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Wisdom from Words: Evidence from Earnings
Conference Calls and Analysts' Research Reports using
State-of-the-Art Natural Language Processing
Methodologies

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Abstract

Corporate communication is gaining importance amid digital transformation, social media engagement, regulatory changes, and integrated reporting. These trends introduce new challenges and opportunities for firms to deliver disclosures to their stakeholders and for stakeholders to analyze these disclosures. Companies aim for more transparent, timely, and engaging communication with investors and the market. However, managers may exploit these opportunities to manipulate stakeholders, influencing market returns, analysts' perceptions, and investors' decisions. Therefore, analyzing and understanding managerial communication practices is essential. The first of the three chapters of this thesis explores the impact of CEO and CFO interactions, specifically their topic allocation, during [Earnings conference calls \(ECC\)](#) on short-term market reactions. I find that intense discussions on financial topics positively influence market responses, with CFO involvement enhancing this effect. The market responds more favorably when CFOs address financial matters and CEOs focus on strategic aspects. Additionally, markets react more intensely to CEOs' sentiments than to CFOs' sentiments. In the second chapter, I examine the strategic tone choice of CEOs and CFOs in [ECC](#) throughout their tenure. I show that analysts are able to adapt to managers' strategic tone over their tenure, resulting in higher forecast accuracy. CEOs' strategic tone has a greater negative impact than CFOs'. Further, equity incentives in managers' compensation lead to higher managerial tone inflation. The third chapter investigates the prevalence and impact of ESG topics in [ECC](#) and financial analysts' research reports ([Analyst research reports \(ARR\)](#)). I find a higher frequency of environmental and social topics than governance in both document types. ESG-related information, particularly environmental topics, negatively affects analysts' forecast accuracy. Governance-related information does not significantly affect forecast accuracy. The results reveal a positive association between ESG discussions in [ECC](#) and forecast accuracy, suggesting that social and governance topics in [ECC](#) can improve accuracy when considered in [ARR](#). The findings of this thesis contribute towards a theoretical and empirical understanding of corporate capital market communication with implications for companies, financial analysts, and ESG regulators.

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List of Abbreviations

AI	Artificial Intelligence.
ARR	Analyst research reports.
BERT	Bidirectional Encoder Representations from Transformers.
BHAR	Buy-and-hold abnormal returns.
BoW	Bag-of-Words.
CAR	Cumulative abnormal returns.
CEO	Chief Executive Officer.
CFO	Chief Financial Officer.
CNN	Convolutional Neural Networks.
CRSP	Center for Research in Security Prices.
CSR	Corporate Social Responsibility.
CSRD	Corporate Sustainability Reporting Directive.
ECC	Earnings conference calls.
EFrag	European Financial Reporting Advisory Group.
EMH	Efficient Market Hypothesis.
ESG	Environmental, Social and Governance.
ESRS	European Sustainability Reporting Standards.
EU	European Union.
GAAP	Generally Accepted Accounting Principles.
I/B/E/S	Institutional Brokers' Estimate System.
IFRS	International Financial Reporting Standards.
IR	Investor Relations.
ISSB	International Sustainability Standards Board.
LDA	Latent Dirichlet Allocation.
LLM	Large Language Model.

LSA	Latent Semantic Analysis.
MD&A	Management's Discussion and Analysis.
ML	Machine Learning.
MLM	Masked Language Model.
NLP	Natural Language Processing.
Q&A	Question & Answer.
RNN	Recurrent Neural Networks.
SEC	U.S. Securities and Exchange Commission.
US	United States of America.
WRDS	Wharton Research Data Service.

1 | Introduction

My research is motivated by the disruptive changes in disclosure practices and communication channels of firms over the past years. These shifts are characterized by various key trends, including digital transformation, enhanced transparency, interactive communication, social media engagement, regulatory changes, and integrated reporting. The evolving needs and expectations of stakeholders, as well as advancements in technology are reflected in these trends. Firms are embracing these changes to ensure more transparent, timely, and engaging communication with investors, analysts, and the broader market (Miller and Skinner, 2015). For example, prominent Chief Executive Officer (CEO)s such as Apple’s former CEO Steve Jobs and Tesla’s CEO Elon Musk possess the potential to exert direct influence on stock market dynamics. Musk, renowned for his proactive engagement on social media channels such as Twitter, consistently disseminates updates pertaining to Tesla’s products, initiatives, and financial situation. This direct interaction with stakeholders not only fosters transparency but also provides valuable insights into Tesla’s strategic trajectory, thereby shaping market sentiments and influencing investor behaviors (Biggs, 2019, Ante, 2023). The participation of Musk, and CEOs in general, in Earnings conference calls (ECC) offers a more formal platform for exerting such influence. During ECC, managers deliver detailed financial discussions and strategic updates, which impact analysts’ perceptions, their Analyst research reports (ARR), and subsequently, investors’ decisions. ECC provide real-time updates and direct insights from top management (e.g., Beyer et al., 2010, Francis et al., 2008, Frankel et al., 1999, Kimbrough and Louis, 2011), while ARR offer in-depth financial analysis and forecasts, significantly affecting how information is processed and acted upon by the market. ECC and ARR are crucial in this evolving landscape of more timely and engaging communication and increased transparency (e.g., Bradley et al., 2014, Huang et al., 2014a, 2018, Kimbrough and Louis, 2011). This context serves as the onset of my research endeavor.

Research on [ECC](#) and [ARR](#) is crucial as it enhances our understanding of how managerial discourse and information dissemination influence financial markets and investor behavior. [ECC](#) serve as a primary medium for firms to convey performance, strategic initiatives, and future prospects, directly affecting investor sentiment and stock prices ([Brown and Hillegeist, 2007](#)). [ARR](#), which synthesize and interpret this information, play a significant role in shaping market expectations and investment decisions ([Groysberg et al., 2008](#)). Moreover, understanding corporate communication strategies, including potential manipulations, is vital for assessing the authenticity and reliability of the information provided to the market. Research in this area uncovers how executives might use tone and strategic disclosures to manage investor perceptions and market reactions, thereby highlighting the need for transparency and regulatory oversight ([Demers and Vega, 2014](#), [Hollander et al., 2010](#)). This body of work contributes to more informed decision-making by investors, enhances the efficiency of capital markets, and informs policymakers aiming to safeguard market integrity.

This thesis, through its three chapters, specifically advances the understanding of the interplay among managerial communication, analysts' perceptions, and financial market reactions, contributing to the refinement of communication strategies and more informed decision-making by firms, analysts, and policymakers. First, this research examines the influence of top management's communication, the interplay of [CEOs](#) and [Chief Financial Officer \(CFO\)s](#) during [ECC](#), on short-term market response (see chapter 2). Second, I explore managers' strategic tone choice, and analyze analysts' learning effects across managers' tenure (see chapter 3). Third, it delves into whether financial analysts consider [Environmental, Social and Governance \(ESG\)](#)-related information in their [ARR](#) and, if they do, whether they make more or less accurate forecasts than their peers who do not integrate this information (see chapter 4). The empirical basis for the analyses is derived from [ECC](#) and [ARR](#) utilizing state-of-the-art [Natural Language Processing \(NLP\)](#) methods. By implementing these methodologies, I am capable of addressing research questions previously hindered by limitations in analyzing both structured and unstructured textual data. In doing so, I contribute to the [ECC](#) literature and advance the understanding of financial analysts' behaviors and perceptions, with particular emphasis on the significance of [ESG](#) information in shaping their forecasts.

In the introduction, I lay out the cohesive theoretical framework that integrates the three main chapters of this thesis by positioning corporate communication within the context of the [Efficient Market Hypothesis \(EMH\)](#). Further, I depict the fundamental distinctions between voluntary

and mandatory disclosure practices to provide a deeper understanding of the empirical basis of this thesis. This explanation highlights the importance of [ECC](#) and [ARR](#) as primary datasets. Second, I outline the advancements in disclosure analysis and their role in addressing novel research questions, such as in this thesis. Third, a concise overview of the three main chapters is presented, encompassing their theoretical framework, relevance, and addressed research questions. Fourth, I introduce the research methods and data employed in these chapters. Additionally, I outline the main findings and a general contribution of this thesis, and the introduction concludes by delineating the thesis structure.

1.1 Theoretical Framework and Disclosure Types

In this section, I explain the theoretical framework of the [EMH](#), which underpins the conceptual foundation of the three main chapters within this thesis. Secondly, I outline the distinctions between mandatory and voluntary disclosure as forms of corporate communication. Additionally, I delineate [ECC](#), a form of voluntary disclosure, and the subsequent [ARR](#) frequently associated with these calls.

