam (2017) further expands on this definition. ERM is a management process based on an integrated and continuous approach. This approach includes understanding the interdependencies across risks and implementing integrated strategies. ERM aims to minimize unexpected performance variance (defensive application) and maximize intrinsic firm value (offensive application). Hence, it is not about reducing or avoiding risk but optimizing risk/return tradeoffs. Lastly, an ERM system supports better decisions at the board and management levels.

2.2.1.2 Definitions given by Independent Organizations

Causality Actuarial Society (CAS)

In 2003, the Causality Actuarial Society (CAS) adopted the following definition of ERM:

"ERM is the discipline by which an organization in any industry assesses, controls, exploits, finances, and monitors risks from all sources to increase the organization's short- and long-term value to its stakeholders." (CAS, 2003)

CAS (2003) merits individual attention in five different parts.

1. ERM is a discipline that is an enterprise's orderly or prescribed conduct or patterns of behavior. It means that ERM has the management's full backing and dedication, and it impacts corporate decision-making and eventually becomes part of the company's culture.
2. The definition draws attention to ERM itself, and CAS suggests that different industries can present different types of ERM implementation. This argument suggests that ERM is flexible and adjustable to the various conditions of different industries.
3. Exploiting risk as a part of the risk management process (along with the defined objective of increasing short-and long-term value) demonstrates that ERM intends to be value-creating and risk-mitigating.
4. All sources of risk are considered.
5. ERM considers the interests of all parties involved, including owners and creditors, managers and officials, workers, clients, and the community.

CAS definition of ERM links risk management to a holistic approach. The implicit understanding of this definition is the recognition of ERM as a strategic decision support framework for management. As a result, it improves decision-making at all levels of the organization (Gordon et al., 2009).

The Institute of Internal Auditors (IIA)

The Institute of Internal Auditors released a statement where they gave their definition of ERM:

"ERM is a structured, consistent and continuous process across the whole organization for identifying, assessing, deciding on responses to and reporting on opportunities and threats that affect the achievement of its objectives."

Since IIA has an internal auditing focus, it highlights the internal auditor's role in ERM, considering their definition. They state that internal auditing is an independent, objective assurance and consulting activity. Its core role in ERM is to provide objective assurance to the board on the effectiveness of risk management. Board directors and internal auditors believe that internal auditing delivers the most value by providing objective assurance and ensuring the risk management and internal control structure is operating effectively.

Committee of Sponsoring Organizations of the Treadway Commission (COSO)

The most widely accepted definition of ERM is the one issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). The definition goes as follows:

"Enterprise risk management is a process, effected by an entity's board of directors, management, and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives." (COSO, 2004)

The definition of ERM given by COSO can be divided into four integral objectives, and these are:

- Strategic – high-level goals, aligned with and supporting its mission
- Operations – effective and efficient use of its resources
- Reporting – reliability of reporting
- Compliance – compliance with applicable laws and regulations

The 2004 COSO framework was created in response to the SOX Act. The definition of 2004 allows for four categories, two of which, reporting and compliance, are directly related to corporate governance. The ERM framework can be viewed as an expanded version of the internal control framework because it includes enterprise-wide reports and financial statements. In addition, the ERM framework comprises strategic objectives to guarantee operations, reporting, and compliance alignment. These four objectives are often regarded as the backbone of ERM.

In order to better incorporate risk consideration when planning and implementing strategies to achieve the organization's goals and objectives, COSO created an updated ERM framework. The updated definition is: "The culture, capabilities, and practices, integrated with strategy-setting and its execution, that organization rely on to manage risk in creating, preserving, and realizing value" COSO (2016).

The two mentioned versions of the ERM frameworks provided by COSO incorporate and expand upon the COSO (1992) original framework for assisting firms in assessing and enhancing their internal control system. Even though the COSO (2016) definition is the most recent, this study will focus on the COSO (2004) definition because it is the most widespread and facilitates comparisons between studies.

We have now presented different definitions of ERM. The general takeaway is that ERM is a process that identifies risks across the firm and the methods to minimize them appropriately. In the following section, we present the two primary perspectives of ERM research: firm characteristics and performance.

2.2.2 Firm characteristics from adopting ERM and CRO appointments

ERM has been the subject of two primary lines of inquiry in the past decade. The first line of inquiry investigates the characteristics of companies that adopt ERM or employ Chief Risk Officers. The second line of investigation focuses on ERM and its impact on business value and performance.

The research studies investigate the firm characteristics of organizations that adopt ERM, including the presence of Chief Risk Officers (Arena et al., 2011; Beasley et al., 2005; Hoyt and Liebenberg, 2011; Pagach and Warr, 2010). The primary findings indicate that larger enterprises with greater earnings volatility, larger internal audit groups, and greater institutional ownership benefit from ERM implementation. However, Bohnert et al. (2019) discovered that financial leverage is inversely associated with ERM engagement.

James Lam of General Electric (GE) Capital created the position of CRO for the first time in 1993. Lam was tasked with establishing a new capital market firm with particular responsibilities for the middle-office and back-office operations. Middle office risks consisted of credit, counterparty, market, and liquidity risks. Lam envisioned a role that would integrate numerous risk categories and simultaneously raise the risk management plan to the executive level. As the new CRO for GE Capital, he was tasked with developing and implementing an ERM program (Lam, 2017).

Numerous organizations and experts have viewed the hiring of CROs as a tendency toward risk management activities as firms seek to respond to

expanding regulatory obligations and a growing variety of business concerns (Beasley et al., 2008; Lam, 2003).

CRO is responsible for the implementation and management of ERM programs. The perception regarding the use of CRO as a measurement of ERM implementation was that corporations do not publicly proclaim the presence and execution of ERM. For example, Liebenberg and Hoyt (2003) compiled a sample of organizations that signaled their ERM usage by appointing a CRO. Their empirical findings show no consistent differences between companies that announce ERM by appointing a CRO and firms of comparable size and industry. However, they discovered that highly leveraged companies are more likely to hire CROs. These companies believe a CRO can reduce risk-shifting expenses. In addition, the CRO can effectively explain the firm's risk profile to external stakeholders. The value of these benefits is expected to be significantly higher for highly leveraged organizations (Liebenberg and Hoyt, 2003).

Moreover, Pagach and Warr (2010) sampled 138 announcements of senior risk officer jobs made between 1992 and 2005. Consistent with the literature, they discovered that organizations apply ERM when they are larger, have more unpredictable cash flows, and have riskier stock returns (Hoyt and Liebenberg, 2011; Liebenberg and Hoyt, 2003). Nevertheless, their research on companies' disclosure of risk management procedures has limits.

Desender and Lafuente (2009) also employed CRO appointments as proxies for ERM implementation. The authors demonstrate a correlation between the presence of a chief risk officer and ERM adoption. In addition, it emphasizes that CROs have strategic and risk-related responsibilities, giving the organization a risk-based approach to strategic decision-making.

Lin et al. (2012) also find that insurers with higher geographical diversity are more likely to deploy ERM systems. Lechner and Gatzert (2018) research is congruent with Lin et al. (2012), demonstrating that geographical diversity positively correlates with ERM implementation. In addition, size and industry (banking, insurance, and energy) are cited as factors that favorably influence the implementation of an ERM system (Lechner and Gatzert, 2018).

Previous research demonstrates that organizations with high earnings volatility and greater leverage are more likely to implement an ERM program. In addition, we have observed that some companies have adopted ERM elements by employing a CRO. However, Beasley et al. (2005) argue that utilizing the CRO position as a proxy for ERM implementation does not reflect the full depth of ERM program implementation. Therefore, in the following section, we will discuss ERM implementation in practice using Equinor as a firm example.

2.2.3 Example of ERM implementation

Lindnér and Wendt (2013) interviewed CROs in 12 non-financial Swedish companies to determine why companies choose to use ERM and what challenges are encountered during the implementation process. The authors discovered that legislation on corporate governance and enhanced investment decision-making are the two most important drivers of ERM implementation. The authors noted some barriers, such as a disagreement over the risk owner, difficulty in aggregating qualitative and quantitative risks, and the ERM implementation's effectiveness depending on the CRO's background. Moreover, the authors propose that ERM implementation can be carried out more effectively through an initial planning and communication phase (Lindnér and

Wendt, 2013).

Equinor, a Norwegian oil and gas firm, is an example of a company that utilizes ERM. Risk management is integral to Equinor's business operations, as the company's activities involve several risks. Equinor's risk management entails recognizing, analyzing, evaluating, and managing risk in all activities to produce value and prevent incidents in the company's best interests. To reach the ideal solution, Equinor based its risk management on an ERM framework, which includes the following elements:

- The focus is on the value impact for Equinor, including upside and downside risk.
- Risk is managed in compliance with Equinor‘s requirements with a strong focus on avoiding health, safety, and environment (HSE), human rights, and business integrity incidents (such as accidents, fraud, and corruption).

Equinor explains that ERM requires a holistic method to evaluate the link between inherent risks and natural hedges in its portfolio. This method permits Equinor to reduce the number of risk management transactions and prevent sub-optimization. In addition, risk has been incorporated into Equinor's IT system, where the company's mission, vision, and strategy are transformed into strategic objectives, risks, actions, and KPIs. The use of IT systems is an example that enables the alignment of risk with strategic objectives and performance and integrates risk into the decision-making process. The risk management procedure at Equinor is consistent with ISO31000 Risk management — concepts and guidelines. The CFO leads the Equinor corporate risk committee, which creates and monitors the company's risk policies and processes. In addition, the committee is accountable for supervising and

enhancing Equinor's ERM system and suggesting suitable actions to control the overall risk profile (Equinor ASA, 2022).

Firms should have an initial planning and communication phase to implement an ERM program successfully. Additionally, the implementation process and execution must be conveyed to the entire organization. Lastly, an ERM program's important part is the continuous evaluation and improvement. In the following section, we will discuss ERM's second line of inquiry.

2.2.4 ERM and Firm Performance

The second study investigates the impact on company performance factors (Baxter et al., 2013; Beasley et al., 2008; Hoyt and Liebenberg, 2011; Kleffner et al., 2003; McShane et al., 2011; Goodwin-Stewart and Kent, 2006). Due to proper management and monitoring of a company's complete risk portfolio, ERM-using enterprises may absorb a greater level of risk than organizations that manage risk in silos (Bohnert et al., 2017).

According to Meulbroek (2002), ERM enterprises are better suited to increase capital efficiency and return on equity, providing a more comprehensive resource allocation perspective. Hoyt and Liebenberg (2011) examined the effect of ERM on the company value of publicly traded insurers. Using Tobin's Q as a proxy for firm value, they build a model showing a positive relationship between firm value and the usage of ERM, indicating that ERM does boost firm value.

Bertinetti et al. (2013) assess the relationship between ERM and firm value using CRO appointment as a proxy for ERM implementation and Tobin's Q

as a proxy for firm value. On the contrary, their sample does not consist of U.S. insurers but European enterprises from all industries. Their findings are consistent with those of (Hoyt and Liebenberg, 2011), indicating that their results can be gathered beyond the insurance industry (Bertinetti et al., 2013).

Baxter et al. (2013) also evaluated the relationship between ERM and company value and performance during the financial crisis. Higher ERM quality is linked to more complexity, minor resource limitation, and more robust corporate governance. In addition, despite the global financial crisis, firms with higher ERM quality responded to the market bounce with more robust earnings (Baxter et al., 2013).

Gordon et al. (2009) argue that the relationship between enterprise risk management (ERM) and firm performance is contingent upon an appropriate match between ERM and the five factors affecting a firm: environmental uncertainty, industry competition, firm size, firm complexity, and board of directors' monitoring. These results suggest that organizations should consider establishing an ERM system in conjunction with the organization's contextual variables (Gordon et al., 2009).

According to the literature, organizations should use ERM to improve corporate performance. However, not all studies show a strong link between the two variables. According to McShane et al. (2011), company value grows with competent usage of TRM but not ERM. This expression could imply that ERM investments are not infinitely valuable. After implementing a comprehensive risk management system, it may be more expensive to manage the remaining risks to save money (McShane et al., 2011).

Lin et al. (2012) show that ERM has a strong negative relationship with the firm's value at a 5 percent discount, as measured by Tobin's Q. Investors may be unable to deconstruct ERM's value because it complicates risk management (Fraser et al., 2008). ERM may therefore be perceived as a costly program with few rewards (Beasley et al., 2008; Pagach and Warr, 2010; Lin et al., 2012).

Pagach and Warr (2011) found minimal evidence that ERM boosts business value and performance based on CRO hiring. Three probable explanations are offered. First, their data may be overly noisy, preventing them from detecting corporate performance changes. As a result, introducing ERM may be beneficial. Second, their testing may be too short to evaluate ERM's long-term benefits. This argument is highly implausible, considering their sample data spans from 1992 to 2004. ERM may not be worth installing if its benefits take more than 12 years. Lastly, ERM has no noticeable impact on firm performance. They argue that ERM is unsuccessful at establishing organizational value.

The study on ERM and corporate value and performance are inconclusive. Papers measured positive connections (Baxter et al., 2013; Bertinetti et al., 2013; Hoyt and Liebenberg, 2011; Meulbroek, 2002; Gordon et al., 2009). Others found a negative correlation (Lin et al., 2012; Pagach and Warr, 2010; McShane et al., 2011). Nevertheless, ERM gives the impression of increasing business value by successfully managing risk; hence it will likely result in decreased audit fees.

The absence of a consistent and precise basis for measuring ERM is one of the limits of writing a thesis on ERM. Therefore, as we will explore in the next part, scholars have employed many approaches to evaluate ERM

implementation.

2.3 Inconsistencies with measuring ERM (ERM Adoption)

Alongside an increasing interest in ERM research, the major obstacle faced by academics has been the difficulty of generating a valid and reliable measure of the ERM (Eckles et al., 2014; Hoyt and Liebenberg, 2011; McShane et al., 2011). In response to this trend, academics have employed a variety of metrics or signals to calculate ERM implementation. These variations partially explain why various empirical research has yielded inconsistent and contradictory results. Therefore, we divide researchers into three groups based on the source and information used to measure ERM adoption or implementation (Adam et al., 2021).

2.3.1 Using CRO appointments as a proxy for ERM

Researchers in the first of these three categories considered the presence of CROs or risk functions as a signal for ERM implementation. The appointment of a Chief Risk Officer is the typical indicator of ERM adoption by businesses. Examples of studies that fit in this category are (Beasley et al., 2008; Hoyt and Liebenberg, 2011; Pagach and Warr, 2010; Baxter et al., 2013; Desender, 2011; Bertinetti et al., 2013; Paape and Speklé, 2012). According to Beasley et al. (2008), firms appoint CROs for three possible reasons:

- To fill a newly created CRO position in the organizational structure, it is reasonable to assume that the firm is about to adopt ERM or has started

paying more attention to ERM.

- The need to replace an existing CRO could also indicate that ERM has been adopted or is already in place.
- A title change to CRO to properly reflect the officer's responsibility, which also signifies the existence of ERM.

Due to its nature, scope, and influence, an ERM program requires the support and participation of senior executives (Pagach and Warr, 2010). This argument supports the concept that hiring CROs and ERM implementation coincide (Adam et al., 2021).

In addition, empirical research supports the relationship between CRO appointments and ERM implementation (Beasley et al., 2005). For example, a CRO is connected with a more advanced stage of ERM implementation, and Paape and Speklé (2012) discovered that publicly traded companies with a CRO and an Audit Committee had a more developed ERM. In their examination of the effect of ERM on company performance, Florio and Leoni (2017) also used the presence of CRO and other risk functions as a proxy for ERM.

Notably, using a CRO as a proxy for ERM signifies ERM adoption without providing any information on the ERM system's compliance with an appropriate ERM framework, global best practices, or the level of sophistication of a company's ERM program (Beasley et al., 2008; Florio and Leoni, 2017; McShane et al., 2011; Pagach and Warr, 2010). Using the announcement of appointing a CRO or the presence of a CRO as a proxy for ERM has led to the research of more accurate ERM indicators (Adam et al., 2021).

2.3.2 Using survey responses to determine ERM

The second category of researchers is comprised of individuals who use surveys to determine whether a company has adopted ERM and embraced it. Studies that survey ERM are; (Soltanizadeh et al., 2016; Beasley et al., 2005). In a previous study by Beasley et al. (2005), the authors experimentally assessed the impact of ERM adoption on the internal audit function. The survey questionnaire was designed utilizing the COSO-identified ERM elements. The researchers emphasized that the questionnaire enabled them to collect information about ERM operations based on the main components and topics of ERM as stated by COSO. The researchers used the replies to calculate the extent of ERM implementation for the individual firms.

Soltanizadeh et al. (2016) examine the ERM procedures of Malaysian companies. The authors employed the same methodology as Beasley et al. (2005) to determine each company's ERM implementation level. In addition, the researchers administered questionnaires to CROs or the highest level of seniority possible in twelve industries.

Adam et al. (2021) states that the survey respondents must be technically and deeply involved in the firm's ERM process to complete a survey that will provide the necessary information to measure the firm's ERM implementation. This specification deepens our understanding of the firm's ERM endeavor. Consequently, the number of potential respondents are limited to senior management executives, making it difficult to obtain a complete response. These factors diminish the quantity and quality of information acquired from a survey process to facilitate the development of an effective ERM measure

(Adam et al., 2021).

2.3.3 Modelling ERM index based on firm-specific information

The third set of researchers utilizes firm-specific, public, or non-public information to determine the adoption and level of ERM implementation among firms. For example, Gordon et al. (2009) and Alawattegama (2017) created an ERM index model and used financial data from enterprises to determine ERM implementation. In their respective research, Gordon et al. (2009) and Alawattegama (2017) utilized the COSO framework to identify whether or not enterprises adopted ERM. Gordon et al. (2009) designed an ERM index (ERMI) based on the four COSO ERM objectives: strategy, operations, reporting, and compliance. On the other side, Alawattegama (2017) developed an ERM index using COSO's eight interrelated ERM components: objective settings, event identification, risk assessments, risk response, information, communication, control activities, and monitoring. Using such models as ERM indicators means that the efficiency of a company's ERM is contingent on its ability to fit inside the COSO framework (Adam et al., 2021).

Individually designed ERM indices are based on a modest quantity of qualitative and quantitative data extracted from annual reports and operating procedures. In addition, using the COSO's ERM framework to determine ERM ratings has been questioned because the assigned ERM index can be substantially influenced by researcher subjectivity (Adam et al., 2021). Additionally, utilizing only one ERM model for such an exercise could give a poor ERM index to enterprises that use ERM models other than COSOs or the one picked by the researcher (Tekathen and Dechow, 2013).

A subset of this third type consists of academics who rely on externally issued ERM ratings, such as those provided by Standard & Poor for specific corporations (McShane et al., 2011; Baxter et al., 2013; Bailey et al., 2018). The researchers concluded that because the S&P-ERM index is assigned after a thorough examination of a firm's risk management culture, systems, procedures, and practices, ERM implementation was represented in its complete form.

Using the S&P-ERM index as a proxy for ERM implementation has limits because an index is only available for selected industries (Adam et al., 2021). In addition, Baxter et al. (2013); McShane et al. (2011) noted that rating agencies had been criticized for issuing ratings skewed by their business relationships with customers, which raises some questions about the integrity of the S&P-ERM index published to companies.

In the preceding sections, we showed numerous ERM measurements. The inconsistent ways of assessing ERM are highlighted in the sections above, which is one reason why results on ERM may be inconclusive. In the following section, we will discuss the effects of regulatory legislation, specifically the SOX Act, on publicly traded companies.

2.4 Corporate Governance

The SOX Act brought new corporate governance regulation reforms that all public and listed corporations must follow (SEC, 2002). Companies are required by Section 404 of the SOX Act to include information on their internal accounting controls and processes for financial reporting in their financial reports. If business executives fail to guarantee the accuracy of the

company's financial statements, the Security and Exchange Committee will seek potential punishment. When the SOX Act was introduced, the company executives expressed their fear that the regulatory requirements would take up an increasing amount of executive time and money (Lutkevich, 2020). Specifically, some individuals felt that Section 404 was overly burdensome. Due to legal constraints, non-U.S. corporations such as Telenor and Norsk Hydro delisted themselves from the US stock exchange (Hydro, 2007; Telenor, 2007)

The application of regulatory requirements raises the question of how internal auditors and external auditors can collaborate more effectively to conduct an external audit that is more productive and efficient. To meet these needs, the study by Faitusa (2017) proposed using a three-line defense model. As a starting point, the author identifies three possible points of connection between internal and external auditors, including:

1. Consultation concerning the choice of subjects to audit; minimizing resource requirements and maximizing impact; avoiding duplication of effort; exploiting synergies.
2. Ongoing contact to secure greater risk assessment insight and decisions concerning stratification. Assessing the potential for even close cooperation of internal and external audits.
3. Assessing the potential for even close cooperation of internal and external audits.

The two functions can mutually benefit from one another's efforts. The functions must foster close ties to maximize their potential while respecting each entity's independence. To ensure the success of an organization's risk

management system, the board and senior management must rely on adequate line functions inside the business, including monitoring and assurance functions. Therefore, the authors present the three-lines-of-defense model as a means of elaborating the relationship between these functions and as a guide for allocating responsibilities.

1. The first line – functions that own and manage risk
2. The second line – functions that oversee or specialize in risk management, compliance
3. The third line – functions that provide independent assurance, above all, internal audit

The third line of defense, internal audit, will assure the organization's management of how well it analyzes and manages its risks, including how the first and second lines of defense operate. Finally, external auditing can be viewed as the fourth line of defense, offering assurance to the organization's management over an independent perspective of the financial statements.