1.1.1 Efficient Market Hypothesis and Corporate Communication

The [EMH](#) is a financial theory developed by Eugene Fama in the 1960s that asserts that financial markets efficiently incorporate and reflect all available information into asset prices. The hypothesis suggests that it is impossible to consistently achieve above-average returns by using historical price information or other public information, as prices already reflect and adjust to all relevant data ([Fama, 1970](#)). The [EMH](#) has been a cornerstone of financial economics. It has profound implications for investment strategies, suggesting that it is challenging to consistently outperform the market based on information that is already known or can be easily obtained ([Fama, 1970](#), [Jensen, 1978](#), [Malkiel, 2003](#)). However, debates and critiques of the [EMH](#) persist, with some scholars arguing that various forms of inefficiencies exist in financial markets. These inefficiencies can arise from factors such as investor behavior, market microstructure, and corporate communication strategies. For instance, anomalies like momentum and reversal effects, as well as underreaction and overreaction to news, challenge the notion of market efficiency ([Shiller, 2003](#), [Lo, 2004](#)). Corporate communication, including earnings announcements and strategic disclosures, can trigger market inefficiencies by creating information asymmetry and influencing investor sentiment ([Miller and Skinner, 2015](#), [Hirshleifer and Teoh, 2003](#)). Understanding these

dynamics is crucial in today's fast-paced and information-driven financial markets, as it can inform more effective communication strategies and regulatory policies, ultimately contributing to market stability and investor protection. The surrounding framework highlights the scientific relevance of studying the interplay between managerial communication and financial market reactions. By examining this interplay, this thesis addresses the core concept of information efficiency in financial markets, emphasizing how effective communication by top management within corporate settings significantly influences market responses, analysts' behavior, and investor reactions. The second chapter delves into corporate communication strategies during [ECC](#) and their immediate effects on investor reactions. The third chapter explores the phenomena of overreaction and underreaction by analysts to the strategic tone choices of top management during [ECC](#). The fourth chapter elucidates the influence of [ESG](#)-related information conveyed during [ECC](#) and in [ARR](#) on analysts' forecast accuracy and, consequently, on investor perceptions.

1.1.2 Voluntary and Mandatory Corporate Disclosure

In the realm of corporate disclosure, a categorical distinction can be made between two forms: *mandatory* and *voluntary disclosure*.

Mandatory disclosure, often also referred to as *non-voluntary* or *regulatory disclosure*, pertains to information that corporations are legally obliged to disclose. This encompasses financial statements adhering to [Generally Accepted Accounting Principles \(GAAP\)](#) or [International Financial Reporting Standards \(IFRS\)](#), as well as disclosures mandated by securities regulators or stock exchanges. Furthermore, mandatory disclosure extends to the timely reporting of material events or transactions necessitated by regulatory requirements (e.g., [Beyer et al., 2010](#), [Nelson and Pritchard, 2016](#)).

Voluntary disclosure, alternatively termed *non-mandatory disclosure*, represents a proactive communication strategy undertaken by corporations, extending beyond regulatory obligations. This practice involves the dissemination of supplementary information through various channels such as financial statements, investor presentations, or sustainability reports. Unlike non-voluntary disclosure, which is bound by legal mandates, voluntary disclosure is driven by the company's discretion and strategic objectives. Its underlying purpose is to augment transparency, cultivate stakeholder trust, and influence perceptions of the organization within the marketplace (e.g., [Beyer et al., 2010](#), [Francis et al., 2008](#), [Frankel et al., 1999](#), [Kimbrough and Louis, 2011](#)).

[ECC](#) are considered a form of voluntary disclosure in the domain of corporate communication. Unlike mandatory disclosures required by regulatory authorities, such as financial statements and filings, [ECC](#) are not legally mandated. Instead, companies opt to host these calls voluntarily as a means to offer additional insights, context, and forward-looking guidance on their financial performance to investors, analysts, and other stakeholders. As such, [ECC](#) serve as a strategic tool for companies to enhance their mandatory disclosure obligations and foster greater transparency and engagement with the investment community ([Frankel et al., 1999](#), [Kimbrough and Louis, 2011](#), [Matsumoto et al., 2011](#)).

Quarterly Earnings Conference Calls

[ECC](#) are voluntary events organized by publicly traded companies to announce and discuss their financial performance for the preceding quarter with analysts, investors, and other stakeholders. These calls typically include a management presentation followed by a [Question & Answer \(Q&A\)](#) session, allowing analysts to directly engage with management ([Cicon, 2017](#), [Kimbrough, 2005](#), [Price et al., 2012](#)). While there is no legal obligation to conduct these calls, they have become common among publicly listed firms, especially on major stock exchanges, to enhance transparency and provide relevant information to shareholders and the investment community ([Kimbrough, 2005](#), [Tasker, 1998](#)). Consequently, the primary objective of [ECC](#) is to mitigate information asymmetries and foster connections with stakeholders ([Tasker, 1998](#)). Key top management team members, including increasingly involved [CEOs](#), typically participate, underscoring their growing significance. The initial presentation, often led by the [CFO](#), [CEO](#), or both, is evolving to encompass not only financial details but also additional information to align business strategy with operational results, meeting stakeholders' informational needs ([Ruggeri et al., 2017](#)).

The Refinitiv database comprises over 580,000 transcripts of [ECC](#) from global firms, averaging approximately 26,000 annually, underscoring their significance for financial analysts and investors. The average duration is about 42 minutes, subject to variation based on factors such as the complexity of presented financial data.¹ The importance of [ECC](#) has witnessed a noticeable increase over the past two decades due to advancements in communication technology and the expansion of financial markets. Investors and analysts have progressively demanded access to timely and accurate information, leading companies to recognize the significance of these

¹This estimate is derived from a pace of about 157 words per minute and an average of 7,366 words per transcript, as per [Jason V. Chen \(2018\)](#), [Matsumoto et al. \(2011\)](#).

calls as an essential strategic communication tool to bridge the information gap between the firm and its stakeholders (e.g., [Price et al., 2012](#), [Ruggeri et al., 2017](#)). The objective of ECC has evolved over time. Initially, these calls were primarily viewed as a means to disseminate financial results. However, they have transformed into a platform for company executives to discuss not only financial performance but also future strategies and respond to queries from analysts and investors. The calls now serve as a valuable opportunity for managers to articulate their vision, address concerns, and provide contextual insights surrounding the financial figures ([Ruggeri et al., 2017](#)).

Analysts' Research Reports

While ARR belong to neither mandatory nor voluntary firm disclosure, financial analysts, who write these research reports², play a crucial role as information intermediaries in capital markets ([Bradley et al., 2014](#), [Huang et al., 2014a, 2018](#)). ARR are comprehensive documents for investors containing quantitative measures such as earnings forecasts, stock recommendations, and target prices. These reports also feature a textual discussion covering various aspects, including the company's current and future financial performance, recent corporate events, business strategies, management effectiveness, competitive landscape, and the macroeconomic environment ([Huang et al., 2018](#)). They function as a condensed overview akin to an executive summary delineating the essential aspects of the firm. Existing research generally indicates that these ARR bring value to participants in capital markets (e.g., [Bradley et al., 2014](#), [Huang et al., 2014a](#), [Li et al., 2015](#)). Investors rely on these reports to gain deeper insights into a company's fundamentals, potential risks, and growth prospects. These reports can significantly influence investors' decisions and market sentiment ([Hinze and Sump, 2019](#)). The significance of ARR has notably increased over the past decades. As financial markets have expanded, regulations have changed, and technology has advanced, investors have increasingly relied on expert analysis to inform their investment choices. The proliferation of online brokerage platforms and financial news outlets has also facilitated broader access to ARR ([De Franco et al., 2015](#), [Lehavy et al., 2011](#)). ARR frequently complement companies' ECC because these calls provide valuable information and data concerning the company's financial results and operational activities. Analysts utilize the information disclosed during these conference calls as a foundation for their research and analysis.

²The analyst research reports used in this thesis are usually not publicly available. They are commonly distributed to the firm's clients or subscribers. Investors, institutional clients, and sometimes financial professionals may have access to these reports as part of their subscription services or through their relationship with the financial institution.

Such calls enable analysts to hear directly from company executives about the firm's performance and future strategies, offering supplementary context and perspectives to enrich their research. Only through timely issued [ARR](#) investors attain an informational advantage influencing their investment and trading decisions ([Huang et al., 2018](#)). Hence, [ARR](#) play an integral role in the investment landscape. However, [ARR](#) remain relatively unexplored, primarily due to the resource-intensive data-gathering process, the time-consuming individual procurement of these expensive reports, and the challenging preprocessing demands arising from the unstructured nature of these documents, coupled with their exclusive availability in PDF format. Nonetheless, recent advancements in disclosure analysis set the groundwork for addressing these data-related challenges ([Bochkay et al., 2023](#)). These developments are elucidated in the following section.

1.2 Advancements in Disclosure Analysis

In recent years, accounting research has witnessed a transformative shift by incorporating [NLP](#) methods and further [Artificial Intelligence \(AI\)](#) techniques. These advanced computational methodologies have paved the way for addressing novel research questions and have demonstrated their superiority over traditional textual analysis approaches such as the [Bag-of-Words \(BoW\)](#) model (e.g., [Hartmann et al., 2023](#), [Huang et al., 2023](#)). [NLP](#) methods outperform conventional techniques, for example, in handling unstructured textual data. Accounting research relies heavily on textual sources, including financial reports, disclosure documents, and news articles. These texts are rich in valuable information but are often unstructured and voluminous. Traditional methods, like the [BoW](#) approach, struggle to capture the nuanced semantics and contextual information embedded within this unstructured data. On the other hand, [NLP](#) techniques can analyze and interpret the language used in these texts, providing a deeper understanding of the content ([Bochkay et al., 2023](#)). A further advantage is the enhanced information extraction (e.g., [Anand et al., 2020](#)). Accounting research often requires extracting specific data points from textual documents, such as financial figures, disclosures, or compliance information. [AI](#) driven [NLP](#) models can automate this process with high accuracy, reducing the manual effort required for data collection and enabling large-scale analyses. Deep Learning for financial discourse highlights the potential of [NLP](#) methods to unlock new avenues of inquiry. Deep learning architectures, like transformer-based models (e.g., [Bidirectional Encoder Representations from Transformers \(BERT\)](#)), have demonstrated exceptional performance in understanding the complex semantics of financial discourse. They can capture global dependencies, contextual nuances,

and latent patterns in financial texts, which are challenging for traditional methods to discern (Huang et al., 2023).