External auditors, regulators, and other external entities are outside the organization's structure yet can help with governance and control. As a result, the SOX Act implicitly mandates the appointment of independent board members. Regulators sometimes impose requirements to reinforce an organization's control and sometimes do an independent, objective assessment of the first, second, and third lines of defense based on those requirements. When appropriately coordinated, external auditors, regulators, and other parties outside the business can be viewed as extra lines of defense, offering assurance to the firm's shareholders, including the board of directors and senior

management. However, given their mission's scope and objectives, the risk information they collect is often less thorough than that of an organization's internal three lines of defense (IAASD, 2013).

We would like to mention equivalent internal control and corporate governance requirements from different nations, specifically Norway. Legislation in Norway requires corporate directors to stay current on the firm's financial condition and oversee the company, its finances, and wealth management (Ministry of Trade, 1997). In addition, the law requires the CEO to guarantee that the company's financial reports comply with all applicable laws and that wealth management is orderly (Ministry of Trade, 1997). Furthermore, the external auditor must determine if the company's financial statements comply with applicable laws and regulations and if they have met its obligations (Ministry of Finance, 2020). These regulations establish the groundwork for adequate financial reporting guidance regarding rules and regulations for both the corporation and external auditors. Therefore, these requirements appear to be sufficient, and further implementation of the SOX Act in Norway would be unnecessary.

US public firms must comply with the SOX Act even though it is unnecessary for Norwegian companies. For this reason, businesses must balance various roles, including directors, management, and internal and external auditors, as shown by the Three-Lines of Defense model. How companies can employ internal control in all aspects is an essential concept in continued development. The outcome would be implementing a focused and effective operation and compliance per COSO, emphasizing a far broader perspective than simply focusing on financial reporting. A broader view of enterprise risk management can open the door to controlling risk. Success is much more likely when factors like strategy, operation, compliance, and reporting are emphasized. As a

result, laws and regulations that prevent businesses from taking affirmative action are less influential in terms of the interests of the corporations and their shareholders.

In the subsequent section, we will discuss audit fees. The elements that determine the audit fees paid by firms to external auditors will be presented. In addition, we will focus on corporate governance and the influence of the SOX Act on the audit fees paid.

2.5 Audit Fees

Audit fees are the expenses incurred by a company for audit services provided by an auditing firm. In the past, several authors have defined the concept. For example, Simunic (1980) defines audit fees as the product of unit price and the number of audit services required by the audited company's management. Due to agency fees and the law, firms must have an external third party verify and confirm that their financial statements accurately reflect their activity (Owusu and Bekoe, 2019). According to the definition, firms incur audit-related costs to satisfy regulatory requirements and demonstrate an independent evaluation of their activities. Generally, audit fees are determined by a contractual agreement between the auditors and the company, considering time, effort, and the required staff (El-Gammal, 2012).

The auditors' statements (audit reports) can establish the reliability and validity of a company's financial data (Owusu and Bekoe, 2019). SEC issued a regulation requiring firms to disclose audit and non-audit fees in their annual statements. Thus the transparency of audit fees has become a basis for measuring the effectiveness of an audit process (Beck et al., 2013). In addition,

numerous studies have utilized audit fees as proxies for audit quality and auditor independence over the years (Bentley et al., 2013; Hoitash et al., 2008).

On the one hand, higher audit fees may motivate auditors to work harder to provide audit services, thereby improving audit quality. However, such high payments may cause auditors to become monetarily dependent on a single client, compromising their independence (Hoitash et al., 2008). Consequently, audit fees remain crucial to research, and the question that arises is what determines the amount of audit fees paid to external auditors. Hence, in the following section, we shall examine this specific subject.

2.5.1 Audit Fees and its determinants

According to Simunic (1980), the first step in establishing the cost of the audit service is to determine the quantity of work required. As indicated briefly in the preceding section, the company's size plays a significant role in calculating the audit price. Understandably, larger clients will necessitate more time and effort than smaller companies (Owusu and Bekoe, 2019).

In addition, regulation reforms such as the SOX Act are a crucial point to emphasize. Jenna Tang and Li (2014) examined the factors determining audit fees before and after the implementation of the SOX Act. The findings reveal that, although larger audit firms continue to make higher revenue following the SOX Act, the gap between the Big Four (KPMG, PWC, EY, Deloitte) and non-Big Four firms has narrowed. This reduction is because the SOX Act mandates a more significant compliance effort, which has increased audit fees for both large and small auditors. In addition, the increased compliance effort has facilitated the expansion of non-big-4 companies and

partially blurred the distinction between them and the Big Four. As a result, after implementing the SOX Act, size is less influential in determining audit fees.

In contrast, reputation has been substantially more valuable since the passage of the SOX Act. As a result, there is a clear correlation between audit fees and the additional work required to restore and manage reputation. Additionally, following the passage of the SOX Act, industry specialization has a lasting impact on audit fees, as it can elevate and decrease audit fees in the presence of increased audit work. In addition, the SOX Act strengthens the positive impact of firm size, complexity, and litigation risks on audit fees (Jenna Tang and Li, 2014).

Naser and Nuseibeh (2007) explored the structure of audit fees in an emerging Jordanian economy. They did a cross-sectional OLS regression of audit fees on business size, firm status, corporate complexity, profitability, risk, accounting year-end, and audit report lag. The authors discovered that the primary predictors of audit fees are:

- The company's size.
- The reputation of the auditing firm.
- The industry.
- The degree of organizational complexity.
- The level of risk.

Nonetheless, criteria such as profitability, company accounting year-end, and time between accounting year-end and the audit report appeared to be minor predictors of audit fees (Naser and Nuseibeh, 2007).

According to Desender (2011), inherent risk, organization size, and risk litigation explain audit fees. Large, complicated businesses will be audited for extended periods, potentially resulting in complicated audit processes and consequently increased audit fees.

This paper examines the perceptions of external auditors regarding the most influential criteria in determining audit fees. From the perspective of an external auditor, Owusu and Bekoe (2019) surveyed Big Four auditors. The findings indicate that audit fee determinants can be classified into five separate categories (Audit firm reputation, experience & expertise; Nature and scope of the audit; Market-wide factor; Client size; Client risk) (Owusu and Bekoe, 2019).

Prior research on audit fees has mainly explained audit fee determinants. Previous research demonstrates that inherent risk, organization size, and risk litigation contribute to the justification of audit fees. Large, sophisticated organizations will be subjected to more audit hours, which means more outstanding audit fees and a higher risk of accounting errors. In the next section, we will look at the effect of corporate governance elements on audit fees.

2.5.2 Audit Fees and Corporate Governance

Recent research has examined the connection between audit fees and corporate governance, resulting in a novel methodology. Adequate corporate governance, such as independent board members, is intended to strengthen the control mechanism and reduce the need for external audits, resulting in lower audit fees when using a production-based strategy. A study by Zhang and Yu (2016) determined if independent board members influence audit fees. They

discovered that increasing board independence is not significantly related to changes in audit fees when firms operate in an environment with little information. However, greater board independence is connected with increased audit fees in a robust information environment (Zhang and Yu, 2016).

According to Abbott et al. (2003), audit committees with independent board members and at least one financial expert are connected with higher audit fees. However, committee meeting frequency is not significantly related to audit fees. They explain that the number of hours spent in these meetings was not included, making the variable incomplete. The findings show that a higher-quality audit committee either raises the bar for external audits or does not increase the quality of internal controls and risk management (Abbott et al., 2003).

Chan et al. (2013) investigated if the tenure of independent audit committee members affected audit fees. They discovered that audit fees are negatively correlated with the number of long-tenured directors on the independent audit committee, which is consistent with the theory that long-tenured audit committee members result in less audit effort (Chan et al., 2013).

For example, O'sullivan (2000) finds no evidence that board characteristics influence auditor pricing decisions. However, Carcello et al. (2002) show those audit fees are higher when the client firm has an independent board (but not an independent audit committee), implying a more significant audit effort in the presence of an independent board.

Desender and Lafuente (2009) investigated the effect of the ownership structure and the board of directors on audit demand for 247 French and Spanish public

businesses. The findings indicate that the ownership structure substantially impacts the board's priorities and audit demand. They argue that dominant owners influence the board's priorities to place a greater emphasis on resource provision than on monitoring. In contrast, boards in publicly traded companies place a greater focus on monitoring. We find that board independence and CEO duality are highly connected to audit fees for publicly traded companies. In contrast, the association between board qualities and the demand for external audits in closely held companies is minimal (Desender and Lafuente, 2009).

Despite the positive link discovered by Abbott et al. (2003); Carcello et al. (2002) using data collected previous to the legislative change, the research acknowledges endogeneity in the relationship between board composition and audit quality (Francis, 2004). However, Chen et al. (2015); Zhang and Yu (2016) look at the relationship between board independence and audit fees in the context of a significant legislative change to reduce endogeneity and how this relationship is affected by the information environment of the client firm.

For example, Ghosh and Pawlewicz (2009) investigated changes in auditor fees concerning the SOX Act. The implementation of the SOX Act has led to an economically significant increase in audit fees, as indicated by their findings. After the implementation of the SOX Act, audit fees are predicted to increase due to an increase in audit effort and auditors' anticipated legal liabilities. Non-audit fees decreased dramatically during the same time period, yet total fees paid to auditors increased since audit fees increased more than non-audit fees did (Ghosh and Pawlewicz, 2009).

2.6 ERM & Audit Fees

This section will examine research that focuses primarily on the impact of ERM on audit fees.

According to Desender and Lafuente (2009), external auditors can rely on the work of internal auditors when conducting external audits, as both are concerned with ensuring effective controls. An ERM system can assist external auditors in comprehending the established internal control system before conducting substantive work. Consequently, an ERM system can minimize the required audit hours, thereby reducing audit fees. Their research identified a correlation between ERM quality and audit fees (Desender and Lafuente, 2009). Organizations that have adopted an ERM system are more likely to improve the auditor's work environment, resulting in lower audit fees. The research undertaken by Ji et al. (2018) aligns with (Desender and Lafuente, 2009). The research shows that companies with ERM systems have lower audit fees. Hence, successful ERM procedures create conditions for enhanced internal monitoring and seamless auditing Ji et al. (2018).

Simultaneously, ERM quality indicators and audit fees include:

- Fewer control problems.
- A more internal solid control system.
- Better internal audits.
- A lower perceived business risk.

The indicators of ERM quality are directly linked to the reduction of audit fees (Bell et al., 2001; Hines et al., 2015; Hoitash et al., 2008; Raghunandan

and Rama, 2006).

From 2003 to 2011, Hines et al. (2015) examined the relationship between board-level risk committees and audit fees for a sample of U.S. listed banks. They document both supply- and demand-side influences on audit pricing. Consistent with Hines et al. (2015), Bhuiyan et al. (2020) suggest that risk committees contribute to more comprehensive financial reporting quality but raise audit fees. Specifically, the inclusion of a risk committee correlates with increased audit fees.

ERM seems to reduce risk through strengthening internal control mechanisms and therefore increases the productivity of external auditors. Based on the literature on ERM quality and audit fees, we hypothesize a negative relationship between ERM and audit fees. This reasoning provides the foundation for our first hypothesis.