Integrating NLP and further AI methods into accounting research is not merely a technological evolution but a paradigm shift. These advanced techniques provide the means to explore novel research questions, analyze unstructured textual data effectively, and extract richer insights from accounting narratives. By surpassing the limitations of traditional approaches like the BoW model, AI opens the door to a new era of data-driven, context-aware, and cross-linguistic accounting research, ultimately enriching our understanding of financial reporting, investor behavior, and market dynamics. The accounting literature has emphasized the dictionary approach to measuring sentiment, forward-looking focus, and other constructs. Newer NLP methods can improve the measurement of existing constructs, develop new text-based measures, and help answer new research questions (Bochkay et al., 2023). This aligns precisely with the focus of this thesis, wherein state-of-the-art NLP methods are applied to address novel research questions in the realm of disclosure, especially capital market communication.

1.3 Theoretical Background, Relevance, and Research Questions

This thesis touches upon the core concept of information efficiency in financial markets, specifically how managerial communication during ECC influences the perceptions of analysts and investors and, consequently, the market's reaction. Effective communication by top management in corporate settings is a critical factor influencing market responses, analysts' behavior, and investor reactions. Consequently, the three main chapters are subject to the EMH. I investigate and address three interconnected research questions pertaining to top management communication. These questions are subsequently presented with a brief overview of their relevance and classification in the pertinent literature.

1.3.1 Conference Call Topics, Manager Roles, and Market Response

In the second chapter of the thesis, I examine the interplay between managerial roles (CEO and CFO), the prevalent topics discussed during conference call presentations, and the ensuing short-term market response. Financial markets operate on information, and ECC are crucial events for disseminating information. Understanding how managers' communication influences market reactions is vital for investors, analysts, and policymakers (e.g., Borochnin et al., 2018, Brown et al., 2015, Hollander et al., 2010, Larcker and Zakolyukina, 2012, Li et al., 2014, Matsumoto et al.,

2011). Current research on textual analysis in financial disclosure has primarily concentrated on language stylistics rather than specifically addressed topics. Past studies have predominantly examined aggregated tone, with particular focus on creating wordlists tailored to financial texts, such as those developed by Loughran and McDonald (2011) for measuring positive and negative tone. The measures of tone derived from such analyses have been linked to market reactions, including 10-K filing returns, trading volume, and return volatility, setting the stage for exploring tone in ECC. Tone, viewed as an expression of private information about anticipated future developments, has been identified as relevant to both current and future firm performance (Price et al., 2012). Allee and Deangelis (2015) find that tone dispersion, indicating the evenness of tone throughout a conference call presentation, influences investor and analyst responses and current and future firm performance. Moreover, diurnal variations impact executives' mood during discussions, leading to negative tone and temporal stock mispricings, as demonstrated by Chen et al. (2018). The use of extreme language, regardless of sentiment, reflects reality and elicits more pronounced market reactions regarding trading volume and stock price movements, as found by Bochkay et al. (2019). While studies have explored various factors influencing market reactions not directly tied to conference call content, such as concreteness (Pan et al., 2018), complexity (Bushee et al., 2018), non-plain English (Brochet et al., 2016), deception (Larcker and Zakolyukina, 2012), and lack of spontaneity (Lee, 2016), there is limited research on the thematic content of conference calls beyond linguistic cues. Firk et al. (2020) provide initial insights by demonstrating that a balanced information composition, incorporating non-financial data based on the balanced scorecard concept, leads to a lower cost of capital by reducing information asymmetries. Addressing this research gap is crucial due to the substantial impact of conference call information on market reactions and investor decisions. Furthermore, Davis et al. (2015) provided evidence of a manager-specific component affecting conference call tone and associated returns, representing manager-specific optimism or pessimism. Differentiating between CFO and CEO roles recognizes that these executives may have distinct responsibilities and perspectives, and their communication may have varying impacts. Hence, the first goal of this thesis is to analyze:

Research Question 1: How does the role of the manager (CFO or CEO) in communicating about specific topics during quarterly earnings conference calls influence the perception of investors, and the subsequent market reaction?

With this research question, I focus on identifying the topics top management addresses during

these calls' presentations and investigating the subsequent market reaction. Moreover, I analyze how the choice of manager (CEO or CFO) addressing each topic influences the impact. Employing a topic modeling methodology that prioritizes thematic content over stylistic elements, this research identifies the underlying themes discussed during conference calls. Additionally, it examines the impact of these themes on market dynamics and investigates the influence of managerial roles (CEO and CFO) on market responses.

1.3.2 Manager Tone over Time and Analysts' Learning Effects

In the third chapter, I investigate the relationship between the strategic tone choices of managers (CEOs' and CFOs') during ECC and analysts' forecast accuracy over managers' tenure. Further, it delves into the incentives for managers to inflate tone during these conference calls.

The tone analysis in written corporate disclosures, such as 10-K and 10-Q reports, earnings press releases, and annual reports, has been extensively studied in accounting and finance literature. Empirical research has shown that managerial tone impacts investor reactions, firm performance, managerial incentives, and even fraud prediction (Henry, 2008, Feldman et al., 2010, Li, 2010, Loughran and McDonald, 2011, Davis et al., 2015, Arslan-Ayaydin et al., 2016). Managers often employ a more optimistic tone to influence stock prices and investor sentiment (Davis et al., 2015, Arslan-Ayaydin et al., 2016), with significant effects on stock returns and trading volumes (Loughran and McDonald, 2011, Mayew et al., 2013).

The concept of impression management is frequently examined in this context, with managers using positive tone to manipulate perceptions for personal or corporate gain (Arslan-Ayaydin et al., 2020). Oral disclosures, especially in ECC, amplify the impact of tonality, particularly for favorable news (Elliott et al., 2024). Studies indicate that ECC tone significantly predicts abnormal returns and trading volume, often more strongly than earnings surprises (Price et al., 2012). Negative associations have been found between ECC tones and firm value uncertainty, emphasizing the importance of tone spreads as market signals (Borochin et al., 2018). Institutional investors respond more to analysts' tones than managers' tones, highlighting the critical role of analysts' reactions (Brockman et al., 2015).

Understanding managerial tone in ECC is crucial for analysts aiming to improve forecast accuracy (Price et al., 2012, Bowen et al., 2002, Bushee and Huang, 2024, Henry, 2008, Mayew et al.,

2013, 2020). Despite the emphasis on the importance of this understanding, the long-term implications of consistent manager-specific tone variations remain underexplored. Analysts' forecast accuracy is linked to their ability and experience, suggesting that they might learn to interpret strategic tone over a manager's tenure (Clement et al., 2007). Prior literature further reveals that the sensitivity of managerial compensation to stock price changes is a main incentive for managers' tone inflation (Arslan-Ayaydin et al., 2016).

In the third chapter, I follow Huang et al. (2014b) by disaggregating managers' tone into two discernible components: a "normal" tone and an "abnormal" (strategic) tone. The "normal" tone is justified by the financial results of the previous quarter, while the "abnormal" tone is strategically employed by the respective manager and provides incremental information. I investigate the relationship between managers' (CEOs' and CFOs') strategic tone and analysts' forecast accuracy, using textual analysis of ECC speech parts. My focus on the underresearched long-term effects aims to shed light on whether analysts can adapt to manager-specific strategic tone over time.

Research Question 2: How does the strategic tone of managers' (CEOs' and CFOs') communication influence analysts' perceptions and subsequent forecasts, what are managers' incentives, and to what extent do analysts learn and adapt their perceptions over time?

The strategic use of tone in corporate communications, particularly when managers inflate their tone to meet short-term performance targets, influence compensation, or manage market perceptions, can compromise the integrity of financial disclosures and diminish investor trust. By investigating tone inflation, this research identifies and measures the extent and impact of such practices, thereby fostering greater transparency and accountability in corporate governance. The findings can assist analysts and investors in better assessing the reliability of information presented in earnings calls, leading to more informed investment decisions.

1.3.3 ESG Information and Analysts' Forecast Accuracy

In the fourth chapter of the thesis, I investigate whether ESG-related information provided in voluntary firm disclosures comprises transparent information for capital market participants. Regulators currently struggle with the topics of ESG disclosures that should be required in corporate disclosures. In recent years, ESG factors have gained prominence in the financial landscape, reflecting an increasing awareness of the broader impact of business activities on

society and the environment. A debate persists regarding the mandatory inclusion of ESG topics in corporate reports. While the [International Sustainability Standards Board \(ISSB\)](#) and the [U.S. Securities and Exchange Commission \(SEC\)](#) prioritize climate-related disclosures to meet investor information needs, the [European Financial Reporting Advisory Group \(EFRAG\)](#) takes a broader approach, offering [European Sustainability Reporting Standards \(ESRS\)](#) covering all elements of ESG and addressing the information needs of various stakeholders. These recent regulatory initiatives, with differing scopes, prompt consideration of which ESG information requires regulation to enhance the decision-making process for users of financial statements. My research delves into this inquiry by uncovering the information needs of sell-side financial analysts. This is the third research goal of this thesis.