H1: There is a negative relationship between audit fees and ERM quality.

2.7 Audit fees and the presence of a CRO

In addition to the level of ERM, the presence of a CRO may impact audit fees. Liebenberg and Hoyt (2003) utilized CRO appointments to investigate the factors influencing ERM adoption. When organizations have greater financial leverage, they appoint a chief risk officer. According to Desender (2007) and Desender (2011), the presence of a CRO correlates to the extent of ERM adoption. CROs are responsible for strategy and risk management, allowing the firm to make strategic decisions with a greater emphasis on risk. Additionally, CROs may impact the demand for external audits. This

argument leads us to our second hypothesis.

H2: There is a negative relationship between external audit fees and the presence of a Chief Risk Officer (CRO).

3 Research methodology

In the next part, we will explain the architecture of our model selection procedure to determine the optimal method for answering our research question. Furthermore, we will comment on the validity of our chosen model.

3.1 Unbalanced Panel Data

Panel data (also known as longitudinal or cross-sectional time-series data) is a set of observations of the behavior of entities across time (Hsiao, 2012). Entities might be nations, people, or, as in our case, firms.

Our data sample consists of observations spanning seven years, from 2014 to 2020, for 137 firms. The data is structured as an unbalanced panel resulting from missing data throughout our sample period. For example, Eagle Rock Energy Partners LP (CIK: 1364541) only has one observation for 2014, while JP Morgan Chase CO (CIK: 19617) has observations for all years from 2014 to 2020.

There are several advantages to the panel data format compared to pure cross-sectional or time-series data. Primarily, panel data includes the potential for individual heterogeneity. Moreover, we can control for time and condition invariant variables affecting our dependent variable (Biørn, 2017). Hence, by correctly structuring our data, we can control unobservable variables that could influence our dependent variable. Secondly, pure time-series data would require a sample with many time-series observations to access the dynamic relationship between variables. By instead using data for multiple companies, we can increase the number of observations to strengthen the validity of our research (Brooks, 2012).

3.2 Choice of model

There are four well-known approaches when faced with panel data, among others. One approach to taking full advantage of the data available in the sample is to use the Seemingly Unrelated Regression (SUR) framework. The model, however, requires that the number of time-series observations, T, per cross-sectional unit, I, be at least equal to the number of such units (Brooks, 2012). This specific model cannot be utilized since our cross-sectional unit, companies, exceeds the time-series data, year.

In addition to the SUR framework, pooled OLS, fixed effects, and random effects models present three other viable alternatives, which will be discussed in detail below.

3.2.1 Pooled Model

The most straightforward technique to analyze panel data is performing a pooled regression on the data. Estimating a single equation for the entire data set is required for data pooling. This entails stacking the dependent variable's cross-sectional and time-series data into a single column. Similarly, the regressors for each independent variable would be stacked in a single column. Then, the equation would be estimated using OLS (Brooks, 2012). For our purpose, the model would entail a regression model represented by:

$$\begin{aligned} LNA_{iT} &= \alpha_{iT} + \beta_1 ERMI_{iT} + \beta_2 RC_{iT} + \beta_3 LNTA_{iT} \\ &+ \beta_4 RECINV_{iT} + \beta_5 SQSEG_{iT} + \beta_6 LTDEBT_{iT} + \beta_7 OTHLIAB_{iT} \\ &+ \beta_9 BIG4_{iT} + \beta_{10} NAFRATIO_{iT} + \epsilon_{iT} \end{aligned} \tag{1}$$

Where i = 1, ..., 137 and T = 2014, ..., 2020

Even though this approach is simple and requires only the estimation of a few variables, it has significant drawbacks. Expressly, the pooled OLS assumes that the average values of the variables and their relationships are consistent throughout time and across the sample's cross-sectional units (Brooks, 2012). This assumption implies that the sampled companies should have identical average values for all variables. Furthermore, we should discover that these variables co-influence one another in the same manner across all entities. However, this assumption is unlikely for a large sample of cross-industry companies.

3.2.2 Fixed Effects Model

The fixed-effects model (FE) considers the individual variability among panel data items. This consideration is achieved by separating the error term unit, ϵ_{iT}, into two separate components, α_{iT} and ϵ_{iT}. One captures the time-invariant effects, while the other explains the remaining volatility in our dependent variable (Brooks, 2012).

There are different ways to model fixed effects. One could, for example, incorporate a dummy variable for each firm, enabling us to capture each firm's constant influence throughout time. The designation for this approach is the Least Squares Dummy variable (LSDV). Concerning LSDV, there is a substantial number of dummy variables must be calculated. If the number of entities, N, is high, the model will require (N-1) dummy variables to account for time-invariant effects in the data.

Using predetermined commands inside statistical software is another approach to measuring fixed effects. Using Stata, for example, one could use the "xtreg" command, which fits regression models to panel data without manually creating dummy variables. The following equation needs to be approximated using this model:

$$LNA_{iT} = \alpha_{iT} + \beta_1 ERMI_{iT} + \beta_2 RC_{iT} + \beta_3 LNTA_{iT} \tag{2}$$
$$+ \beta_4 RECINV_{iT} + \beta_5 SQSEG_{iT} + \beta_6 LTDEBT_{iT} + \beta_7 OTHLIAB_{iT}$$
$$+ \beta_9 BIG4_{iT} + \beta_{10} NAFRATIO_{iT} + \alpha_{iT} + \epsilon_{iT}$$

Where i = 1, ..., 137 and T = 2014, ..., 2020

3.2.3 Random Effects Model

Contrary to the fixed-effects model, the random effects model (RE), assumes that variation between entities is random and uncorrelated with the predictor or independent variables included in the model (Brooks, 2012). The equation for random effects is written as follows:

$$LNA_{iT} = \alpha_{iT} + \beta_1 ERMI_{iT} + \beta_2 RC_{iT} + \beta_3 LNTA_{iT} \tag{3}$$
$$+ \beta_4 RECINV_{iT} + \beta_5 SQSEG_{iT} + \beta_6 LTDEBT_{iT} + \beta_7 OTHLIAB_{iT}$$
$$+ \beta_9 BIG4_{iT} + \beta_{10} NAFRATIO_{iT} + \alpha_{iT} + \epsilon_{iT}$$

Where i = 1, ..., 137 and T = 2014, ..., 2020

If the data were randomly sampled from a specific population, the random-effects model would typically be preferred (Wooldridge, 2010). However, our

sample is determined by a variety of exclusion criteria. Therefore, we cannot maintain the condition that our data was collected at random.

3.3 Model Specification Tests

We have conducted a series of tests evaluating model specifications to decide which model is most suited for our data. First, we tested individual effects to determine if the cross-sectional entities in our data have individual effects that must be considered. Then, we conducted a Breusch-Pagan Lagrange multiplier test to evaluate the individual effects' variance. This test is required to determine whether the individual impacts are random. Finally, if our data contains individual effects, we use the Hausman test to assess whether the fixed-or random-effects model is more appropriate.

3.3.1 Test for individual effects

Our individual effects test consists of a Chow F test on the individual effects, u_i. The unrestricted model employs fixed effects estimation, whereas the restricted model employs the OLS pooling estimation. The null and alternative hypotheses for the Chow F test are as follows:

$$H_0 : u_i = 0$$

$$H_A : u_i \neq 0$$

If the null hypothesis is rejected, the individual effects of the data will be statistically different from zero. Therefore, if H0 is rejected, a model with fixed

effects is preferable over a pooled OLS estimate.

3.3.2 Breusch Pagan test

The Breusch-Pagan LaGrange multiplier test is used to evaluate whether the variance of the individual effects in the data, $\sigma^2_{u_i}$, is statistically different from zero (Breusch and Pagan, 1979). This test is a simple yet effective method to test for heteroskedasticity. The Breusch-Pagan test has the following null and alternative hypotheses:

$$H_0 : \sigma^2_{u_i} = 0$$

$$H_A : \sigma^2_{u_i} \neq 0$$

If the null hypothesis is rejected, the variance of the individual effects deviates significantly from zero. Thereby, a random-effects model is preferable to a pooled OLS model (Breusch and Pagan, 1979).

3.3.3 Hausman test

We do a Hausman test to evaluate if our data are dominated by FE or RE (Hausman, 1978). This test compares the estimators FE and RE for the model with fixed effects and the model with random effects, respectively. Following are the null hypothesis and alternative hypotheses:

$$H_0 : \beta_{fe} - \beta_{re} = 0$$

$$H_A : \beta_{fe} - \beta_{re} \neq 0$$

Under the null hypothesis, random and fixed effects models are both consistent. However, if the null hypothesis is rejected, only the fixed effects model is consistent (Hausman, 1978).

3.4 Validity

The results of our model specification tests indicate that a model with fixed effects best fits our data. The following sections will discuss the FE model's assumptions to validate our conclusions.

3.4.1 Selection Bias

Selection bias occurs when a limited sample does not represent the entire population. Selection bias is not a significant issue when the sample is collected by simple random sampling (Wooldridge, 2010). According to the fixed effects model, variables are distributed consistently and independently among entities. Thus, the FE model satisfies the necessary conditions for selection bias.

3.4.2 Omitted Variable Bias

When a relevant variable contributing to a better understanding of the dependent variable is left out of the regression analysis, it might lead to omitted

variable bias. Because of this, the coefficients of the model's explanatory variables might end up being biased and inconsistent as a result. Consequently, the regression could make inappropriate conclusions (Brooks, 2012).

One of the FE-underlying assumptions is that, given the regressors and time-invariant effects, the expected value of the error term is zero (Wooldridge, 2010). If the error term is not zero and is related to the independent and dependent variables, then the estimators we derive will be biased and inconsistent.

We chose the independent variables for our research based on recommendations from earlier studies (Hoyt and Liebenberg, 2011; Baxter et al., 2013; Gordon et al., 2009). As a result, there is no basis for us to conclude that our model is vulnerable to the influence of missing variables.

3.4.3 Multicollinearity

A third presumption made by the fixed effects model is that there should be some degree of multicollinearity, but it should not be perfect. It is expected that the regressors will have some correlation with one another when using a multivariate regression model. Nevertheless, there is a problem when one or more variables have a precise relationship to one another. It is not feasible to provide an accurate estimate of all of the coefficients under these circumstances. This particular state of affairs is referred to as "perfect multicollinearity."

Near-perfect multicollinearity is a more cause of concern. This term refers to a scenario in which one or more variables show correlations that are not perfect but which are yet significant. If near-perfect multicollinearity is present

but ignored, we would assume that the model's R^2 would be high, but the significance of the coefficients would be low. This assumption is because we would be disregarding multicollinearity. In addition, the standard errors of the coefficients would be, causing misleading conclusions from significance testing (Brooks, 2012).