Research Question 3: Do financial analysts consider ESG information in their forecasts (i.e., reflected in their ARR)? If they do so, does considering ESG information impact their forecasting performance?

Specifically, I investigate (1) the ESG topics addressed in financial analysts' research reports and (2) whether analysts who integrate this information make more or less accurate forecasts compared to their peers. In doing so, my research furnishes regulators with fresh insights into the ESG topics associated with higher or lower analysts' forecast errors, aiding in the determination of areas requiring standardization in ESG disclosures.

Previous literature underscores the pivotal role of financial analysts as information providers, furnishing investors with decision-relevant insights through their research reports ([Beyer et al., 2010](#)). ARR are regarded as the culmination of analysts' efforts, offering investors incremental information beyond earnings forecasts and stock recommendations ([Bradley et al., 2014](#), [Huang et al., 2018, 2014a](#)). Notably, [Huang et al. \(2014a\)](#) demonstrate that ARR convey information beyond contemporaneously released forecasts, recommendations, and target prices, aiding investors in interpreting market signals. While previous research is relatively silent on the integration of ESG information in ARR and its impact on analyst forecasts, some studies explore the association between firms' ESG disclosures and analysts' forecast performance ([Becchetti et al., 2013](#), [Dhaliwal et al., 2012](#), [Muslu et al., 2019](#)). My research complements existing literature by investigating individual analysts' responses to ESG-related information, irrespective of firms' disclosure practices. By analyzing the content of ARR, I assume that analysts incorporate information perceived as decision-relevant for investors, potentially incorporating ESG information if deemed value-relevant ([Huang et al., 2014a, 2018](#)).

To illuminate the circumstances under which ESG disclosures contribute to analysts' performance enhancement, two plausible mechanisms are proposed. Firstly, drawing from prior research in *information economics*, analysts who integrate ESG-related information into their reports are anticipated to exhibit higher forecast accuracy compared to those who do not. This expectation stems from the assumption that ESG disclosures improve the firm's information environment, thus reducing information asymmetries. Consequently, analysts incorporating ESG-related information are expected to make fewer forecast errors relative to their peers who overlook this value-relevant information (Kothari et al., 2023, Lys and Soo, 1995, Tan et al., 2011). Secondly, according to the *social norm compliance* hypothesis, analysts are incentivized to conform to social norms and tend to cover firms with stronger ESG practices. This leads to increased analyst coverage for "good firms," not necessarily because ESG-related information is inherently value-relevant, but because a high analyst coverage fosters a competitive information environment, compelling analysts to make more accurate predictions for stocks with greater coverage (Dhaliwal et al., 2011, Hong and Kacperczyk, 2009, Alford and Berger, 1999). Another line of research, known as *impression management*, posits that ESG disclosures are biased and primarily serve to enhance corporate image rather than provide transparent information. From this perspective, ESG disclosures may mislead analysts in their decision-making process (Cho et al., 2015, Michelon et al., 2016). Given these divergent theoretical perspectives, it remains an open empirical question whether there exists a positive or negative relationship between the consideration of ESG-related information and analysts' forecast accuracy.

In conclusion, investigating the integration of ESG information by financial analysts in a European setting is both timely and imperative. This research delves into the evolving regulatory landscape, investor expectations, forecast accuracy, corporate decision-making, and broader policy implications. By exploring these areas, the chapter aims to provide nuanced insights into the intersection of financial analysis and sustainable business practices. This investigation responds to the calls for further research by several review papers (Beyer et al., 2010, Bradshaw, 2011, Ramnath et al., 2008) that advocate for a deeper understanding of the sources of analyst value (Huang et al., 2014a, 2018). Ultimately, this research contributes to academic literature and the ongoing discourse on responsible and impactful investing, highlighting the significance of integrating ESG factors into financial decision-making.

Together, these three main chapters provide a comprehensive understanding of the interplay between top management communication, analysts' perceptions, and market reactions. They

contribute to the scientific literature by examining the influence of managerial roles, communication styles, and the integration of ESG information on analysts' perceptions and market reactions. The findings provide valuable insights for practitioners, investor relations teams, and policymakers, aiding in optimizing communication strategies and disseminating relevant information from management to market participants.

1.4 Research Methods and Data

In this section, I offer an overview of the evolution of NLP methods within the realms of finance and accounting, highlighting their key applications. Further, I delve into the specific NLP methods employed in the three main chapters of this thesis. Additionally, I delineate the data sources and describe the sample utilized in each chapter.

1.4.1 Natural Language Processing in Finance and Accounting and applied methods

The emergence and evolution of NLP methodologies have brought about a paradigm shift in the domain of finance and accounting literature. By enabling automated analysis of textual data, NLP techniques have empowered researchers and practitioners to extract valuable insights from extensive volumes of unstructured information. The substantially increasing magnitude of textual data in finance and accounting, encompassing financial reports, news articles, social media feeds, and analyst reports, presents both challenges and opportunities. Conventional methodologies for analyzing structured financial data face difficulties handling the intricacies and variations inherent in unstructured textual information (Bochkay et al., 2023). However, NLP techniques offer a means for researchers and practitioners to glean invaluable insights from vast reservoirs of unstructured data.

This section delves into the evolutionary trajectory of NLP methodologies, their applications in finance and accounting, and their important contributions to these fields. It additionally elaborates on the merits and drawbacks of unsupervised learning models.

In the realm of finance and accounting literature, NLP methodologies have found wide-ranging applications:

Financial Sentiment Analysis involves the automatic assessment of sentiment in news articles, social media posts, and financial reports, facilitating investors in gauging market sentiment,

identifying trends, and making informed trading decisions (e.g. [Sinha, 2016](#), [Bollen et al., 2011](#), [Smales, 2014](#)).

Financial Event Extraction entails identifying and categorizing financial events from textual sources. [NLP](#) techniques can automatically extract crucial information such as mergers and acquisitions, earnings announcements, and regulatory changes, offering timely insights to investors, analysts, and regulators (e.g. [Cecchini et al., 2010](#)).

Fraud Detection plays a pivotal role in finance and accounting, with [NLP](#) methods unveiling patterns indicative of fraudulent behavior through the analysis of textual data. Such patterns may encompass misleading statements, unusual transactions, non-compliance with regulations, or linguistic cues (e.g. [Cecchini et al., 2010](#), [Humpherys et al., 2011](#), [Larcker and Zakolyukina, 2012](#)).

Financial Disclosures and Reporting benefit from [NLP](#) techniques by automating tasks such as information extraction, summarization, and anomaly detection in financial reports and disclosures. These methods enable efficient processing of large volumes of financial data, enhancing transparency and aiding auditors, regulators, and investors (e.g. [Andersen et al., 1992](#), [Jacobs and Rau, 1990](#)).

The rise of [AI](#) in research has opened up new opportunities. [Figure 1.1](#) provides an overview of how the models relevant to this thesis can be categorized. These approaches will be explained in the following.

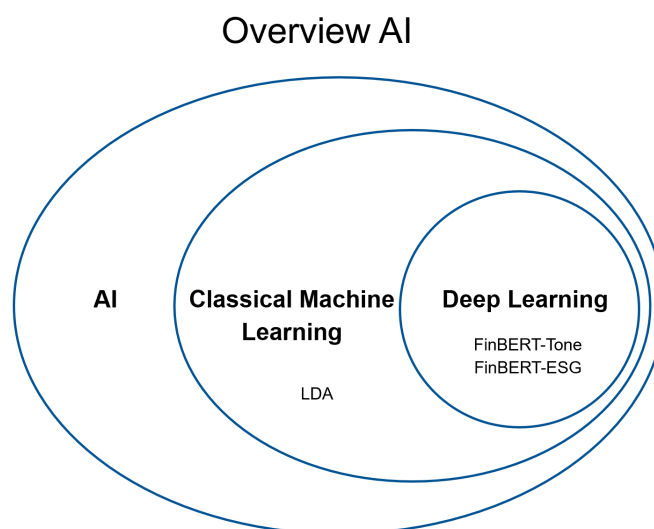


FIGURE 1.1: Classification of Applied Methods into an [AI](#) Framework

Table 1.1 summarises selected [Machine Learning \(ML\)](#) and deep learning models pertinent to disclosure analytics, expounded upon subsequently. Additionally, it delineates the classification of methods employed in the three main chapters of the thesis. The advent of classical machine learning (statistical approaches) in the early 2000s marked a substantial leap forward. Techniques for dimensionality reduction in text data such as [Latent Semantic Analysis \(LSA\)](#) and probabilistic topic modeling, exemplified by [Latent Dirichlet Allocation \(LDA\)](#), harnessed machine learning algorithms to identify patterns and extract meaningful information from textual data (e.g., [Boukous and Rosenberg, 2006](#), [Seo et al., 2002](#), [Blei et al., 2003](#)). Statistical approaches laid the foundation for automated text classification, sentiment analysis, and document clustering, thereby revolutionizing the understanding and utilization of textual information in the fields of finance and accounting.³

The introduction of deep learning and neural networks propelled [NLP](#) to new horizons. Models such as [Recurrent Neural Networks \(RNN\)](#) and [Convolutional Neural Networks \(CNN\)](#) facilitated capturing sequential and contextual information in text, leading to breakthroughs in text generation, named entity recognition, and sentiment analysis. [RNN](#) are specialized for managing data sequences by maintaining hidden states that store information from prior inputs. On the other hand, [CNN](#) are best suited for grid-like data, like images, utilizing convolutional layers to identify patterns. While [CNN](#) perform exceptionally well with image-related tasks, they are not inherently designed for handling sequential data or capturing temporal relationships. These methods harnessed the power of distributed representations, surpassing the limitations of earlier approaches and transforming the landscape of [NLP](#) (e.g., [Wang et al., 2016](#), [Pak and Kim, 2017](#)).