Quantification of multicollinearity can be difficult when viewed from a formal perspective. By inspecting the correlation matrix, we have the opportunity to discover variables that may have significant correlations. We may proceed with our investigation if there are observable correlations by determining the Variance Inflation Factor for each variable (VIF). This factor provides a quantitative representation of the independent factors' effect on the dependent variable's variance. In order to calculate the VIF, a regression is performed, with the independent variables serving as the independent factors and using one of the independent variables as the dependent factor. The aforementioned procedure is followed for each independent variable. In most cases, VIF values of 5 or 10 are used as cut-offs to determine whether or not multicollinearity exists (Marcoulides and Raykov, 2019).

3.4.4 Stationarity of Idiosyncratic Errors

The stationarity of idiosyncratic error is an additional requirement that must be met for the fixed effects model to be viable. This requirement indicates that its anticipated value and variance are stable throughout time (Wooldridge, 2010). The stationarity of idiosyncratic errors is visually assessed by graphing the residuals against an independent variable. This assumption correlates to anticipating a few significant outliers that would alter the error distribution.

3.4.5 Serial Correlation of Idiosyncratic Errors

We say that an error term is serially correlated when we find correlations between error terms from several different time periods (or cross-section data), which are often close to one another. The serial correlation arises when the errors associated with a particular time period are carried over into subsequent time periods. The serial correlation may lead to wrongful conclusions from the regression (Brooks, 2012). Hence, the presence and type of serial correlation need to be tested.

3.4.6 Measurement Error

Measurement errors, also known as observational errors, are the difference between a measured quantity and its real value. Among others, there are precisely two errors. First, the systematic error results from a miscalibrated instrument that affects all observations, such as an incorrect Excel calculation. Random error, on the other hand, is a mistake that occurs spontaneously and is to be expected when working with large datasets.

According to our understanding, there are no data miscalculations or mishandlings that could impact the outcome of our research. Our data is collected from the well-known databases Wharton Research Data Services (WRDS) and Electronic Data Gathering, Analysis, and Retrieval (EDGAR), which are explained in greater detail in the next section.

4 Data

4.1 Sample data

This study is supported by quantitative data collected from the databases EDGAR, COMPUSTAT, CRSP, and Audit Analytics. All of which are available via EDGAR or WRDS. The majority of ERM research has been conducted on U.S. firms. Therefore, to increase the comparability, we will investigate a sample of U.S. firms from 2014 to 2020, a period that, as far as we are aware, has not yet been studied. In addition, in accordance with Hoyt and Liebenberg (2011), all Standard Industrial Classification (SIC) codes will be employed to adjust for industrial variances.

The research commenced with a search for companies from 2014 to 2020 in the databases COMPUSTAT, CRSP, and AUDIT ANALYTICS. After omitting blank observations needed to calculate both dependent- and independent variables, 1258 firms were left. We then scraped the EDGAR database for the mentioned firms to evaluate if they have incorporated elements of ERM. We followed Hoyt and Liebenberg (2011), which identified companies utilizing the ERM framework by searching for the following key strings in their 10-K filings report: enterprise risk management, strategic risk management, corporate risk management, risk management committee, risk committee, and chief risk officer. We chose these terms because the latter two strings are regarded as significant implementation approaches, while the other strings are synonymous with ERM (Liebenberg and Hoyt, 2003). All "search hits" containing the key strings were carefully read in context to identify whether the company has embraced ERM practices or is contributing to the selling of ERM solutions. In addition, those instances in which companies only partially implemented

a risk management strategy was omitted from our sample. For instance, a search for the word "risk committee" frequently returned strings such as "foreign exchange risk committee," "operation risk committee," and "finance risk committee." Nevertheless, we did not consider these instances to be an implementation of the ERM concept as we described it. Appendix A gives examples of ERM "search-hits."

The S&P ERM rating, which assigns firms a score of either superior, strong, good, or adequate, could also be used as a proxy for ERM, as discussed in chapter 2. However, neither through our institution nor when we approached S&P directly to request educational access was this data available to us. Therefore, we continued manually searching corporate filings as our best proxy for ERM.

Scraping the EDGAR database with the aforementioned search strings resulted in 137 firms identified as having implemented ERM practices between 2014 and 2020, giving us 713 observations. Since we now had four distinct datasets, COMPUSTAT, CRSP, AUDIT ANALYTICS, and EDGAR, we used Excel Power Query to match each company's unique CIK number and year.

Table 1: Industry distribution

Industry	**Number of firms**	**%**
Finance, Insurance and Real Estate	382	54
Manufacturing	155	22
Wholsesale Trade	90	13
Transportation, Communications, Electric, Gas and Sanitary service	869	12
Total	**713**	**100**

Based on the first two digits of SIC codes, Table 1 provides an overview of the sample's industry distribution. Our sample consists of four industries, with

"Finance, Insurance, and Real Estate" having the most significant observations (54 percent). The findings are consistent with Liebenberg and Hoyt (2003), which found that the banking industry had a high percentage (58 percent) of firms in their ERM-adoption sample. In addition, Beasley et al. (2005) report that the banking industry has the highest level of ERM implementation among industries, which may explain the vast number of observations in the "Finance, Insurance, and Real Estate industry", in our sample.

4.2 Variables and measurement

4.2.1 Independent variables

4.2.1.1 Audit fees

The model's dependent variable is the amount of audit fees paid. In compliance with the majority of research (e.g., (Abbott et al., 2003; Goodwin-Stewart and Kent, 2006; Palmrose, 1986; Raghunandan and Rama, 2006)), the natural logarithm (LN) of audit fees will be used. Regarding audit fees, there are two variables in the AUDIT ANALYTICS database: audit fees and non-audit fees. An examination of non-audit fees relative to total audit fees is an intriguing comparison, given that the SEC considers excessive non-audit fees as a risk to auditor independence. If an auditor makes a substantial amount of money from non-audit fee assignments, this dynamic may, over time, unintentionally erode his or her professional skepticism when conducting an independent audit. We, therefore, want to use the natural logarithm of audit fees, which represents only the audit fees paid to the audit firm, excluding other non-audit services like Mergers and Acquisitions and consulting work.

4.2.2 Dependent variables

4.2.2.1 ERM Index

To operationalize ERM quality, Gordon et al. (2009) created an ERM index (ERMI). In this study, the ERM quality of the sample will be measured using a modification of the ERMI. The ERMI consists of four areas corresponding to the four pillars of ERM as defined by COSO: strategy, operations, reporting, and compliance. Each category has equations to demonstrating an organization's effectiveness in achieving its goals and objectives. We determine firms' ERM quality as their respective score are measured by the ERMI.

In the initial version of Gordon's model, two equations were defined for each indicator. However, due to financial information limitations on one of the compliance equations, we shall only proceed with one of the equations. Otherwise, we would have been constrained to a decrease of 50 percent in sample size.

The ERMI is, therefore, the sum of the four equations;

$$ERMI = \sum_{k=1}^{2} Strategy_k + \sum_{k=1}^{2} Operation_k + \sum_{k=1}^{2} Reporting_k + \sum_{k=1}^{1} Compliance_k \tag{5}$$

Strategy

Porter (2008) defines strategy as a firm's positioning in relation to its rivals. A company's strategy is geared toward gaining competitive advantages over rivals in the same industry. If a company has a viable strategy, it will obtain additional competitive advantages, reduce its total risk and improve its performance. In the same industry, all firms compete for the same sales possibilities. When a

company's sales are above the industry average; it is reasonable to assume that its strategy is superior to its rivals. Therefore, the effectiveness of a company's strategy is determined by the number of times its sales vary from the industry's mean sales (Gordon et al., 2009). The following equation results:

$$Strategy_1 = \frac{Sales_{it} - \mu Sales_t}{\sigma Sales_t} \tag{6}$$

Where $Sales_{it}$ = sales of company i in year t, $\mu Sales_t$ = average industry sales in year t, and $\sigma Sales_t$ = standard deviation of sales of all firms in the same industry year t.

The second criterion for determining if a company has a successful strategy, considering ERM, is the company's capacity to lower its systematic risk. Thus, a significant advantage of implementing ERM is the ability to diversify risks, thereby lowering them, by managing a portfolio of risks arising from all sources (Tufano, 1996; Hoyt and Liebenberg, 2011; Stulz, 2008). Consequently, a strategy for controlling systematic risk is essential for ERM practice. This idea is supported by the fact that the systematic risk (i.e., beta) derived from the market model represents an organization's undiversified risk, and a more effective diversification strategy can minimize this risk (Thompson, 1984). Consequently, our second indicator of strategic success is a firm's beta decrease relative to other companies in the same industry.

$$Strategy_2 = \frac{\Delta\beta_{it} - \mu_{\Delta\beta_t}}{\sigma_{\Delta\beta_t}} \tag{7}$$

Where $\Delta\beta_{it} = -(\beta_i \ in \ year_{t+1} - \beta_i \ in \ year_t)$, β_i = firm i's beta, $\mu_{\Delta\beta_t}$ = average industry $\Delta\beta$ in year t, and $\sigma_{\Delta\beta_t}$ = standard deviation of $\Delta\beta$'s of all

firms in the same industry in year t.

Operations

Operations (i.e., operational efficiency or productivity) can be quantified based on the input-output relationship within a company's operations process (Banker et al., 1989). More output for a given level of input or less for a given level indicates a more efficient operation. Therefore, greater operational efficiency should reduce a company's risk of failure, enhancing its performance and value. Consequently, asset turnover, defined as sales divided by total assets, is one indicator of operational efficiency. This metric is displayed below.

$$Operation_1 = \frac{Sales_{it}}{Total\ Assets_{it}} \tag{8}$$

Another measure of operating ratio is the input-output ratio from operations. Defined by sales divided by the number of employees. This measure is shown below.

$$Operation_2 = \frac{Sales_{it}}{Number\ of\ Employees_{it}} \tag{9}$$

Reporting

The notion of reporting is easier to describe in terms of reporting accuracy. Inadequate financial reporting quality is evidenced by illegal earnings management, financial restatements, and financial fraud (Cohen et al., 2017). Inadequate financial reporting should raise a company's total risk of failure, hence lowering its performance and value.

The combination of the three observable variables, Material Weakness, Qualified Auditor Opinion, and Restatement, is a metric for assessing the dependability of financial reporting. Following the Sox Act, companies listed on U.S. stock exchanges must disclose any substantial weaknesses in their internal control over financial reporting. Substantial Weakness is set to 1 if a company reveals a material weakness in its annual report; otherwise, it is set to 0. In their audit reports, auditors provide their judgments about companies' financial reporting. The variable Auditor Opinion is set to 0 for companies having unqualified opinions in their auditor's report; otherwise, it is set to 1. Material Weakness, Auditor Opinion, and restatement information were extracted from the WRDS database. Restatement of a company's financial accounts is considered a decrease in the reporting dependability of the company. Therefore, the variable Restatement is set to 1 if a company issued a restatement; otherwise, it is set to 0. Therefore, the range for Reporting1 is between 3 and 0.

$$Reporting_1 = Material\ Weakness_{it} + Auditor\ Opinion_{it} + Restatement_{it} \tag{10}$$

The absolute value of abnormal accruals has also been used to assess the quality of financial reporting (Johnson et al., 2002). Therefore, the second indicator of a company's reporting dependability is the relative percentage of the absolute value of normal accruals, divided by the total absolute value of both normal and abnormal accruals. Absolute numbers are utilized since both normal and abnormal accruals may be negative. Consequently, their relative strengths are more accurately assessed by their absolute values.

The abnormal accruals are calculated utilizing the cross-sectional accruals estimation model, as defined in (DeFond and Jiambalvo, 1994; DeFond and Subramanyam, 1998). This model estimates normal accruals based on the change in income and the amount of property, plant, and equipment. These variables account for changes in accruals caused by variations in the company's economic condition. The beginning-of-year total assets are utilized as the deflator for all model variables. The abnormal accruals are computed using the following equation:

$$\frac{TA_{ijt}}{A_{ijt-1}} = \alpha_{jt}\left[\frac{1}{A_{ijt-1}}\right] + \beta_{1jt}\left[\frac{\Delta REV_{ijt}}{A_{ijt-1}}\right] + \beta_{2jt}\left[\frac{PPE_{ijt}}{A_{ijt-1}}\right] + \epsilon_{ijt} \qquad (11)$$

Where TA_{ijt} = total accruals for firm i in industry j, A_{ijt-1} = total assets for firm i in industry j, REV_{ijt} = change in net revenues for firm i in industry j, PPE_{ijt} = gross property plant and equipment for firm i in industry j, and ϵ_{ijt} = error term for firm i in industry j.

We then have that:

$$Reporting_2 = \frac{|NormalAccruals|}{|NormalAccruals| + |AbnormalAccruals|} \qquad (12)$$

Where normal accruals = the absolute value of (total accruals) - (abnormal accruals), and abnormal accruals = the estimated error term from the regression model in (11).

Compliance

Compliance with applicable rules and regulations should reduce a company's total risk of failure, enhancing its performance and value. Compliance with Generally Accepted Auditing Standards (GAAS) increases with audit fees,

according to (O Keefe et al., 1994). Consequently, the first compliance metric utilized in this study is the ratio of auditor's fees to net sales revenue. This metric is displayed below.

$$Compliance_1 = \frac{Audit\ fees_{it}}{Total\ Assets_{it}} \tag{13}$$

Equation (6), (7), (8), (9), (10), (12), and (13) is standardized through all 137 firms before being combined in equation (5).

4.2.2.2 Chief Risk Officer

CRO is a dummy variable to assess whether the firm has a CRO or not. The EDGAR database allowed us to gather data on CRO appointments. The relevant data were collected through an online scraping technique on the 10-K filings of the relevant firms in our sample. As stated, our sample consisted of 137 firms, and 105 of them have the presence of a CRO, which means that 32 firms do not. Using the EDGAR database's scraping method, we captured each firm's first appointment of an executive overseeing an ERM program.

Nevertheless, certain appointments are likely not the first for a given executive in charge of the ERM program. It is also likely that our companies have executives overseeing the ERM initiative with varying titles. For example, Lam (2017) notes that some risk management executives have titles like chief market and credit officer, yet these positions may not primarily focus on ERM. These variations will lead to the model misclassification by companies and diminish the effectiveness of our testing once more. However, we believe CRO

is sufficient to determine the firms' ERM initiative.

4.2.2.3 Control Variables

The context of this study is influenced by various variables that could affect a company's risk management or earnings, such as the firm's size, the industry in which it operates, and its level of complexity. The next step is to examine the intercorrelation between the abovementioned variables. The analysis requires that we adjust for the most significant external variables. We include these control variables because these are what prior research has deemed essential determinants of audit fees.

As stated in chapter 2, one factor determining audit fees is the size of the company. It is reasonable to suppose that auditors spend more time and energy on larger businesses. This argument is consistent with a seminal piece by Simunic (1980) and recent research (Owusu and Bekoe, 2019; Jenna Tang and Li, 2014; Naser and Nuseibeh, 2007). However, Jenna (2014) stated that firm size had become a less relevant factor following the SOX Act, but excluding the variable only for this reason would lack evidence. Despite the paper's assertion that size has grown less influential, there is evidence to imply that it remains an essential variable. We include size as a control variable for this reason. A company's size will be measured using the natural logarithm (LN) of its total assets in a given year (Gordon et al., 2009; Hoyt and Liebenberg, 2011; McShane et al., 2011). To further emphasize size as a factor, we incorporate a variable controlling for the proportion of a company's total assets that consists of receivables and inventories.

Additionally, the number of business segments a company works in can have

an effect. Different regulatory and market conditions apply to various business segments. These variations may produce distinct ERM quality outcomes. For example, Hoyt and Liebenberg (2011) claim that companies with stronger industry competition place higher importance on their ERM systems. We use the square root of the number of company segments to compensate for these discrepancies.

In addition, we control for the long-term debt-to-total assets ratio. Additionally, we include non-long-term debt liabilities scaled by total assets (Bailey et al., 2018). These variables represent the firm's capital structure and the agency expenses between its external debt-holders. Following Bailey et al. (2018), we incorporate operating income scaled by total assets as a control variable. Moreover, we control for organizations that employ one of the Big Four auditing firms or not. This variable is included as a dummy variable. Therefore, the company is assigned the number 1 if a Big Four auditor conducts the audit and 0 otherwise. Higher audit fees are expected when the audit firm is recognized to be of superior quality to others (Hay, 2006).

In addition, we consider the ratio of non-audit fees to audit fees. Finally, we control for the systematic risk because it can impact the quality of ERM across industries. In light of McShane et al. (2011), risk will be managed using the company's beta for a particular year.

Table 2: List of Variables

Variable	**Definition**	**Source**
LNA	LN of audit fees	AA
ERMI	Sum of strategy, operation, compliance and reporting	Compustat, AA
CRO	Dummy variable, 1 if CRO is identified, 0 if not	EDGAR
LNTA	LN of total assets	Compustat
RECINV	Total receivables divided by total assets	Compustat
SQSEG	Square root of the number of business segments	Compustat
LTDEBT	Long-term debt-to-total assets ratio	Compustat
OTHLIAB	Other liabilities divided by total assets	Compustat
BIG4	Dummy variable, 1 if BIG4 auditor, 0 if not	Compustat
NAFRATIO	Audit fees divided by non-audit fees	Compustat

Where AA: Audit Analytics.

Table 2 above presents all the variables used, their definition, and their source.

5 Descriptive Statistics

This section will provide some statistics to help us comprehend the distribution of our sample's observations. In addition, we will discuss whether some observations should be included or omitted. Finally, we present a correlation matrix that will be useful for understanding the independent impacts of the variables on one another.

5.0.1 Full sample

Table 3: Descriptive Statistics

	Mean	Median	SD	Min	Max	Kurtosis	Skewness
LNA	14.60	14.66	1.47	9.21	18.22	3.03	0.01
ERMI	0.00	-0.31	2.68	-19.65	17.81	14.83	1.24
LNTA	9.29	9.17	2.24	1.00	15.04	3.34	0.05
RECINV	0.44	0.50	0.29	0.00	0.96	1.41	-0.04
SQSEG	1.32	1.41	0.38	1.00	2.65	3.81	1.12
LTDEBT	0.16	0.07	0.22	0.00	1.29	7.08	2.04
OTHLIAB	0.11	0.02	0.21	0.00	0.94	7.72	2.43
N	713						

The variables' descriptive statistics are presented in table 3. The figures in table 3 are based on our sample of 713 observations. LNA has a mean of 14.61, a standard deviation of 1.47, a range from 9.21 to 18.22, and a median of 14.66. The ERMI variable has a mean of zero due to the standardization we performed on each indicator (operation, strategy, compliance, and reporting) contained in the ERM index.

The percentage difference between the mean and median values for the ERMI variable is significantly more significant than any other variable. This trait indicates that our sample contains more outliers, which causes the mean to deviate from the median. The presence of outliers is indicated by kurtosis and skewness. In statistical terms, kurtosis is a measure of the distribution's

peak. The fatter the distribution, the lower the kurtosis coefficient. The coefficient of the normal distribution is equal to three. In contrast, skewness assesses a distribution's lack of symmetry. The skewness coefficient is zero if the distribution is symmetric. When the coefficient is negative, the median is typically greater than the mean, indicating a left-skewed distribution. When the coefficient is positive, the median is less than the mean, indicating a right-skewed distribution (Brooks, 2012).

The kurtosis of ERMI is 14.83, indicating that a large proportion of observations are close to the mean. As a result, the distribution has a significantly greater peak than the average distribution. Furthermore, the tail of the distribution will be thicker than the tail of a random variable with a normal distribution. A leptokurtic distribution has a more prominent peak and a fatter tail than a normally distributed random variable with the same mean and standard deviation (Brooks, 2012). In addition, the skewness is positive. A positively skewed distribution indicates that the right-hand tail is long, and most of the data is located in the left-hand tail (Brooks, 2012). This distribution is the result of specific positive and negative extreme values.

The mean and median values are roughly identical for all other factors, meaning that they are more or less normally distributed. The other variable, kurtosis, is significantly lower than the ERMI. The distribution of the explanatory variables is also less skewed than the distribution of the dependent variable. The Minimum and Maximum columns illustrate our sample's range of firm characteristics.

5.0.2 Dealing with outliers

We have discovered observations that we will refer to as outliers. Our initial sample consisted of 713 observations, but eleven were excluded due to extreme outliers. Observations in ERMI that were skewed away from normal distribution were deemed as outliers. The observed kurtosis was also relatively high. We decided to avoid outliers that altered the ERMI distribution. Therefore, we omitted observations with ERMI values below -10 and above 10.

Table 4: Descriptive Statistics after omitting outliers

	Mean	Median	SD	Min	Max	Kurtosis	Skewness
LNA	14.61	14.67	1.47	9.21	18.22	3.02	0.00
ERMI	-0.12	-0.34	2.08	-5.36	9.69	4.82	0.83
LNTA	9.32	9.19	2.20	2.44	15.04	3.16	0.13
RECINV	0.44	0.51	0.29	0.00	0.96	1.42	-0.06
SQSEG	1.32	1.41	0.38	1.00	2.65	3.85	1.13
LTDEBT	0.16	0.07	0.22	0.00	1.29	7.15	2.06
OTHLIAB	0.11	0.02	0.21	0.00	0.94	7.60	2.41
NAFRATIO	0.27	0.18	0.33	0.00	4.38	41.50	4.55
N	702						
	This table presents the descriptive statistics for our sample after dealing with outliers.						

The consequence of the transformation is shown in Table 4. We found that ERMI now has a kurtosis of 4.82, which is significantly closer to a sample with a normal distribution than it was previously. In addition, its skewness is 0.83, which is similar to the normal distribution.

Using the range criterion was to make the ERMI distribution more normal while avoiding Omitting Variable Bias (OVB). We could have, for instance, limited the range even further, but doing so would have weakened the explanatory power of the variable.

5.0.3 Correlation

The correlation coefficient is a simple descriptive statistic used to evaluate the strength of a linear relationship between two interval- or ratio-scale variables. A correlation matrix displays, on an individual level, one variable's effect on the others. The correlation coefficient ranges from -1 to 1 for perfect negative (or inverse) correlation and perfect positive (or direct) correlation, respectively.