Bidirectional Transformers represent a specific architecture within neural networks, initially introduced for [NLP](#) tasks.⁴ Their strength lies in effectively capturing dependencies over long distances in sequential data. In the case of Bidirectional Transformers, they process input data in both forward and backward directions, enabling them to incorporate information from both preceding and succeeding contexts for each position in the sequence. Transformer-based models, with the Transformer architecture serving as a quintessential example, represented a paradigmatic shift in [NLP](#). Particularly, the [BERT](#) model emerged as a game-changing advancement.

³Conventional classifiers frequently employed for such tasks encompass Naive Bayes, Support Vector Machine, and Random Forest ([Hartmann et al., 2023](#)).

⁴These algorithms, often also referred to as [Large Language Model \(LLM\)](#), characterized by their extensive parameter counts reaching up to billions ([Devlin et al., 2018](#)).

By leveraging self-attention mechanisms, transformer-based models excel at capturing global dependencies and have demonstrated remarkable performance across a broad array of NLP tasks such as language translation, named entity recognition, and sentiment classification of general text. BERT’s groundbreaking approach to language representation, involving pre-training on extensive corpora and subsequent fine-tuning for specific tasks, revolutionized the capabilities of NLP models (e.g., Huang et al., 2023).

TABLE 1.1: Overview of Major NLP Models Applied in Finance and Accounting Literature

Model	Classical Machine Learning		Deep Learning		
	LDA	LSA	RNN	CNN	BERT
Method	Probabilistic generative model	Dimensionality reduction technique	Neural network with recurrent connections	Neural network with convolutional layers	Transformer-based neural network
Nature	Topic modeling	Capture latent semantic structure	Processes sequential data	Feature extraction for images	Captures contextual relationships in text
Purpose	Identify hidden topics	Capture latent semantic structure	Process sequences of data	Image recognition, sequential data analysis	NLP tasks
Application Examples	Blei et al. (2003), Huang et al. (2018)	Boukus and Rosenberg (2006), Seo et al. (2002)	Wang et al. (2016)	Wang et al. (2016)	Devlin et al. (2018), Huang et al. (2023)
	Chapter 2 and Chapter 4				

FinBERT a specification of BERT: a BERT-based model specially trained on financial data to encapsulate the nuanced characteristics inherent to the finance domain.

Subsequently, FinBERT undergoes a fine-tuning process resulting in two distinct variants, namely FinBERT-Tone and FinBERT-ESG. The fine-tuning process enhances the model’s adaptability to tone-related and environmental, social, and governance (ESG) aspects within the financial context (Huang et al., 2023).

FinBERT-Tone
Chapter 3

FinBERT-ESG
Chapter 4

Note: This table provides a concise overview of the key characteristics of each method, including its method type, nature, purpose, and an application example, with an additional row indicating whether it belongs to classical machine learning or deep learning.

This thesis predominantly relies on statistical approaches (e.g., LDA) and transformer-based

models (FinBERT-Tone and FinBERT-ESG) due to their superior performance compared to traditional methods like the dictionary approaches.

Machine learning and deep learning, particularly for straightforward classification tasks, surpass dictionary approaches. [Hartmann et al. \(2023\)](#) underscores a significant enhancement in sentiment analysis accuracy when transitioning from dictionaries to classical machine learning methods. Further gains are observed when progressing from traditional machine learning to deep learning methods like [CNN](#) and [RNN](#). Despite this improved accuracy, only a limited number of accounting studies have employed traditional machine learning or deep learning models ([Bochkay et al., 2023](#)). The financial sentiment dictionary introduced by [Loughran and McDonald \(2011\)](#) remains widely popular. It is frequently employed to gauge sentiment in various contexts, including SEC disclosures ([Bochkay and Levine, 2019](#)), earnings press releases ([Davis and Tama-Sweet, 2012](#), [Huang et al., 2014a](#)), conference calls ([Allee and Deangelis, 2015](#), [Bochkay et al., 2019](#)), and analyst reports ([Twedt and Rees, 2012](#), [Gustaf Bellstam, 2020](#)).

Given the widespread use of [LDA](#) in the finance and accounting domain, further elaboration on this method is omitted here.⁵ In contrast, transformer-based models like [BERT](#) have seen limited application in this context. [BERT](#), a prominent [NLP](#) model developed by Google, builds upon the transformer architecture introduced [Vaswani et al. \(2023\)](#). This foundational work proposed self-attention mechanisms for processing sequential data, and [BERT](#) advances textual analysis in several crucial aspects.

Firstly, [BERT](#) incorporates bidirectional training, allowing it to consider both left and right contexts simultaneously during training. This bidirectional approach enhances the model's contextual understanding, a key factor in capturing complex language relationships. Secondly, [BERT](#) employs a [Masked Language Model \(MLM\)](#) objective during pretraining, involving predicting missing words in sentences. This enables [BERT](#) to capture intricate semantic nuances and context, resulting in more nuanced language representations. Additionally, [BERT](#) adopts Word Piece Tokenization, breaking down words into smaller subwords, enhancing its ability to represent the meaning of a diverse range of words and ensuring robustness in handling varied vocabularies. Furthermore, [BERT](#)'s pre-trained representations are fine-tuned for specific tasks using smaller labeled datasets, showcasing its adaptability and allowing it to apply general language understanding to various applications. Lastly, [BERT](#) generates rich contextual embeddings for words through attention mechanisms and transformer blocks, capturing nuanced

⁵For an in-depth explanation of [LDA](#) see chapter 2

contextual relationships and excelling in tasks requiring a profound understanding of language semantics and structure. In summary, BERT's contributions to textual analysis, encompassing bidirectional training, novel training objectives, advanced tokenization strategy, and adaptability for fine-tuning on specific tasks, position it as a powerful model for capturing intricate language patterns. This versatility makes BERT instrumental across a broad spectrum of natural language understanding applications (Devlin et al., 2018).

FinBERT, introduced by Huang et al. (2023) is intricately linked to BERT through a process of domain-specific fine-tuning. Built upon the foundational architecture of BERT, FinBERT specializes in financial domain tasks, leveraging the transfer learning paradigm. This linkage involves adapting the general-purpose BERT model to the financial domain by fine-tuning on specific financial text data. The fine-tuning process tailors the model to capture the nuanced language, terminologies, and context prevalent in financial communications. While BERT serves as the base architecture with versatile applicability, FinBERT's domain-specific adaptation enhances its performance, particularly in financial sentiment analysis and related tasks.

There are two established versions of FinBERT. The iteration developed by Huang et al. (2023) is trained on financial reports, analyst reports, and earnings conference call transcripts. In contrast, the version by Liu et al. (2020) is trained on financial news and chatroom discussions in Reddit. I utilize the FinBERT algorithm introduced Huang et al. (2023), given its alignment with the dataset employed in this research.

Huang et al. (2023) employ human-annotated sentences from financial text, categorized into three sentiment classes (positive, neutral, and negative), to fine-tune FinBERT for sentiment analysis. Their findings indicate that FinBERT exhibits significantly higher accuracy than the dictionary approach and the general-purpose BERT model. In essence, machine learning methods demonstrate superiority over the dictionary approach, and deep learning, as represented by FinBERT, surpasses traditional machine learning. This underscores the rationale for employing state-of-the-art methods in this thesis for the requisite textual analysis to address the posed research questions.

While unsupervised machine learning and deep learning algorithms offer powerful tools for exploring and extracting insights from data, they also present various challenges and considerations that must be addressed to ensure reliable and ethical use (Naeem et al., 2023).

Reliance on Data Quality: Unsupervised algorithms are contingent upon the quality and quantity of input data. The presence of noise, incompleteness, or bias within the data can engender inaccuracies or unreliability in the outcomes (Naeem et al., 2023). I guarantee this and elaborate on the corresponding training and input data in greater depth in each chapter of the thesis.

Challenge in Result Interpretation: Unsupervised algorithms frequently yield intricate and abstract data representations, posing difficulties in elucidating the underlying patterns or clusters. Comprehending and explaining the outputs of these algorithms can prove arduous, particularly within deep learning models characterized by multiple layers (Naeem et al., 2023). I tackle this obstacle through manual verification and labeling, as elucidated further in Chapter 2 of this thesis.

Absence of Ground Truth: In contrast to supervised learning paradigms, unsupervised learning lacks explicit labels or ground truth for objectively assessing the model’s efficacy. This absence impedes the objective evaluation of clustering or dimensionality reduction techniques (Humphrey et al., 2022). The effectiveness evaluation of each method is guaranteed through thorough manual inspections and suitable alternative methodologies.

Computational Intensity: Deep learning architectures, particularly those endowed with numerous layers (e.g., deep neural networks), necessitate substantial computational resources for training and inference tasks. The training process for deep learning models can be protracted and computationally demanding, especially when dealing with extensive datasets (Hestness et al., 2019).

Susceptibility to Overfitting: Unsupervised learning algorithms are susceptible to overfitting, wherein the model assimilates noise or irrelevant patterns from the data, resulting in diminished generalization performance on unseen data instances (Roelofs et al., 2019). I address this concern, e.g., by carefully selecting hyperparameters to strike an optimal balance between maximizing model performance on the training data while mitigating the risk of overfitting.

Complexity in Hyperparameter Tuning: Deep learning models entail the calibration of numerous hyperparameters, such as learning rates, activation functions, and network architectures. Achieving the optimal configuration of hyperparameters can prove challenging, necessitating extensive experimentation and refinement (Fan et al., 2020). I particularly address this issue in the second chapter.

1.4.2 Data and Sample Description

Figure 1.2 illustrates the data sources utilized in the three main chapters of this thesis and the databases from which the data was retrieved. All three main chapters are based on transcribed spoken disclosures in the form of [ECC](#) and use company and financial data (from [Center for Research in Security Prices \(CRSP\)](#), and [Wharton Research Data Service \(WRDS\)](#)s' Eventus and Compustat). The third and the fourth chapter additionally include analysts' data (from [Institutional Brokers' Estimate System \(I/B/E/S\)](#)). Further, the third chapter uses managers' data (from Execucomp), while the fourth chapter investigates [ARR](#) following the respective conference call of a firm.

Data & Databases	Chapter 2	Chapter 3	Chapter 4
Quarterly Earnings Conference Calls (Refinitiv)	X	X	X
Analysts' Research Reports (Refinitiv)			X
Company & Financial Data (CRSP, WRDSs' Eventus & Compustat)	X	X	X
CEO Data (Boardex & Execucomp)		X	
Analyst Data (I/B/E/S)		X	X

FIGURE 1.2: Overview of data and databases used.

Thesis Chapter 2

I follow [Huang et al. \(2018\)](#) by obtaining all available [ECC](#) of publicly listed US firms from Thomson Reuters' StreetEvents Database from 2002 to 2018. I identify 99,014 transcripts in which the presentations were delivered by either the [CEO](#), the [CFO](#), or both. To conduct a separate analysis, I extract the speech portions of [CEOs](#) and [CFOs](#). I exclude speech portions with less than 100 words, as they lacked meaningful content. The financial data of the firms, aligned with the [ECC](#), are sourced from the [CRSP](#) and Compustat databases. Cumulative abnormal returns are obtained from the Eventus database in the [WRDS](#). After applying these inclusion criteria, my final sample consists of 1,262 firms, resulting in 61,138 observations.

Thesis Chapter 3

I follow [Huang et al. \(2018\)](#) by obtaining all available [ECC](#) of publicly listed global from Thomson Reuters' StreetEvents Database from 2002 to 2022. I extract the speech parts of [CEOs](#) and [CFOs](#) to conduct a separate analysis. I exclude speech portions with less than 100 words, as they lacked meaningful content. I match the identified [CEOs](#) and [CFOs](#) from the [ECC](#) with [CEOs'](#) and [CFOs'](#) personal and compensation data from Execucomp. The financial data of the firms, aligned with the conference calls, are sourced from Compustat databases. After applying these inclusion criteria, my final sample consisted of 317 firms, resulting in a total of 50,575 observations.

Thesis Chapter 4

I started my sample selection with all [ECC](#) transcripts from the Refinitiv database for the Euro STOXX 600 firms between 2010 to 2020, yielding 15,356 transcripts. I match the transcripts [ARR](#) issued within the three-day window after the [ECC](#). The financial data of the firms, aligned with the [ECC](#), are sourced from the Compustat database. I add analyst data from [I/B/E/S](#), resulting in a final sample of 430 firms and 23,312 firm-analyst-years.

1.5 Main Findings and General Contribution

Main Findings

In the second chapter, I explore the impact of [CEO](#) and [CFO](#) interactions during [ECC](#) on short-term market reactions. I find that intense discussions on financial topics positively influence market responses, with [CFO](#) involvement enhancing this effect. The market responds more favorably when [CFOs](#) address financial matters, and [CEOs](#) focus on strategic aspects. [CEO](#) sentiments influence market reactions significantly more than [CFO](#) sentiments.

In the third chapter, I examine the strategic tone choice of [CEOs](#) and [CFOs](#) in [ECC](#) throughout their tenure. I show that analysts are able to adapt to managers' strategic tone over their tenure, resulting in higher forecast accuracy. [CEOs](#) strategic tone has a greater negative impact than [CFOs'](#). Further, equity incentives in managers' compensation are found to lead to a higher managerial tone inflation.

In the fourth chapter, I investigate the prevalence and impact of ESG topics in ECC and ARR. I find a higher frequency of environmental and social topics than governance in both document types. ESG-related information, particularly environmental topics, negatively affects analysts' forecast accuracy. Governance-related information does not significantly affect forecast accuracy. The research reveals positive associations between ESG discussions in ECC and forecast accuracy, suggesting that social and governance topics in ECC can improve accuracy when considered in ARR.

General Contribution

By employing advanced NLP methodologies in this thesis, I address previously unexamined research questions hindered by constraints in analyzing both structured and unstructured textual data. This contribution enriches the literature on conference calls and enhances comprehension of financial analysts' behaviors and perceptions, particularly emphasizing the influence of ESG information on their forecasts. The use of advanced techniques such as LDA, the FinBERT-ESG, and the FinBERT-Tone model represents a departure from conventional approaches, shedding light on dimensions of financial analysis and corporate communication that have been largely underexplored.

Collectively, the three main chapters of this thesis contribute to the broader field of financial research, corporate communication, and sustainable finance. The intersection of these domains underscores the interdisciplinary nature of contemporary financial studies and presents insights that have implications for academia, industry practices, and regulatory frameworks.

The findings of the second chapter contribute to the literature on corporate communication and market reactions by unveiling the differential impact of CFOs and CEOs on investor perceptions based on the topics they address during conference calls. This not only enriches our understanding of how managerial communication influences market reactions but also provides actionable insights for firms looking to optimize their communication strategies. The emphasis on easily implementable levers aligns with the practical needs of corporations and contributes to the growing body of literature on effective corporate communication.

On the other hand, in the third chapter, I offer empirical evidence on the dynamic relationship between managerial tone and analyst forecasts. Importantly, it goes beyond short-term effects to demonstrate how analysts develop the skill to distinguish genuine managerial insights from strategic tone inflation, ultimately leading to improved forecast accuracy. Further, I explore

how compensation structures influence managers' strategic tone and analysts' interpretative abilities over time. This nuanced understanding enhances our knowledge of the interplay between compensation structures, managerial communication, and analyst behavior in corporate settings.

By investigating the integration of ESG factors into financial ARR, the fourth chapter responds to the growing importance of sustainability considerations in financial decision-making. I provide empirical evidence beyond the general awareness of ESG issues and reveals the nuanced relationship between ESG-related information and analysts' performance. Current ESG reporting seems to be causing more confusion for analysts rather than aiding them in making more accurate forecasts. This not only enhances our understanding of sustainable finance but also guides future research into the mechanisms through which ESG factors influence financial analysis and decision-making.

When considered together, these three main chapters of the thesis highlight the evolving landscape of financial analysis and corporate communication also in the context of sustainability. The second chapter offers practical implications for firms seeking to enhance their communication strategies to maximize positive market reactions. Simultaneously, the third chapter highlights the importance of comprehending managerial tone as a market signal, providing insights for practitioners, investors, and regulators about the implications of corporate governance and market transparency. The fourth chapter draws attention to the need for regulatory efforts to strengthen ESG-related disclosures, suggesting a broader societal impact.

1.6 Structure of the Thesis

Figure 1.3 presents an overview of the thesis structure. The remainder of this thesis is structured as follows. The second chapter employs a topic modeling methodology to investigate market reactions to managers' roles (CFO or CEO) and specific themes in conference call presentations.

The third chapter analyzes analysts' learning effects over managers' tenure, focusing on their adaptation skills to managers' strategic tone in ECC. Utilizing the advanced NLP model, FinBERT-Tone, evidence suggests that analysts adjust their forecasts, incorporating strategic tone nuances to enhance accuracy throughout the CEO and CFO's tenure.

The fourth chapter delves into considering ESG-related information by financial analysts in their reports. Utilizing advanced textual analyses, including the FinBERT-ESG model and LDA, the findings reveal prevalent environmental and social topics, a negative association between ESG

consideration and forecast accuracy, and a need for enhanced regulatory efforts for transparent ESG disclosures in the [European Union \(EU\)](#).

Finally, chapter five concludes by summarizing the main findings of the three main chapters and their individual contribution to literature and by outlining the potential applications of this research for improving managers' communication, ESG disclosure and disclosure analysis. Further, it points out the limitations of this thesis and describes avenues for future research.