Table 5: Correlation Matrix

	LNA	ERMI	CRO	LNTA	RECINV	SQSEG	LTDEBT	OTHLIAB	BIG4	NAFRATIO
LNA	1									
ERMI	0.24	1								
CRO	0.04	-0.03	1							
LNTA	0.77	0.09	-0.03	1						
RECINV	-0.36	-0.26	0.02	0.13	1					
SQSEG	0.41	0.12	0.01	0.49	0.06	1				
LTDEBT	0.11	0.04	0.05	-0.20	-0.28	0.04	1			
OTHLIAB	0.38	0.15	0.06	0.22	-0.44	0.21	-0.07	1		
NAFRATIO	0.03	0.03	-0.05	0.09	0.05	0.18	0.15	-0.09	0.08	1

This table represents the Pearson-Correlation Matrx for our sample

Except for REQINV, every variable in our sample is positively associated with LNA. The correlation between LNA and ERMI is positive by the value r = 0.24. This correlation contradicts the assumption that audit fees should fall as ERM quality increases. As anticipated from earlier research, e.g. (Bell et al., 2001; Hoitash et al., 2008; Hoyt and Liebenberg, 2011; Raghunandan and Rama, 2006), LNA correlates more strongly with the control variables LNTA (size) and SQSEG (complexity), which could mitigate the regression relationship. In addition, LNA and BIG4 have a positive correlation of r = 0.68. This positive correlation implies, as expected, that firms with a Big Four auditing firm can anticipate increasing audit fees (Abbott et al., 2003)

Regarding ERMI, we can see it has a strong relationship with size and complexity. This correlation suggests that as a company's size and complexity increase, so will the quality of its ERM. Similarly, when ERMI increases, companies are more likely to hire a Big Four auditor.

6 Results

At the beginning of this chapter, we will give the results of the model specification tests. Second, we will attempt to confirm the model's validity by testing for multicollinearity and serial correlation to solve the issues raised in the methodology chapter. Finally, we will provide the findings of our fixed effects model and discuss the regression outcome.

6.1 Model Building

As described in the methodology chapter, three distinct models can be utilized when dealing with panel data. Table 6 summarizes the outcomes of the tests used to determine the optimal model.

Table 6: Results from model specification tests

Model	Individual Effects	Breusch-Pagan	Hausman	Choice of model	Wooldridges	Robust Std. Errors
LNA_t - ERM_t	Reject H0	Reject H0	Reject H0	Fixed Effects	Failed to reject H0	No

We recall from the research methodology chapter that the fixed effects model is given by:

$$\begin{aligned} LNA_{iT} &= \alpha_{iT} + \beta_1 ERMI_{iT} + \beta_2 RC_{iT} + \beta_3 LNTA_{iT} \\ &+ \beta_4 RECINV_{iT} + \beta_5 SQSEG_{iT} + \beta_6 LTDEBT_{iT} + \beta_7 OTHLIAB_{iT} \\ &+ \beta_9 BIG4_{iT} + \beta_{10} NAFRATIO_{iT} + \alpha_{iT} + \epsilon_{iT} \end{aligned} \tag{2}$$

Where i = 1, ..., 137 and T = 2014, ..., 2020

Beginning with a Chow F test on individual effects, the null hypothesis was rejected. Consequently, a model with fixed effects is preferable

over a pooled OLS estimate. The Breusch-Pagan test compares the random-effects model to the ordinary least squares model. The null hypothesis is rejected, and the random effects model is better than a pooled OLS estimator.

Lastly, we did a Hausman test to determine if our data sample is more susceptible to random or fixed influences. The null hypothesis is also rejected; therefore, we will employ a fixed-effects model with the dependent variable LNA. Results from the model specification tests can be seen in the appendix (Tables 9, 10 &11)

6.2 Model Validity

In the methodology chapter, we examined various challenges to the validity of our results. This section will describe the measures used to ensure the accuracy of our model. First, outliers may skew the results of our analysis by distorting the variance of our idiosyncratic error term. As mentioned in the descriptive chapter, we evaluated these outliers and eliminated eleven observations from our sample. After removing these outliers, we visually examined the variance of the idiosyncratic error term by plotting it against the ERMI variable (Brooks, 2012). This figure appears in appendix C (Figure 3). Based on our findings, we conclude that the idiosyncratic error term's mean and variance stay constant.

We would like further to study multicollinearity-related issues through the correlation matrix analysis. To study further if the regressors are connected, we calculated the Variance Inflation Factor (VIF) for each regressor. The individual VIF factors are listed in appendix C (table 10). As previously stated, a VIF value of more than 10 implies a significant level of multicollinearity in the regression model, however, we have chosen a threshold of five. The results

of our VIF table reveal a VIF factor of less than five and a mean VIF of 1.45. In addition, the findings show that our particular regression model is clear of multicollinearity. In light of the absence of perfect multicollinearity, the results permit us to continue utilizing the chosen model.

To test for serial correlation, we used the Wooldridge test, which may be seen in Appendix C (table 11). The test result demonstrates no autocorrelation of the first order in our panel data that could deem our estimators ineffective. As a result, we maintain our null hypothesis. Furthermore, in accordance with Wooldridge (2010), we do not need to apply robust standard errors in our model to assure the validity of our results; thus, our standard errors are unbiased.

6.3 Regression Result

This section investigates the connection between the computed ERMI, CRO, and audit fees. The objective is to confirm whether a relationship exists with the conditions of the control variables. If so, how does it influence the dependent variable?

Table 7 displays the results of our regression analysis using the standardized ERMI computation as the independent variable. The regression model is based on fixed effects. Therefore, the within R^2 value is 0.814. The within R^2 implies that our independent variable's variance adequately explains our dependent variable's variance. This outcome is consistent with previous studies (Bailey et al., 2018; Abbott et al., 2003).

Table 7: Regression results

	LNA	
ERMI	0.0657***	(4.51)
CRO	0.163***	(3.51)
LNTA	0.483***	(32.71)
RECINV	-1.567***	(14.98)
SQSEG	0.131+	(1.81)
LTDEBT	0.850***	(7.14)
OTHLIAB	0.0795	(0.59)
BIG4	0.722***	(10.34)
NAFRATIO	-0.320***	(4.52)
_cons	9.932***	(84.12)
N	702	
adj. R^2	0.814	

Absolute t statistics in parentheses
(+ $p < 0.10$), * $p < 0.05$), ** $p < 0.01$), *** $p < 0.001$)

The first hypothesis predicts a negative relationship between ERM quality and audit fees. Nevertheless, the regression output from table 7 measures a positive $\beta = 0.0657$ with a p-value below 0.001, demonstrating a highly significant positive relationship of 6.57 percent between ERM and the number of audit fees paid.

However, from table 7, we can observe that OTHLIAB has a p-value greater than 0.10 with a t-statistics of 0.59; hence we can declare it insignificant. The outcome of this restults forces us to exclude this variable. The basis of our exclusion builds upon that this specific control variable does not contribute to explaining the relationship between audit fees and ERM.

Therefore, we run an additional regression without the control variable OTHLIAB. The result of the improved regression can be observed in table 8. We can see from comparing the two regression results that R2 does not change. Moreover, we do not observe any significant changes by comparing the beta coefficients for the other variables. These comparisons tell us that OTHLIAB has little to no explanatory power. Consequently, we utilize the result from the

improved regression.

Table 8: Regression results from improved model

	LNA	
ERMI	0.0658***	(4.52)
CRO	0.166***	(3.56)
LNTA	0.484***	(33.24)
RECINV	-1.594***	(17.02)
SQSEG	0.140^{+}	(1.96)
LTDEBT	0.838***	(7.15)
BIG4	0.721***	(10.34)
NAFRATIO	-0.325***	(4.63)
_cons	9.931***	(84.17)
N	702	
adj. R^2	0.814	

Absolute t statistics in parentheses
($+$ $p < 0.10$), * $p < 0.05$), ** $p < 0.01$), *** $p < 0.001$)

The regression output measures a positive $\beta = 0.0658$ with a p-value below 0.05, demonstrating a significant positive relationship of 6.57 percent between ERM and the number of audit fees paid. In addition, audit fees increase significantly with the control variable, LNTA ($\beta = 0.484$, p < 0.001), LTDEBT ($\beta = 0.838$, p<0.001), and BIG4 ($\beta = 0.721$, p < 0.001).

As stated previously, a substantial positive relationship is seen between ERM quality and audit fees; hence, hypothesis one is rejected. ERM does not decrease audit fees; instead, audit fees appear to grow by 6.58 percent. The increase in audit fees may result from the increased demand for audit quality and a more extensive external audit (Abbott et al., 2003; Carcello et al., 2002). On the other hand, audit fees may be reduced due to fewer internal control issues and a more comprehensive internal control system combined with an ERM system. However, the importance of audit quality may outweigh the advantage of lower audit fees (Hoyt and Liebenberg, 2011; Mikes and Kaplan, 2013). Another possible explanation would be that ERM implementation and

audit fees are positively correlated with firm size (Baxter et al., 2013; Beasley et al., 2008; Hoyt and Liebenberg, 2011). Thus, audit fees may already be higher for larger firms with inferior ERM quality. A final explanation follows Desender (2011), which states that audit fees only decrease for companies that have installed extensive ERM systems.

In addition, the second hypothesis anticipated a negative relationship between audit fees and the presence of a chief risk officer. However, the results indicate a positive relationship between CRO presence and audit fees. The results demonstrate a positive $\beta = 0.166$ and a p-value less than 0.001, indicating that the presence of CROs increases audit fees. Consequently, our second hypothesis is likewise rejected. Although Desender (2011)) found that the presence of CRO decreased audit fees, their findings were not statistically significant compared to ours.

The study's most important findings are broken down into categories and presented in table 8 below for ease of comprehension. It offers a condensed summary of the results discovered. According to the findings, neither the first nor the second hypothesis is supported.

Table 9: Findings summary

Hypothesis	**Findings**
H1	Results are significant, however in the oppsoite direction. Reject H1.
H2	Results are significant, however in the oppsoite direction. Reject H2.

7 Conclusion

This thesis aims to explore the relationship between audit fees and the ERM quality of US firms. Our thesis addresses the research question, "Does improved ERM quality result in lower external audit fees?"

Using panel data from 2014 to 2020 and a model with fixed effects, we obtained results comprising of 702 observations. Our research found a link between audit fees and ERM quality. The results indicates that the relationship is highly statistically significant. Based on firm-specific data, the ERMI produces a score that can be used to determine the quality of the ERM. The ERM quality is a score representing how effectively organizations implement the four COSO objectives. Consequently, a positive correlation between audit fees and ERMI suggests that audit fees will likely increase for companies with enhanced ERM quality. Since this relationship contradicts our initial notion, we must therefore reject our first hypothesis. Instead, the strong and significant correlation could be that organizations with more robust ERM quality require more outstanding audit quality, raising audit fees.