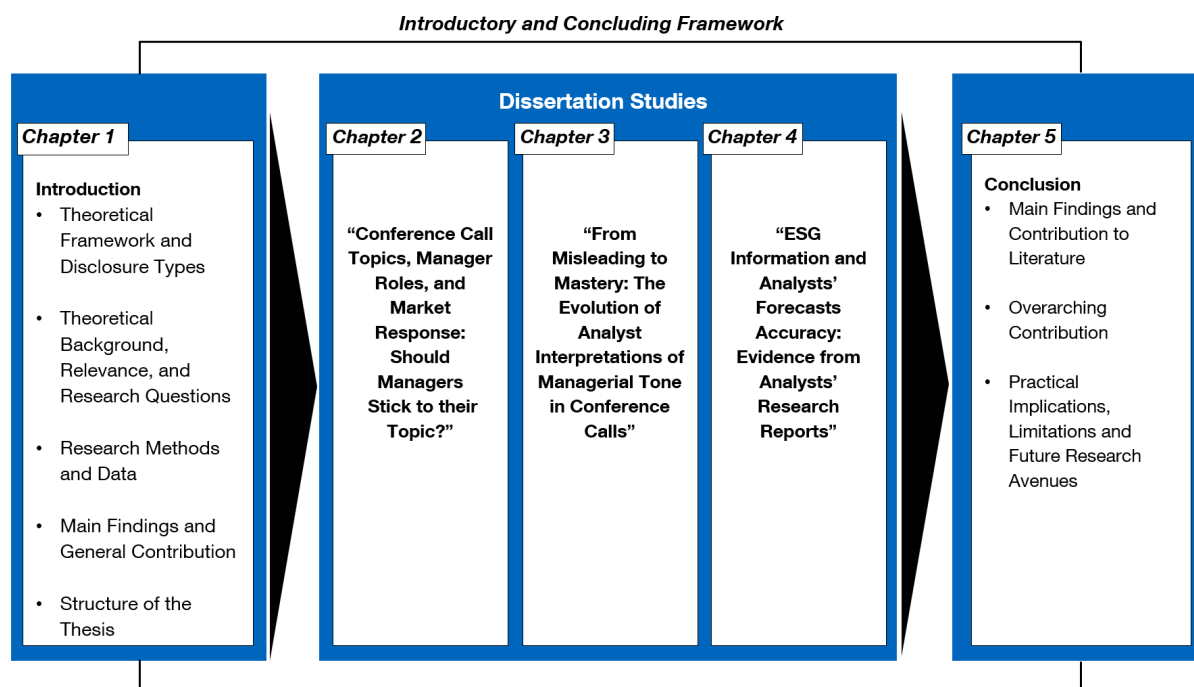


FIGURE 1.3: Structure of the thesis.

2 | Conference Call Topics, Manager Roles, and Market Response: Should Managers Stick to their Topic?⁶

This study investigates the interaction between managers' roles (CFO or CEO), the topics predominantly addressed during conference call presentations, and their associated short-term market reaction. Utilizing a topic modeling methodology, I identify the underlying themes of these presentations, focusing on thematic content rather than stylistics, which distinguishes our approach from previous studies. Our findings reveal that the market reaction is most favorable when the CFO, rather than the CEO, addresses the *financial* topic. Conversely, the market perceives more positively the *strategic* topic when discussed by the CEO. These results remain consistent even when considering the joint presence of both managers during the presentation. Moreover, the most advantageous scenario for market reaction occurs when either both managers primarily discuss the *financial* topic or when the CFO emphasizes *financial* matters while the CEO addresses *strategic* issues. Overall, our research contributes insights that can aid in optimizing conference call design, presenting an easily implementable lever of substantial interest to firms' Investor Relations (IR) and communication teams.

⁶This chapter is based on a working paper co-authored by Alwine Mohnen that is currently under review for publication. The full chapter is included in the examiners' copies of this dissertation. In order to avoid plagiarism or dual publication, it is not included in the freely accessible version of this dissertation. The working paper was accepted for presentation at the International Society for the Advancement of Financial Economics (ISAFE) 2022 (HMC Vietnam), the 44th EAA Annual Congress (Bergen), the FMARC 2021 (Paphos) and received the Best Paper Award in Accounting, the GEABA Young Scholars Conference 2021 (virtual), the Annual Meeting of the American Accounting Association 2021 (virtual), the Workshop on Digitalization in Economics and Management 2020 (Heilbronn) and the Workshop: Latest Advances in Natural Language Processing 2021 (Heilbronn).

3 | From Misleading to Mastery: The Evolution of Analyst Interpretations of Managerial Tone in Conference Calls⁷

This study investigates the impact of managerial tone in [ECC](#) on analysts' forecast accuracy, using textual analysis of global firms' [ECC](#) from 2002 to 2022. Employing FinBERT-Tone to identify *strategic* tone choices, the research examines whether analysts learn to adapt to these tones over time. Managers often use optimistic tones to influence stock prices and investor sentiment, driven by motivations such as meeting market expectations and influencing compensation outcomes. Results show that a higher strategic tone leads to greater forecasting errors, but analysts adjust and improve their accuracy over time as they become accustomed to specific managers' tones. Further analysis reveals that analysts are more misled by [CEOs'](#) tones compared to [CFOs'](#), likely due to higher social status and credibility associated with [CEOs](#). Additionally, tone inflation is more pronounced in the scripted presentation sections of [ECC](#) than in the unscripted Q&A sections. Higher equity incentives in managerial compensation are associated with increased tone inflation, consistent with previous research on equity incentives and managerial tone. This study highlights the importance of understanding managerial tone for enhancing forecast accuracy and informs practitioners, investors, and regulators about the implications of corporate governance and market transparency.

⁷This chapter is based on a working paper (single authored) that is currently under review for publication. The full chapter is included in the examiners' copies of this dissertation. In order to avoid plagiarism or dual publication, it is not included in the freely accessible version of this dissertation. The working paper was presented at workshops at the Technical University of Munich and Goethe University Frankfurt.

4 | ESG Information and Analysts’ Forecasts Accuracy: Evidence from Analysts’ Research Reports⁸

Prior literature provides opposing arguments on whether ESG information is positively or negatively linked to analysts’ forecast accuracy. I study whether financial analysts consider ESG-related information in their analyst research reports (ARR) and, if they do, whether they make more or less accurate forecasts than their peers who do not integrate this information. I document that environmental- as well as social-related topics are more frequently mentioned than governance-related ones. Furthermore, I show that considering ESG-related information is negatively associated with analysts’ forecast accuracy and that the consideration of specific environmental- and social-related subtopics explains this link. My findings are robust in settings when analysts integrate ESG information for the first time. In additional tests, I find that the ESG disclosures in the management presentation of the preceding earnings conference call as well as those from high ESG reporting firms do not help analysts to make relatively more accurate forecasts. Overall, my findings have potential relevance to the current debate about which ESG topics need to be regulated so that financial analysts better understand and integrate such ESG disclosures in their decision-making process.

⁸This chapter is based on a working paper co-authored by Katharina Weiß that is currently under review for publication. The full chapter is included in the examiners’ copies of this dissertation. In order to avoid plagiarism or dual publication, it is not included in the freely accessible version of this dissertation. The working paper was accepted for presentation at the 14th Annual Conference for Management Accounting Research 2024 (Valendar), EAA Doctoral Colloquium 2023 (Espoo), the 45th EAA Annual Congress (Helsinki), the 4th Analyst Research Conference (Athen), the 2023 Bayreuth Emerging Accounting Research Workshop, and workshops at LMU Munich, University of Passau, and Technical University of Munich. This paper also benefited from the excellent research assistance of Vadim Gorski. Katharina Weiß gratefully acknowledges funding by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation): Project-ID 403041268 – TRR 266 Accounting for Transparency.

5 | Conclusion

The rapidly advancing developments in the field of [AI](#) have garnered increased awareness of both its potential benefits and drawbacks ([Dwivedi et al., 2023](#)). Within a few months, [AI](#) has transitioned from being a specialized interest for tech enthusiasts to a mainstream topic. Some scholars assert that these developments mark the onset of a fourth industrial revolution ([Oosthuizen, 2022](#)), with profound implications for transforming the nature of work across all sectors of the economy, including academic research. In the contemporary landscape of computational linguistics, the majority of papers aiming for state-of-the-art performance incorporates a deep learning approach. A compelling illustration of deep learning’s capabilities is evident in the performance of ChatGPT, an OpenAI chatbot launched in November 2022 ([Webersinke, 2023](#)). According to [Webersinke \(2023\)](#) and [Kraus et al. \(2023\)](#), these advancements hold promise for applications in accounting and finance. The surge in regulatory requirements and shareholder expectations for detailed disclosures has led to a rapid expansion of textual data around companies⁹, necessitating sophisticated analytical approaches. Despite this, recent studies in accounting and finance utilizing textual analysis still show limited incorporation of deep learning techniques ([Webersinke, 2023](#)). This thesis employed advanced [NLP](#) methodologies, specifically [LDA](#), [FinBERT-Tone](#), and [FinBERT-ESG](#), to address novel research questions enabled by these new methods. Subsequent sections summarize the principal findings and their corresponding contributions to the existing literature, followed by their relevance for an overarching contribution. Lastly, the conclusion highlights practical implications, acknowledges limitations, and suggests potential areas for future research.

⁹See, for example, for regulatory initiatives in the [EU](#) the [Corporate Sustainability Reporting Directive \(CSRD\)](#) and for the [United States of America \(US\)](#) the proposal for climate-related disclosures by the [SEC](#).

5.1 Main Findings and Contribution to Literature

The second chapter investigates the impact of CFO and CEO interactions during conference calls on short-term market reactions. I find that intense discussions on financial topics positively influence market responses, with the CFO's involvement enhancing this effect. Additionally, the market response is more positive when CFOs primarily address financial matters and CEOs focus on strategic aspects. CEO sentiments are more significant in influencing market reactions than CFO sentiments. These findings highlight the importance of conference call dynamics, specifically topic discussions and executive interactions, in shaping market responses.