In addition, we discovered a statistically significant correlation between audit fees and CRO. The results are consistent with prior studies. This result lends weight to the notion from prior studies that the mere presence of a CRO does not explain lower audit fees.

In the following paragraphs, we highlight various drawbacks the reader should consider. First, the reader should remember that this study is based on an ERM index as a proxy for ERM quality. In chapter 2, we addressed measurement inconsistencies for ERM. The ERM index does not assess firms'

ERM implementation using data consistent with ERM's all-encompassing nature. In addition, COSO's ERM framework has been questioned because the assigned ERM index is prone to high researcher subjectivity. Additionally, using only one ERM model for such an endeavor could result in a low ERM quality for businesses that employ ERM models other than COSOs or the researcher's choice.

Another limitation we incurred was the selection of observations or a more precise selection of companies. We opted for publicly accessible information on publicly traded corporations due to time and accessibility constraints. The minimum market capitalization criterion for the NASDAQ stock exchange is 160 million dollars, provided that total shareholder ownership is at least 55 million dollars and total corporate assets are at least 80 million dollars (Marquit, 2021). Thus, most firms in our sample, though not all, are larger than unlisted firms. Hence, as we demonstrated in the results, the positive relationship between ERM and audit fees was significantly influenced by size.

Another constraint relates to how we proxy for ERM in firms. Our technique consisted of scraping observations from the WRDS database into the EDGAR database, where we utilized various ERM search strings to proxy for ERM in company filings. No SEC regulations mandate the disclosure of ERM procedures in company filings. However, since the SEC and SOX Act paved the way for disclosing internal control systems and audit information in company filings, firms are disclosing more risk management system information than before. Hence, the basis for our ERM proxy strategy.

However, publicly traded corporations' components of risk management are mandated by law. The SOX Act, for instance, mandates parts of ERM

along with effectively regulating their risk management systems (Whitman, 2015). Since our sample contains firms after the Sox Act, we can establish an argument that these legal acts increase audit hours and thus the reason for the increase in audit fees.

We have now presented the critical limitations of our study. The following paragraph will give suggestions to further research on this specific topic. Since our sample contained US public companies, we were obliged to address the relevant regulatory legislation mandated by US Federal Law. As mentioned in chapter 2, we showed that US legislation requirements are much stricter than, for example, Norwegian legislation. Therefore we would suggest that an ERM study on audit fees could be done based in a country with different legislative rules.

It may be possible to conduct further research by establishing an enhanced ERM index that incorporates not only COSO's definition of ERM but also others. To proximate ERM in organizations, researchers must personally determine whether a company has risk management systems. Although time-consuming, this is the only way to determine whether a corporation is allocating resources to ERM practices.

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Appendix

.1 Appendix A: Examples of ERM

(1) WHIRLPOOL CORP (Filing date: 11.02.2020, Form: 10K, p. 45)

*"We have in place an **enterprise risk management** process that involves systematic risk identification and mitigation covering the categories of enterprise, strategic, financial, operational and compliance and reporting risks. The **enterprise risk management** process receives Board of Directors and management oversight, drives risk mitigation decision-making and is fully integrated into our internal audit planning and execution cycle."*

(2) BANKUNITED INC. (Filing date: 28.02.2020, Form: 10K, p. 10)

*"Our **enterprise risk management** framework is designed to identify and minimize or mitigate the risks to which we are subject, as well as any losses stemming from such risks. Although we seek to identify, measure, monitor, report, and control our exposure to such risks, and employ a broad and diversified set of risk monitoring and mitigation techniques in the process, those techniques are inherently limited in their ability to anticipate the existence or development of risks that are currently unknown and unanticipated. The ineffectiveness of our **enterprise risk management** framework in mitigating the impact of known risks or the emergence of previously unknown or unanticipated risks may result in our incurring losses in the future that could adversely impact our financial condition and results of operations."*

(3) DTE ENERGY CO (Filing date: 09.02.2017, Form: 10K, p. 28)

"A key priority for DTE Energy is to maintain a strong balance sheet which facilitates access to capital markets and reasonably priced short-term and long-term financing. Near-term growth will be funded through internally generated cash flows and the issuance of debt and equity. DTE Energy has an ***enterprise risk management*** *program that, among other things, is designed to monitor and manage exposure to earnings and cash flow volatility related to commodity price changes, interest rates, and counterparty credit risk."*

.2 Appendix B: List of companies

Company name	Company name	Company name
AGNC INVESTMENT CORP	EAGLE ROCK ENERGY PARTNRS LP	NEW YORK CMNTY BANCORP INC
ALKERMES PLC	ELLINGTON FINANCIAL INC	NORTHFIELD BANCORP INC
ALLY FINANCIAL INC	ENPRO INDUSTRIES INC	OCWEN FINANCIAL CORP
AMERICAN INTERNATIONAL GROUP	ENSTAR GROUP LTD	ON DECK CAPITAL INC
AMERICAN RIVER BANKSHARES	ESSENT GROUP LTD	ORRSTOWN FINANCIAL SVCS INC
AMERICAN WATER WORKS CO INC	FCB FINANCIAL HOLDINGS INC	PARK STERLING CORP
AMERIPRISE FINANCIAL INC	FINANCIAL ENGINES INC	PEAPACK-GLADSTONE FINAN CORP
AMN HEALTHCARE SERVICES INC	FIRST BANCORP P R	PHH CORP
ANDEAVOR	FIRST CITIZENS BANCSH -CL A	PHOENIX COMPANIES INC
APOLLO GLOBAL MGMT INC	FIRST FINL BANCORP INC/OH	PNC FINANCIAL SVCS GROUP INC
ARGO GROUP INTL HOLDINGS LTD	FIRST MID BANCSHARES INC	POPULAR INC
ASCENT SOLAR TECHNOLOGIES	FIRST NIAGARA FINANCIAL GRP	PORTLAND GENERAL ELECTRIC CO
ASPEN INSURANCE HOLDINGS LTD	FIRSTMERIT CORP	PROVIDENT FINANCIAL SVCS INC
ASSOCIATED BANC-CORP	FLAGSTAR BANCORP INC	PZENA INVESTMENT MANAGEMENT
ASSURED GUARANTY LTD	FOX CHASE BANCORP INC	QC HOLDINGS INC
ATRM HOLDINGS INC	FRANKLIN FINL NETWORK INC	QUESTAR CORP
AXIS CAPITAL HOLDINGS LTD	GAIN CAPITAL HOLDINGS INC	REGIONAL MANAGEMENT CORP
BANC OF CALIFORNIA INC	GATX CORP	REGIONS FINANCIAL CORP
BANCORP INC	GLOBEIMMUNE INC	REINSURANCE GROUP AMER INC
BANK OF AMERICA CORP	GRAFTECH INTERNATIONAL LTD	RTI INTL METALS INC
BANKUNITED INC	GREEN DOT CORP	SCHWAB (CHARLES) CORP
BANKWELL FINANCIAL GROUP INC	HARTFORD FINANCIAL SERVICES	SHORE BANCSHARES INC
BAUSCH HEALTH COMPANIES INC	HILL-ROM HOLDINGS INC	SLM CORP
BERKLEY (W R) CORP	HOMESTREET INC	SOUTHERN FIRST BANKSHARES
BERKSHIRE HILLS BANCORP INC	HOPE BANCORP INC	SPRAGUE RESOURCES LP
BRIDGE CAPITAL HOLDINGS	HOWARD BANCORP INC	STATE BANK FINANCIAL CORP
CALPINE CORP	HUDSON CITY BANCORP INC	SUN BANCORP INC/NJ
CALUMET SPECIALTY PRODS -LP	IGATE CORP	SUNTRUST BANKS INC
CAPE BANCORP INC	INDEPENDENT BANK CORP/MI	SUSQUEHANNA BANCSHARES INC
CAPITAL ONE FINANCIAL CORP	INNOPHOS HOLDINGS INC	SYNOVUS FINANCIAL CORP
CBOE GLOBAL MARKETS INC	INTERACTIVE BROKERS GROUP	TRUIST FINANCIAL CORP
CHEMICAL FINANCIAL CORP	INTERCEPT PHARMA INC	UNITED COMMUNITY BANKS INC
CHUBB LTD	INVESCO LTD	UNITED FINANCIAL BANCORP INC
CINCINNATI FINANCIAL CORP	JPMORGAN CHASE CO	US BANCORP
CITIGROUP INC	KEYCORP	USIO INC
CITIZENS FINANCIAL GROUP INC	LEGACY TEX FINANCIAL GRP INC	USMD HOLDINGS INC
CLEVELAND-CLIFFS INC	LINCOLN ELECTRIC HLDGS INC	VALLEY NATIONAL BANCORP
COMERICA INC	LPL FINANCIAL HOLDINGS INC	VERTEX ENERGY INC
COMMUNITY BANKERS TRUST CORP	M T BANK CORP	VOYA FINANCIAL INC
COMMUNITY FINANCIAL CORP	MAGNACHIP SEMICONDUCTOR CORP	WELLS FARGO CO
COMMUNITYONE BANCORP	MIDWESTONE FINANCIAL GROUP	WESTERN ALLIANCE BANCORP
DIME COMMUNITY BANCSHARES	MONEYGRAM INTERNATIONAL INC	WHIRLPOOL CORP
DISCOVER FINANCIAL SVCS	MOODY'S CORP	WORKIVA INC
DRESSER-RAND GROUP INC	MORGAN STANLEY	XENITH BANKSHARES INC
DTE ENERGY CO	NATIONAL PENN BANCSHARES INC	XOOM CORP
E TRADE FINANCIAL CORP	NELNET INC	

.3 Appendix C: Tables & figures

Table 10: Test for individual effects

Sample	Model	F-Stat	Prob. F	Reject H0
Full	LNA_t - ERM_t	1.32	0.0166	Yes

The table presents the results from the test for individual effects, which is done by performing a Chow F test on the individual effects, u_i

Table 11: Breusch-Pagan test

Sample	Model	X2-Stat	Prob. X2	Reject H0
Full	LNA_t - ERM_t	4.77	0.0145	Yes

The table presents the results from the Breusch-Pagan test where we test wheter the variance of the individual effects, u_i, is different from zero.

Table 12: Hausman test

Sample	Model	X2-Stat	Prob. X2	Reject H0
Full	LNA_t - ERM_t	9.18	0.0421	Yes

The table presents the results from the Hausman test which tests the differences of the estimators, β_{fe} and β_{re} in the fixed and random effects model.

Table 13: Variance Inflation Factor

Variable	VIF
ERMI	1.10
CRO	1.03
LNTA	1.95
RECINV	1.92
SQSEG	1.44
LTDEBT	1.31
OTHLIAB	1.50
BIG4	1.72
NAFRATIO	1.08
MEAN	1.45

Table 14: Woolridge test

Sample	Model	X2-Stat	Prob. > X2	Reject H0
Full	LNA_t - ERM_t	0.002	0.9629	No

The table presents the results from the Woolridge test for serial correlation.

Figure 3: Residuals plot