This chapter makes a twofold contribution to the existing literature. Firstly, in contrast to the predominant focus on the impact of stylistics and information presentation (e.g., Loughran and McDonald, 2011, Davis et al., 2015, Brochet et al., 2016, Lee, 2016, Bushee et al., 2018, Pan et al., 2018, Bochkay et al., 2019), my research adds to the growing literature on conference calls' content (Firk et al., 2020) by identifying underlying topics and assessing their influence on market reactions. Secondly, I show the significance of managerial roles during conference calls and add to this literature (Bochkay et al., 2019) by enhancing comprehension of market responses to various roles, topic emphasis, and the dynamic interaction between CEOs and CFOs. This research elucidates the factors shaping investor perceptions, emphasizing the pivotal roles of effective communication and role clarity in influencing the short-term market reaction.

In the third chapter, I examine the strategic tone exhibited by managers (CEO and CFO) during ECC throughout their tenure, exploring the factors influencing tone inflation and analysts' adaptation skills. It highlights the role of equity incentives in managers' compensation as determinants of their tone. During the initial phase of their tenure, heightened abnormal tone corresponds to decreased analysts' forecast accuracy (increased forecast errors), although this impact diminishes over time, suggesting analysts' adaptation to managers' tone. Notably, CEOs' strategic tone exhibits a stronger negative impact on analysts' forecast accuracy than CFOs'.

This chapter contributes to the literature in two ways. Firstly, I expand upon existing research on managers' strategic tone (Arslan-Ayaydin et al., 2016, Huang et al., 2014b) and the ECC literature on tone (e.g., Blau et al., 2015, Davis et al., 2015, Price et al., 2012) by scrutinizing the tone effects over managers' tenures and analysts' adaptation to it. This long-term perspective and the differentiation between CEO and CFO communication address a gap in the literature.

Secondly, I provide insights into the link between managers' compensation and tone inflation in oral disclosure, adding to findings for written disclosure (Arslan-Ayaydin et al., 2016).

The fourth chapter investigates the prevalence and impact of ESG topics in ARR and ECC. My findings reveal a higher frequency of environmental- and social-related topics than governance ones in both document types. Environmental-related topics dominate ECC, while social-related topics are more equally distributed. I further examine the relationship between ESG-related information in ARR and analysts' forecast accuracy. My results indicate a negative association, particularly for environmental information. Subtopic analysis highlights specific environmental- and social-related subtopics contributing to this negative link. Governance-related information does not significantly affect forecast accuracy. I extend previous literature by exploring the impact of ESG-related discourse in ECC on forecast accuracy, revealing a positive association for environmental-related discussions. Interaction effects suggest increased forecast accuracy when social- or governance-related topics from ECC are considered in ARR. Robustness tests support the main findings, providing insights into the nuanced dynamics of ESG-related information and its implications for analysts' performance.

The contribution of this chapter to the literature is threefold. First, while previous literature has already documented an increase in environmental-related discourse in ECC within the US setting (Henry et al., 2021), I do not only confirm this rise for EU firms, but also reveal a parallel increase in discussions related to social-related topics.

Second, my research extends the existing body of literature on the determinants of analysts' forecast accuracy. Building upon the findings of Dhaliwal et al. (2012), which indicate that issuing a stand-alone ESG report is associated with lower analyst forecast error, I delve into the specific ESG-related information that analysts incorporate into their reports. I demonstrate that considering distinct environmental- and social-related subtopics explains the overall negative correlation between ESG-related discussions and analysts' forecast accuracy.

By doing so, my findings contribute to the growing demand for further research to enhance our understanding of the sources of analyst value (e.g., Bradley et al., 2014, Bradshaw, 2011, Ramnath et al., 2008).

5.2 Overarching Contribution

Overall, the three main chapters of this thesis collectively contribute to the expanding corpus of literature concerning financial communication, market dynamics, and the integration of ESG factors in decision-making processes. Each chapter presents analyses and empirical investigations into key dimensions of information dissemination during conference calls, elucidating its profound ramifications on market behavior and analyst performance. This thesis' overarching contribution is threefold.

The first contribution lies in disentangling the intricate interplay between information quality, clarity, and market responses. For instance, recent events such as the GameStop short squeeze (Zheng et al., 2022) and the Archegos Capital Management debacle (Murphy, 2021) underscore the critical importance of transparent and high-quality information dissemination for fostering well-informed decision-making within financial markets.

Secondly, the chapters yield valuable insights for practitioners and regulators concerning transparency. Analyzing and comprehending corporate communication is crucial, as demonstrated by the provided findings on the evolving significance of ESG information in financial analysis and decision-making processes. Thus, I do not only enhance my understanding of integrating non-financial indicators into conventional financial analysis, but also underscore the growing importance of ESG criteria in shaping investment strategies and market trends.

Thirdly, I demonstrate how new NLP models enable us to answer novel research questions, such as those addressed in this thesis. Consequently, I obtain insights into various aspects of corporate communication, market dynamics, and decision-making processes that have previously been underexplored. This advancement in methodological tools facilitates a deeper understanding of complex phenomena and fosters more informed decision-making across diverse domains.

In summary, these chapters advance both theoretical insights and practical applications in the domains of financial communication, market dynamics, and ESG integration. By shedding light on the intricate interactions between information dissemination, market responses, and ESG considerations, the research provides insights that can inform investment decisions, regulatory frameworks, and corporate policies within the complex fabric of contemporary financial ecosystems.

5.3 Practical Implications, Limitations and Future Research Avenues

This thesis provides valuable insights for various stakeholders. Firstly, it offers guidance to firms' communication and IR teams on optimizing the design of conference calls. It emphasizes the significance of management roles in influencing the perceived credibility of communicated information. Secondly, it advises analysts and investors to pay attention to and consider the communication style of management, as it significantly impacts the evaluation of firm performance. This approach has the potential to enhance the accuracy of firms' valuation. Thirdly, the thesis suggests improvements for regulators to enhance transparency and information quality in ESG disclosure. Current ESG reporting seems to be causing more confusion for analysts rather than aiding them in making more accurate forecasts.

Textual analysis, specifically NLP methods such as LDA, FinBERT-Tone, and FinBERT-ESG, present inherent limitations, which I have mitigated. Textual datasets often exhibit noise, inaccuracies, and inconsistencies, necessitating rigorous preprocessing procedures such as data cleaning, tokenization, and stemming. Despite these efforts, inadvertent alterations to the semantic content may occur, potentially affecting downstream analysis (Nesca et al., 2022). The inherent ambiguity and context sensitivity of textual data pose significant challenges for NLP methodologies. Instances of polysemy and homonymy complicate accurate interpretation, as NLP models may struggle to discern the intended meaning within various linguistic contexts (Yin et al., 2021). NLP models trained on generic corpora may lack accuracy in domain-specific texts, such as financial or corporate communications. These models may inadequately capture specialized terminologies, industry-specific language, and subtle linguistic nuances prevalent within such domains (Liu et al., 2021). While NLP techniques offer valuable insights into textual datasets, their inner workings often lack transparency and interpretability. Consequently, understanding the rationale behind model decisions becomes challenging, raising concerns regarding the reliability and veracity of analytical outcomes (Zini and Awad, 2022). Further, NLP models are susceptible to inheriting biases present within training datasets, potentially resulting in biased outcomes and unfair treatment across demographic groups. Mitigating these biases and ensuring equitable analyses are paramount concerns in NLP research and application domains (Bansal, 2022). Deep learning-based NLP methods may exhibit scalability challenges and demand substantial computational resources, especially during training. Addressing these scalability limitations is crucial for facilitating real-time analysis and processing of large-scale textual datasets (Agerri

et al., 2015). The ability of NLP models to generalize to unseen data and adapt to evolving linguistic patterns remains an ongoing challenge. Issues such as overfitting to specific datasets and failure to capture linguistic evolution pose significant hurdles to the robustness and reliability of NLP-based analyses (Hupkes et al., 2023).

Future research should focus on developing more robust and contextually sensitive NLP models that can handle ambiguity, context dependency, and linguistic nuances more effectively. Additionally, I need to explore novel approaches for integrating domain-specific knowledge and improving the interpretability of NLP models to address these limitations.

In the domain of standardization challenges in ESG reporting, we should direct our research toward developing AI-driven frameworks that foster standardized ESG-reporting practices across diverse industries. Such initiatives are pivotal for establishing uniformity, consistency, and comparability in ESG disclosures, thereby enhancing the reliability and effectiveness of sustainability reporting mechanisms.

Additionally, research can integrate AI methodologies, including NLP and sentiment analysis, within the framework of crafting analyst reports. We should systematically investigate the potential of AI tools to augment the precision and comprehensiveness of information embedded in these reports. My objective is to elucidate how AI applications can contribute to an enriched analytical landscape, providing investors and decision-makers with valuable insights that transcend conventional reporting practices in the financial domain.

The evolving innovative AI tools may enable a broader audience to conduct analyses in the future without requiring specialized skills or extensive prior knowledge like Kim et al. (2024) indicate. Consequently, these tools establish a framework for effectively examining novel or previously unexplored data in the realm of finance and accounting, encompassing images, audio, and video. The resulting research opportunities contribute to portraying and analyzing a more comprehensive depiction of reality.

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